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Floristic characteristics, diversity and structure of riparian forest in the port area of San-Pédro (South-West Côte d'Ivoire)

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Abstract. The coastal forest in the San-Pédro Port area is under threat, so for the sustainable management of dense and coastal forests, knowledge of their flora and structure is of utmost importance. The objective of the study was to identify the flora and vegetation along the coast in the San-Pédro Port area and to determine the vegetation structure along the coast in the San-Pédro Port area. Two methods were used to carry out this work: 50 squares of 400 m^2 each were placed in the vegetation formations, where all individuals with a diameter at breast height greater than

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10 cm were measured. A total of 184 tree species were recorded in the dense forest and 139 tree species in the coastal forest. The Shannon-Wiener diversity index for both forests is medium. The structures showed diameter classes dominated by individuals with a diameter of 10 to 20 cm in the shape of an inverted letter "J", and a height structure dominated by individuals in the range of 5-10 m in both areas. The results obtained indicated that current anthropogenic activities in the study area do not contribute to the sustainable management of the natural resources of the coastal forest. This information revealed the understanding of the floristic and structural biodiversity of coastal vegetation in the port area of San-Pédro. The results obtained allowed the assessment of the state of vegetation in relation to ecological factors and can be used by foresters to improve the management, protection and restoration of these natural areas

Keywords: specific richness; riparian vegetation; ecological factors; disturbance; anthropogenic impacts; zonal ecosystems

Introduction

The fight against climate change to safeguard biodiversity has become a global environmental concern since the Rio de Janeiro summit in 1992. These concerns have attracted the attention not only of scientists, but also of politicians and socio-economic communities. There is no doubt that forest ecosystems provide many services (Matoumouene *et al.*, 2023). Indeed, population growth and economic development are the driving forces behind the decline in forest cover around major urban areas. This is the case with the town of San-Pédro in Côte d'Ivoire. The area surrounding the Port of San-Pédro is home to a wide variety of wooded areas. A few hectares of mature forest have so far been spared from human activity. In response to the impact of human activity on forests, phytosociological studies have been carried out at a number of the least disturbed sites. E.S. Miabangana *et al*. (2020) studied floristic and structural characteristics of the Congo river riparian forest in the Plateau of Cataracts. Authors pointed out in their work that Congo river riparian forest in the Plateau of Cataracts is relatively rich and well diversified forest projects a good structure, thus demonstrating its ecologic maturity.

Côte d'Ivoire, which has experienced a particularly drastic decline in its forest resources, losing approximately 12 million hectares of forest in less than 40 years, appeared to be concerned about the issue of environmental protection (FAO & SEP-REDD+, 2017). Indeed, population growth and economic development were driving the decline in forest cover around large urban areas (Miabangana *et al.*, 2020). In their work of T.V. Borisade & A.I. Odiw (2022) noted that conservation is inevitable towards maintaining and protecting species diversity, ecosystem roles, and services of these forests in Nigeria. Riparian forests were often degraded by human activities, although they may prove to be more resilient than other wetland ecosystems due to their productivity, diversity and connectivity, despite their size in patches (Borisade *et al.*, 2021). They demonstrated that riparian forests in Nigeria are disappearing at a faster rate

The presence of riparian vegetation also acted as a barrier against erosion and helped maintain water flow capacity (Saklaurs *et al.*, 2022). Forests along watercourses have an important aesthetic and social function. They are ideal environments for walking, recreation and artistic activities. Their shade prevented excessive sunlight from reaching the water (Evette *et al.*, 2022). Unfortunately, due to its multiple functions, the flora and vegetation lining the waterways of the autonomous port of San-Pédro were currently under significant anthropogenic pressure, including the gradual destruction of their vegetation cover. These changes can lead to a loss of biodiversity and alter the ecosystem services provided by these natural environments. The excessive destruction of mangroves in search of mangrove trees, *Rhizophora racemosa* G.F.W. Mey. (Rhizophoraceae), used as firewood by local populations could be one of the causes (Egnankou *et al.*, 2023).

