AMAZONIANA XVII (3/4): 399-411 Kiel, Dezember 2003

Floristic composition of a floodplain forest in the Anavilhanas archipelago, Brazilian Amazonia*

by

P. Parolin, J. Adis, M.F. da Silva, I.L. do Amaral, L. Schmidt & M.T.F. Piedade

Dr. Pia Parolin & Prof. Dr. Joachim Adis, Tropical Ecology Working Group, Max-Planck-Institute for Limnology, Postfach 165, 24302 Plön, Germany; e-mail: pparolin @mpil-ploen.mpg.de & adis@mpil-ploen.mpg.de
Dr. Marlene Freitas da Silva, Universidade do Amazonas, Instituto de Ciências Biológicas, Campus Universitário, 69.077-000 Manaus/AM, Brazil; e-mail: marlene@inpa.gov.br
M.Sc. Iêda Leão do Amaral, INPA/CPBO & Dr. Maria Teresa F. Piedade, INPA/Max-Planck-Project, Caixa Postal 478, 69011-970 Manaus/AM, Brazil; e-mail: iamaral@inpa.gov.br & maitepp@internext.com.br
Prof. Dr. Loki Schmidt, Neuberger Weg 80, 22419 Hamburg, Germany.
(Accepted for publication: April, 2003).

Abstract

The Anavilhanas islands in Central Amazonia form the world's greatest freshwater archipelago. They are covered with floodplain forests which are periodically inundated by the blackwater of the Rio Negro. Little is known to date about the forest cover, and this study presents a vegetation analysis as a first step towards describing the forest ecosystem of this unique ecosystem. In a plot of 50 x 30 m (0.15 ha), 267 trees were inventoried. Fifty one species belonging to 50 genera of 29 families were determined. The most common family was the Fabaceae, followed by Apocynaceae and Violaceae, both represented by a single species (*Tabernaemontana rupicola* and *Amphirrhox longifolia*, respectively). These two species had the highest number of individuals. The canopy structure showed three layers, the densest being at 5-8 m, the second at 14-19 m, and the third at 25-33 m. The vegetation in the study area contains tree species which are characteristic of the 'seasonal igapó', but also of whitewater floodplains and/or non-flooded terra firme. The analysed forest plot represents a mature stage of blackwater floodplain forest with a high number of species which have a wide distribution and an ample range of ecological requirements, and a low degree of local endemism.
Keywords: **Amazonia, blackwater, floodplain, inundation forest, igapó.**

Resumo

As ilhas Anavilhanas, na Amazônia Central, formam o maior arquipélago de água doce do mundo. Elas são cobertas por florestas alagáveis as quais são periodicamente inundadas pelas águas pretas do Rio Negro.

*Dedicated to Prof. Dr. Wolfgang J. Junk on the occasion of his 60th anniversary.

ISSN 0065-6755/2003/399/

Até o momento, pouco é conhecido a respeito da cobertura vegetal das ilhas Anavilhanas e este estudo apresenta uma análise da vegetação, como primeiro passo em direção à descrição do tipo florestal deste ecossistema único. Em uma unidade amostral de 50 x 30 m (0,15 ha), 267 árvores foram inventariadas. Foram determinadas 51 espécies, pertencentes a 50 gêneros, divididos em 29 famílias. A família mais comum foi Fabaceae, seguida de Apocynaceae e Violaceae, sendo as duas últimas representadas por apenas uma espécie (*Tabernaemontana rupicola* e *Amphirrhox longifolia*, respectivamente). Essas duas espécies apresentaram o mais elevado número de indivíduos. A estrutura do dossel apresentou três níveis, o mais denso compreendido na faixa entre 5-8 m, o segundo na faixa de 14-19 m, e o terceiro entre 25 e 33 m. A vegetação da área estudada contém espécies arbóreas consideradas características do 'igapó sazonal', apresentando, porém, componentes das áreas alagáveis por águas brancas e/ou das áreas não alagadas de terra firme. A unidade florestal analisada representa um estágio maduro da floresta inundável de igapó, caracterizado por um elevado número de espécies com uma ampla distribuição e grande amplitude de requerimentos ecológicos, e um baixo grau de endemismos locais.