In Côte d'Ivoire, many studies have been carried out in wetlands, focusing on the flora and vegetation of swamp forests (Abrou *et al.*, 2019), riparian forests (Condé *et al.*, 2023) and mangroves (Egnankou *et al.*, 2023). However, few studies on flora and vegetation were generally carried out along riverine strips (Miabangana & Malaisse, 2020). To address this shortcoming, this study focused on the floristic characteristics, diversity and structure of riparian forest in the San-Pédro port area (PASP). The riparian vegetation of the PASP, which played an important role in maintaining water quality, had never been fully surveyed. This situation raised several questions with regard to the implementation of a sustainable management policy. This study was initiated with a view to providing answers to this question and will serve as a basis for sustainable management and biodiversity conservation strategies in this rapidly changing region. The main objective of this study is therefore to improve knowledge of the flora, vegetation and structure along the coast in the port area of San-Pédro. Specifically, this involved: (1) characterise the flora and vegetation along the coast in the port area of San-Pédro and (2) determine the plant structure of the flora and vegetation along the coast in the port area of San-Pédro.

Materials and Methods

The sampled sites are located along the coast in the port area of the town of San-Pédro (Fig. 1). The relief of San-Pédro is that of a coastal strip stretching some twenty kilometres wide (Bourlière, 1972). The only lowlands that reach the sea are narrow strips wedged between crystalline hills along the waterways. Where very low-lying plains exist in the hinterland, they form continental expanses that block the coastline with ridges and particularly rocky areas. The vegetation of the study area is included in that of the Guinean rainforest sector, dominated by dense evergreen rainforest (Guillaumet & Adjanohoun, 1972). It is a *psammophilous* forest characterised by *Turraeantho africanae – Heisteriotum parvifoliae* due to the presence of schist soils with good water reserves (Bourlière, 1972). The hydrography consists of small coastal rivers between Sassandra and Cavally, where water is retained during the dry season by a sandbar that blocks their mouths. The climate of the city of San-Pédro is known as the "transitional equatorial regime", characterised by a first rainy season from April to July, which is always more intense than the second, a short dry season from July to September, a second rainy season from September to November, which is very irregular, and a long dry season from December to march. Monsoon winds from the south-west, mainly saturated with water vapour, bring heavier rainfall of between 1,600 and 2,500 mm (Bourlière, 1972). The area is characterised by a low average temperature, which fluctuates between 26°C and 27°C. The development of the San-Pédro port area has led to the preservation of an ecological belt around the port. It consists mainly of a section of forest covering the lower and upper slopes of the hills bordering the port area. The sites where samples were collected are situated along the coastline and consist mainly of forests that are subject to periodic flooding and cover the lower slopes (Fig. 2a), whilst the upper slopes of the hills are generally covered by dense forests (Fig. 2b).

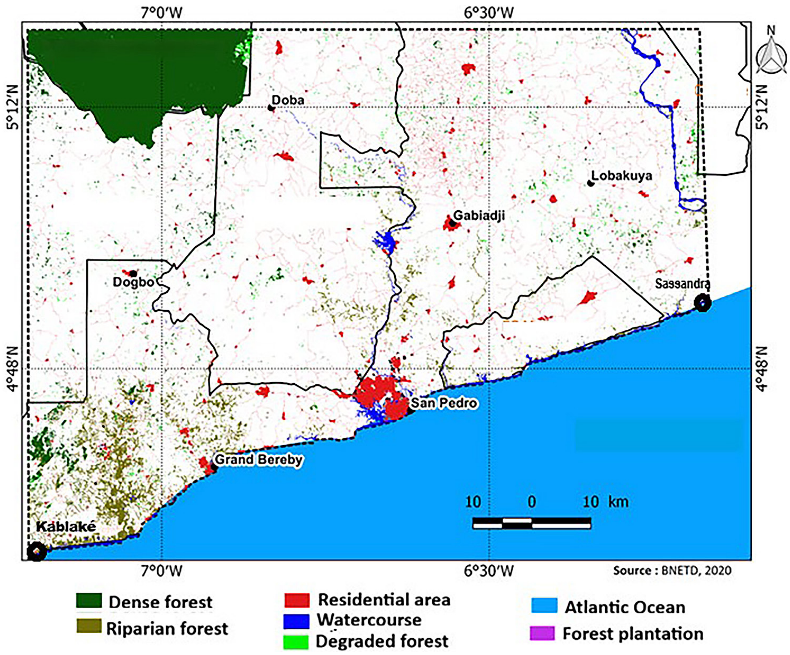

Figure 1. Location of inventoried sites

Source: developed by the authors with using ENVI 5.3 and QGIS 2.12.3 software

a

b

Figure 2. Riparian forest in the port area of San-Pédro

Note: a – forest covering the lower slopes; b – dense forest at the top of the hillsides along the sea

Source: images taken by the authors during their fieldwork whilst carrying out sampling

In this study, phytosociological surveys using the surface method and mobile survey were used. To set up the different plots, a mobile survey was first carried out to determine the accessible areas. The mobile survey method consists of covering the study area in all directions and senses (Gnahore *et al.*, 2023). This method made it possible to identify the areas suitable for carrying out surface surveys; furthermore, during the survey, the species identified were added to the complete list of flora. The surface method consisted of determining a study area based on a geometric shape depending on the biotope in question. A square shape with an area of 400 m² was therefore chosen for all the plant formations encountered (Condé *et al.*, 2023).

The selected area of 400 m^2, defined as the minimum area, enabled the maximum amount of information to be obtained from each survey. Along the water's edge, 25 plots were arranged in wooded groups of riparian formations. Similarly, in dense forests, 25 other sampling plots were set up. The study sites were selected on the basis of physionomic vegetation type and accessibility. They were spaced 50 meters apart on either side due to the small size of the study sites. This distance ensured that the entire study area is covered.

Dendrometric measurements focused on the diameter of trees at 1.30 m above ground level. All individuals with a DBH (diameter at breast height) greater than or equal to 10 cm were identified. Measuring the circumference of the trees made it possible to determine the stage of vegetation degradation and to define the diametric structure of the tree stand. Within each plot in the riparian and dense forests, tree individuals with a DBH greater than 10 cm were identified. Identifications were made in the field initially and then with the help of reference works and a few botanical specialists. The scientific names of the species were updated in the African Plant Database (version 4.0.0) according to African Plant Database (2022). Data collection took place from 3 to 30 March 2025.

As R. Schnell (1970) pointed out, species richness represents the list of all species that inhabit an ecosystem. It is also the number of species in the sample of a plant community studied. The floristic composition was determined through this study. It refers to all the biological, morphological, geographical and ecological characteristics of the species found there, as well as the specific status of the species. It was used to characterise the floristic lists obtained and assess their richness. The Shannon-Wiener diversity Index (H') and Pielou's Evenness Index (E) were calculated using the data collected (Shannon, 1948). The quantification of the floristic diversity of the flora and vegetation of the related PASP terroirs was assessed by calculating these indexes. The calculation of the index takes into account the number and abundance of the species considered. This index varied from the lowest diversity to the highest according to the classification of J.M. Felfili *et al.* (2004) for the tropical or primary forests. When the value of H' is less than 2.5, diversity is very low. Similarly, when the value of H' is between 2.5 and 4, diversity is average, and when the value of H' is greater than or equal to 4, diversity is high. If N is the total number of species S considered within a study plot, and P*i* (n*i*/N) is the relative abundance of species *i*, then the Shannon-Wiener diversity Index can be summarised by the following mathematical expression:

$$\mathrm{H'} = -\sum_{i=1}^{s} pi\, pi \times ln, \qquad (1)$$

In this study, the relative proportion of species and their abundance were analysed within each plot. Pielou's Evenness Index or Equitability Index (J) corresponds to the ratio between the Shannon-Wiener diversity Index (H') and maximum diversity (lnS) according to E.C. Pielou (1966). Pielou's Evenness Index (E) reflects how individuals are distributed across species (Gnahore *et al*., 2023). According to the classification by J.M. Felfili *et al*. (2004) for the tropical or primary forests, equitability was very low when the value of J is less than 0.6. When the value of J is between 0.6 and 0.7, this corresponds to average equitability, and when the value of J is greater than or equal to 0.8, equitability is high. Evenness index is calculated using the following formula (Pielou, 1966):

$$\mathrm{J} = \frac{\mathrm{H'}}{\mathrm{lnS}}. \qquad (2)$$

In this study, species frequencies were used to calculate these index using the statistical software PAST 2.16. The study of woody vegetation density provides information on species occupancy of the land. Density (D) is defined as the ratio of the total number of stems (n) with a circumference greater than or equal to 10 cm to the total area (S) sampled in the environment (Condé *et al.*, 2023). The number of stems obtained from the 400 m^2 area was extrapolated to the hectare. This parameter was used to assess the density of adult individuals in each of the biotopes. It is expressed by the following formula:

$$D = \frac{n}{S}, \quad (3)$$

with S: an area of 0.04 hectares (400 m^2) in each study area. Diameter class was used to characterise the diameter structure of vegetation, which reflects the condition of a plant community's ability to develop naturally (Gnahore *et al.*, 2023; Tré *et al.*, 2025). The diameter distribution of individuals is one of the essential characteristics of a species population. For this study, seven diameter class (cm) were selected. The differents class were between [10-20 cm]; [21-30 cm]; [31-40 cm]; [41-50 cm]; [51-60 cm]; [61-70 cm] and >70 cm. The diameter intervals, with a range of 10 cm, provided a better understanding of the diameter structure of the forest stand.