Introduction

The islands of the world's greatest freshwater archipelago, the Anavilhanas in Central Amazonia, are covered with floodplain forests which are periodically inundated by the blackwater of the Rio Negro. As is typical for these 'seasonal igapó forests' (PRANCE 1979), these nutrient-poor environments are subjected to flooding heights of up to 15 m lasting for up to seven months every year. Despite the adverse conditions for tree growth caused by prolonged anaerobic soil conditions, the forests bordering the Rio Negro and its affluents consist of several hundred tree species and show a high diversity (IRION & ADIS 1979; KEEL & PRANCE 1979; REVILLA 1981; WORBES 1997; FERREIRA 1997, 2000).

Although the role of the Anavilhanas archipelago as a unique ecosystem is undoubted, with its almost 200 islands comprising 100,000 ha on an area of 90 x 12.5 km, it still is a 'white spot' concerning knowledge about the vegetation cover. In the literature, one may find studies of fish, reptile and macroinvertebrate fauna of the archipelago (NESSIMIAN et al. 1998; SILVEIRA & MAGNUSSON 1997, 1999; VIEIRA et al. 1999), as well as hydrochemical studies (FILOSO et al. 1999; FILOSO & WILLIAMS 2000). MOREIRA & MOREIRA (1996) collected seeds in the Anavilhanas and analysed germination in a glasshouse. PIEDADE (1985) analysed the reproductive biology of *Astrocaryum jauary* on the Anavilhanas islands in a non-published thesis which includes also a floristic inventory, and other floristic data of an island may be found in a preliminary floristic inventory performed by RODRIGUES (1961). Summarizing, there is a lack of basic information about the forest cover of the islands. The aim of the present study is to present a vegetation analysis as a first step towards describing and analysing the forest ecosystem of the Anavilhanas archipelago.

Methods

The study area was located between the Paraná Anu and the Lago do Prato, Anavilhanas archipelago (2° 00' and 3°02'S of latitude and 60°27' to 61°07'W of longitude). The soils of the Anavilhanas islands are mainly loam and aggregated silt (LEENHEER & SANTOS 1980). Mean monthly temperature in Central Amazonia ranges from 26.3 to 27.2 °C. The area is subject to a rainy season (December-May: average precipitation 1550 mm; 258.8 ± 36.8 mm/month) and a "dry" season (June-November: average precipitation 550 mm; 91.8 ± 43.8 mm/month, each month with some rain events; cf. RIBEIRO & ADIS 1984). Variation of water level of the Amazon river and its affluents is markedly seasonal. The rising phase lies between December and June, and the receding period between July and November. The flooded period can last 210 days (JUNK 1989). In the period of data collection (April 1985), maximum flooding height in the

inventoried stand was 1.70 m.

In a plot of 50 x 30 m (0.15 ha), with the side of 50 m being parallel to the river bed, all trees were inventoried. Tree height was measured with a yardstick, and tree circumference and diameter at breast height were measured with a measuring tape. The 'family importance index' (FIV) was calculated as relative dominance ('basal' area at breast height in %) + relative tree density + relative frequency (excluded here, because it is 100 % for all species).

The collected material was identified by Luis F. COELHO, Dionízio F. COELHO, Marlene Freitas da SILVA and Iêda Leão do AMARAL and deposited at the INPA herbarium in Manaus.

Results

Floristic composition.

Two hundred and sixty seven trees were inventoried, with 51 species in 50 genera of 29 families (Table 1). The most common family was Fabaceae with a FIV of 86, followed by Apocynaceae with a FIV of 19 and Violaceae with a FIV of 15. These latter families are both represented by only one species, *Tabernaemontana rupicola* and *Amphirrhox longifolia*, respectively (Table 1). These species also had the highest numbers of individuals (Table 2).

Forest structure.

Most trees had diameters at breast height (DBH) below 10 cm (Figure 1). Mean DBH of all trees was 10.5 cm. Some species had high mean DBH (Table 2), for example *Erisma calcaratum* (mean = 54.8, n = 1), *Vatairea guianensis* (mean = 39.5, n = 3), and *Mabea* sp. (mean = 39.2, n = 1). The tree with the largest DBH was *Aldina latifolia* with 117.8 cm.

Most trees were 5-10 m tall (Fig. 2), and average tree height was 9.3 m, with a maximum height of 34 m (*Swartzia polyphylla*). Most individuals (125) and species (31, + indetermined species with 26 individuals) were found between 5-8 m (Fig. 3). Emerging trees, with heights between 24 and 34 m, belonged to 11 species, with *Aldina latifolia* being one of the most striking and typical.

The two most abundant species, *Tabernaemontana rupicola* (Apocynaceae) and *Amphirrhox longifolia* (Violaceae), had few individuals taller than 8 m, with DBH below 10 cm (Fig. 4). Most individuals were within a small range of height and DBH-classes. This was not the case for *Aldina latifolia* which was represented by a wide range of DBH and height classes (Fig. 4).