The study of the vertical structure of the vegetation was evaluated across height class (Condé *et al.*, 2023). For this study, in order to take into account the middle, upper and emerging tree strata, different height class (m) were selected: [5-10 m], [11-15 m], [16-20 m], [21-25 m], [26-30 m] and ⩾30 m. To estimate the lower layer of the undergrowth, which forms part of the regeneration species, woody individuals measuring at least 5 cm were taken into account. To compare the means of the floristic parameters between the two areas, one-way analysis of variance (One-way ANOVA) was performed using PAST 2.16 software. The two areas were treated as independent samples. The significance test was carried out at $P = 0.05$. Normality was tested using the Shapiro-Wilk test in each case prior to analysis. The homogeneity of variances was tested using Bartlett's test. This involved comparing the mean values of the floristic parameters (richness, morphological type and diversity index). In the presence of a significant difference (One-way ANOVA test) between the means for a given parameter, Tukey's test was immediately applied. This test allowed the groups to be classified and identified which ones was different (Gnahore *et al.*, 2023). These were used to compare the means of the above parameters.

Results

Floristic characteristics. The inventory of all forests identified 277 species. These are organised into 268 genera and 75 families. A comparison of the two sites shows a greater number of plant species in the dense forest. This observation also applies to families. The total number of species inventoried in the different formations varies between the two biotopes (Table 1). Comparison of the average species richness of the different biotopes using the Tukey's test showed a statistically significant difference ($P < 0.05$) between the biotopes.

Table 1. Comparison of the number of species in the different formations around the PASP

Parameter	Plant formations		Statistical parameters	
	Dense forest	Riparian forest	F	P
Number of readings	25	25	-	-
Total species	184	139	-	-
Average species (M ± SE)	31.28 ± 1.70^{a}	22.24 ± 1.11^{b}	114	0.001

Note: different letters a and b indicate statistically significant differences between groups ($P < 0.05$); F – Fischer value; P – probability value, M ± SE: mean values, plus or minus the standard error

Source: developed by the authors

A total of 75 families were recorded during this study. The most common families, in descending order, are Fabaceae (22 species), Malvaceae (14 species) and Rubiaceae (11 species). In the riparian forest, Rubiaceae (17 species), Fabaceae (13 species) and Apocynaceae (12 species) remain the dominant families. At the edge of the riparian forest, the genera *Ficus* is frequently encountered. A comparison of the different strata of the study sites shows a dominance of shrubs and trees at both sites. Across all the different formations, shrubs dominate with 112 species, followed by lianas (78 species) and trees (70 species). Herbaceous plants account for the remaining 17 species. The proportions of morphological types vary according to the different plant formations. In the dense forest, shrubs also account for the largest number of species, with 81 species (44.02%), followed by trees with 55 species (29.89%) and lianas with 41 species (22.28%). Herbaceous species come last with 7 species (3.80%). The riparian forest comprises 53 species (38.12%) of lianas, 46 species (33.33%) of shrubs and 30 species (21.73%) of trees. Herbaceous plants are very poorly represented in this biotope (10 species, or 7.24%). The proportions differ significantly between the different plant formations in terms of shrubs and trees ($P < 0.05$). The proportions of herbaceous plants are statistically identical ($P > 0.05$), as shown in Table 2.

Table 2. Comparison of the morphological types of the different formations around the PASP

Morphological types (%)	Plant formations		Statistical parameters	
	Dense forest (M ± SE)	Riparian forest (M ± SE)	F	P
Shrubs	8.10 ± 3.24^a	4.60 ± 1.84^b	14.45	0.001
Lianas	4.10 ± 1.64^a	5.30 ± 2.12^b	5.37	0.01
Trees	5.50 ± 2.20^a	3 ± 1.20^b	12.54	0.001
Herbaceous	0.90 ± 0.28^a	1 ± 0.04^a	0.91	0.084

Note: different letters a and b indicate statistically significant differences between groups ($P < 0.05$); F – Fischer value; P – probability value; M ± SE: percent mean values, plus or minus the standard error

Source: developed by the authors

In terms of study sites, dense forest is the most diverse with an average of 3.185 ± 0.01. Riparian forest follows with a value of 3.178 ± 0.00. In terms of the biotopes that comprise it, dense forest has the highest Evenness value (0.989 ± 0.01), ahead of riparian forest (0.987 ± 0.00), as shown in Table 3. However, statistical testing reveals no significant difference ($P > 0.05$) between these two plant formations in terms of Shannon-Wiener diversity Index and Pielou's Evenness Index.

Table 3. Comparison of the Shannon-Wiener diversity and Evenness index for different plant formations

Floristic parameters	Plant formations		Statistical parameters	
	Riparian forest	Dense forest	F	P
Species number	139	184	-	-
Shannon-Wiener index (M ± SE)	3.178 ± 0.00^a	3.185 ± 0.01^a	1.106	0.78
Evenness index (M ± SE)	0.987 ± 0.00^a	0.989 ± 0.01^a	1.128	0.172

Note: different letters a and b indicate statistically significant differences between groups ($P < 0.05$); F – Fischer value; P – probability value; M ± SE: Mean values, plus or minus the standard error

Source: developed by the authors

Structural characteristics. In the dense forest stand, 28 stems with a diameter at breast height greater than or equal to 10 cm were counted over an area of 400 m^2, corresponding to 700 stems/ha. The most commonly encountered, given their abundance found species include *Synsepalum afzelii* (Sapotaceae), *Trichilia monadelpha* (Meliaceae), *Microdesmis keayana* (Pandaceae) and *Baphia pubescens* (Fabaceae). With regard to the vegetation of the riparian forest, an average of 23 individual trees were recorded per 400 m^2 area, equivalent to 575 stems/ha. *Alchornea cordifolia* (Euphorbiaceae), *Ficus trichopoda* (Moraceae), *Monodora myristica* (Annonaceae) and *Funtumia africana* (Apocynaceae) are the most dominant species in this biotope. Although the average stem density (stem ⩾ 10 cm) is higher in dense forest formations than in riparian forest formations, the Mann-Whitney statistical test reveals no significant difference ($P > 0.05$). In general, across all study areas, the histograms show a downward exponential trend, as illustrated in Figure 3. All of these areas show a significant and steady decline in the number of individuals as tree diameter class increase. However, in the smallest diameter class between 10 and 20 cm, the number of individuals is higher. By comparison, the number of stems in the dense forest is higher in the juvenile class. In terms of vertical structure, the 5-10 m, 11-15 m, 16-20 m and 21-25 m height class dominate the forest community in both biotopes (Fig. 4). The majority of stems surveyed are found in the smallest height class, between 5 and 10 m. The distribution of heights in the different class resembles an inverted "J".

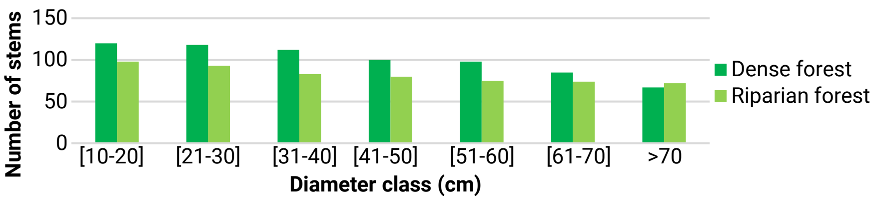

Figure 3. Histograms of the distribution of tree stems in the diameter class of dense and riparian forests

Source: developed by the authors

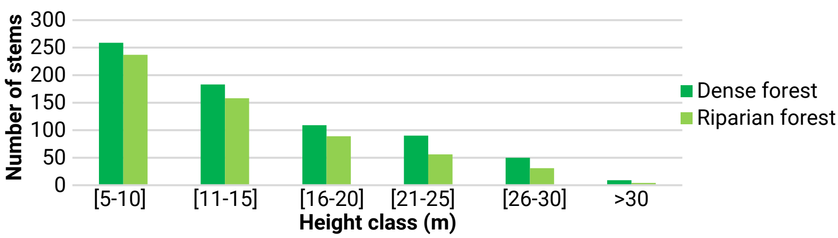

Figure 4. Histograms of the distribution of tree stems in dense and riparian forests by height class

Source: developed by the authors

Discussion

The discussion was based primarily on a comparison with the data obtained by E.S. Miabangana *et al*. (2020) concerning the floristic and structural characteristics of the Congo river riparian forest in the plateau of cataracts. Overall, the compilation of the flora lists for the two sites covered by this study identified 277 species in the port area, compared with 50 species recorded by E.S. Miabangana *et al*. (2020)

around the Congo River in the Cataracts Plateau, Republic of the Congo. Although the sampling area was the same (2 ha), the sites surveyed for this study remain floristically rich compared with those of E.S. Miabangana *et al.* (2020). This situation can be explained by the fact that the site of the present study is located in the Guinean-Congolese sector, whereas the site studied by E.S. Miabangana *et al*. (2020) was situated in the Guinean-Congolese-Zambian transition sector.

Sampling of riparian vegetation around the autonomous port of San-Pédro resulted in the identification of 277 species, divided into 268 genera and 75 families. The results of this study highlight differences between the two sites in terms of species richness, morphological types and diversity index. Around the autonomous port of San-Pédro, a comparison of the number of species in different forests shows that dense forest is the most species-rich biotope. This difference in species numbers could be explained by the lack of water due to the fact that dense forest is located at the top of hillsides. Indeed, the amplitude, frequency, timing and duration of flooding affect plant communities within wetlands. According to C. Byun *et al*. (2017), the duration of flooding had the greatest impact on wetland vegetation. Similarly, the lower species richness in riparian forests could be explained by the presence of various anthropogenic activities. As a result, plant diversity had virtually no time to develop (Condé *et al*., 2023). These prevailing stress conditions will limit the number of species that can establish themselves there and thus species richness (Barrios-Calderón *et al.*, 2024).

In both forests studied, the families richest in species are Rubiaceae, Fabaceae and Apocynaceae. According to F.N. Tuo *et al*. (2017), the dominance of Rubiaceae was a fairly common phenomenon in most tropical forests. The abundance of Rubiaceae in humid environments is consistent with the work of author. A comparison of the rates of morphological types shows that dense forest contains the largest number of shrubs and trees. Similar observations were made by S. Condé *et al*. (2023) in the Milo River basin in north-eastern Guinea. This observation could be explained by the fact that the dense forest located at the top of the hillsides is spared from human activities around the autonomous port of San-Pédro. However, lianas are present in significant proportions in the riparian forest. Indeed, numerous authors have demonstrated the prevalence of this morphological form in tropical forests (Tchatchou *et al*., 2015). Several studies have shown that human disturbance was the primary cause of vegetation degradation in forests (Gnahore *et al*., 2023). These activities promoted the regrowth of species such as lianas, which found ideal conditions there. This was undoubtedly what explained the presence of numerous lianas in this plant formation.

The Shannon-Wiener diversity Index calculated from the abundance of individuals of the species for the dense forest as a whole is higher than that of the riparian forest. The high diversity value reflects the high diversity of the flora in this forest. The low diversity of the riparian forest compared to the dense forest is undoubtedly linked to the presence of water. The low diversity observed in the riparian forest is mainly due to the significant disruption caused by flooding during the rainy season. The variation in diversity observed at the different study sites shows highly variable patterns of plant organisation from the watercourse to the hillside. The results of this study were consistent with those of S. Condé *et al*. (2023) in the Milo River basin in north-eastern Guinea. These authors agree on the role played by natural disturbance in a given environment as a source of diversity. In tropical environments, several authors have also observed low diversity and a dominance of a few tree species in wetlands, in contrast to what was found in adjacent terrestrial environments (Barrios-Calderón *et al.*, 2024). The banks of the riparian forest, naturally vegetated, are now degraded, as clearly shown by diversity index (species richness, Shannon-Wiener diversity Index and Pielou's Evenness Index). This was directly attributable to excessive practices by local riverside populations (Condé *et al.*, 2023).

Distribution by diameter class can be used to assess the impact of anthropogenic pressure on the tree population. The distribution of individuals into diameter class revealed a gradual decrease in the number of individuals as the diameter class increases. Individuals with a diameter in the 10-20 cm range are predominant in dense forest sites and less numerous in riparian forest sites. Similar studies conducted by S. Condé *et al.* (2023) in Guinea in the Milo River basin have shown that tree density has an inverted J-shaped structure. According to T.C. Whitmore (1998), high densities of small-diameter class ensured the future of natural formation of large trees. This confirmed the strong regeneration and stability of these inventoried formations (Nghonda *et al.*, 2024). However, environmental factors or habitat variables were key elements in the distribution of plant communities. Other studies have confirmed that edaphic factors are responsible for the distribution of plant species and their dynamics (Omar Ali & Vinet, 2018). These factors, referred to as habitat parameters, such as slope and soil texture, have played a crucial role in the discrimination of plant communities. The results of this study corroborated those of studies conducted in the Milo River basin in north-eastern Guinea on the structure of plant biodiversity by S. Condé *et al.* (2023).

The vertical structure in both forests shows an 'L' shape. This distribution of individuals in height class could mean that these stands are in the process of regeneration. The low number of individuals recorded in the stratum above 30 meters in height can be explained by delayed growth due to anthropogenic actions on certain emergent species. The urban forests in the San-Pédro port area help to reduce the negative environmental impact per capita, in particular by improving air quality and managing municipal waste. In this area, only a few patches of mature forest have so far been spared from human impact. They are confined to the coastline along the Atlantic Ocean.

Conclusions

This study focused on floristic characteristics, diversity and structure of riparian forest in the port area of San-Pédro (South-West Côte d'Ivoire) and conducted with the aim of improving knowledge of the flora, vegetation and structure along the coast in the port area of San-Pédro. The methodological approach used, following characterisation of the riparian forest, confirms the same trend in the tree structure. The floristic inventory made it possible to determine the floristic composition, assess floristic diversity index and determine the vegetation structure of dense and riparian forests. The results obtained show that there are 184 species in the dense forest compared to 139 species in the riparian forest. Analysis of the floristic composition and diversity showed a high level of species richness and diversity in the dense forest. The results obtained indicate that current anthropogenic activities in the study area do not promote sustainable management of the riparian forest's natural resources.

The various dendrometric measurements and statistical analysis carried out have provided new information on the structure and dynamics of floristic biodiversity at the two study sites. Analysis of the structures shows a diameter class structure dominated by individuals with a diameter of between 10 and 20 cm, with an inverted "J" shape, and a height structure dominated by individuals in the 5-10 m range at both sites, with an "L" shape. These findings contributed to the understanding of plant biodiversity and provide a vital basis for the development of management plans aimed at preserving these forest habitats. In order to further knowledge of the floristic biodiversity of riparian forest in the port area of San-Pédro, the selection of other sites could help to confirm the data obtained from this study. However, the carbon sequestration capacity of this forest stand warrants further consideration in order to strengthen the scientific basis.

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Conflict of Interest

None.

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Флористичні характеристики, різноманітність та структура прибережного лісу в портовій зоні Сан-Педро (Південно-Західний Кот-д'Івуар)

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Анотація. Прибережний ліс у портовій зоні Сан-Педро знаходиться під загрозою, тому для сталого управління густими та прибережними лісами знання їхньої флори та структури є надзвичайно важливим. Мета дослідження полягала у визначенні флори та рослинності вздовж узбережжя в портовій зоні Сан-Педро та визначенні рослинної структури вздовж узбережжя в портовій зоні Сан-Педро. Для виконання цієї роботи використано два методи: 50 квадратів площею 400 м^2 кожен були розміщені в рослинних формаціях, де були виміряні всі особини з діаметром на висоті грудей більше 10 см. Загалом було зареєстровано 184 деревні види в густому лісі та 139 деревних видів у прибережному лісі. Індекс різноманітності Шеннона-Вінера для обох лісів є середнім. Структури показали діаметральні класи, в яких домінують особини з діаметром від 10 до 20 см у формі перевернутої літери «J», та структуру висоти, в якій домінують особини в діапазоні 5-10 м на обох ділянках. Отримані результати свідчили про те, що поточна антропогенна діяльність у досліджуваній зоні не сприяє сталому управлінню природними ресурсами прибережного лісу. Ця інформація розкрила розуміння флористичного та структурного біорізноманіття прибережної рослинності в портовій зоні Сан-Педро. Отримані результати дозволили оцінити стан рослинності стосовно екологічних факторів і можуть бути використані лісівниками для покращення управління, захисту та відновлення цих природних територій

Ключові слова: специфічне багатство; прибережна рослинність; екологічні фактори; порушення; антропогенний вплив; зональні екосистеми