Discussion

According to the floristic categories of Amazonian forest types subjected to flooding (PRANCE 1979, 1980), the vegetation in the study area contains tree species characteristic of the 'seasonal igapó'. The species with more than 10 individuals in the plot, and also the three most characteristic and abundant tree species, *Tabernaemontana rupicola, Amphirrhox longifolia*, and *Aldina latifolia*, are all typical representants of black-water floodplains (igapó; Table 2), although *Tabernaemontana rupicola* is cited as typical for vegetation on whitesand soils (campina; PRANCE 1978; KLINGE 1985). In fact, a high number of species is also represented in whitewater floodplains (várzea) and/or non-flooded uplands (terra firme; Table 2). Seven species of várzea and terra firme have not been reported to occur in blackwater floodplains to date.

Non-flooded terra firme forests are absent on the islands of the archipelago, but it may be possible that upland species get established within the upper, shortly flooded

areas of the igapó, especially if they have preadaptations to periodical flooding (KUBITZKI 1989). Species of the nutrient-rich várzea may find a suitable environment in the Anavilhanas archipelago because of the influence of the Rio Branco: this large whitewater river enters the Rio Negro close to the Anavilhanas archipelago and influences the igapó vegetation (RODRIGUES 1961; AMARAL et al. 1997).

The vegetation of the inventoried forest plot was clearly dominated by two species, *Tabernaemontana rupicola* (Apocynaceae) and *Amphirrhox longifolia* (Violaceae). The genus *Tabernaemontana* is common in várzea and terra firme forests throughout Amazonia, and less in igapó forests. *Amphirrhox longifolia* is common in floodplains along the Rio Negro (WORBES 1983, 1986; KUBITZKI 1989; KLINGE et al. 1990) along the Rio Caura in Venezuela (ROSALES et al. 1997, 2001) and on terra firme (PRANCE et al. 1976; BRAGA 1979; RIBEIRO et al. 1999). They may belong to those trees which originated in non- or seldom-flooded areas and migrated into flooded areas representing a first step towards the evolution of typical floodplain species (KUBITZKI 1989). According to RIBEIRO et al. (1999) and ROSALES (pers. comm.), both genera and species are typical understory trees. In the present study, *Tabernaemontana rupicola* and *Amphirrhox longifolia* are very frequent in the lowest stratum and are absent in the middle and high strata.

Summarizing, the analysed forest plot represents a mature stage of blackwater floodplain forest with a high number of species which have a wide distribution and an ample range of ecological requirements. Species number and diversity are lower than in terra firme forests (PRANCE et al. 1976; PRANCE 1982; RANKIN-DE-MERONA et al. 1992) because of flood stress in the floodplains (ADIS & JUNK 2002). Furthermore, the degree of local endemism seems to be low: high speciation, typical for archipelagos (KANESHIRO 1995), is diminished by the high dynamics of the system and lack of isolation of the islands. The distances between the islands are small and allow pollinating insects to cross the river barriers, and water, fish, birds, bats and monkeys enhance dispersal of the diaspores (GOULDING 1983; AYRES 1993; KUBITZKI & ZIBURSKI 1994).

Acknowledgments

We thank the Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus/Brazil for assistance, and the technicians of INPA for help received in the field. The field work was made possible by financial support from the INPA/Max-Planck Project. Dr. William A. Rodrigues, Curitiba, and Dr. Eduardo Lleras, EMBRAPA, Manaus/Brazil, gave helpful comments on the manuscript.

References

ADIS, J. & W.J. JUNK (2002): Terrestrial invertebrates inhabiting lowland river floodplains of Central Amazonia and Central Europe: a review. - Freshwater Biology **47**: 711-731.

AMARAL, I.L. DO, ADIS, J. & G.T. PRANCE (1997): On the vegetation of a seasonal mixedwater inundation forest near Manaus, Brazilian Amazonia. - Amazoniana **14**(3/4): 335-347.

AYRES, J.M.C. (1993): As matas de várzea do Mamirauá. - Estudos do Mamirauá. Vol. **1**. CNPq: Sociedade Civil Mamirauá, Brasília.

BRAGA, P.I.S. (1979): Subdivisão fitogeográfica, tipos de vegetação, conservaçao e inventário florístico da floresta amazônica. - Supl. Acta Amazonica **9**(4): 53-80.

FERREIRA, L.V. (1997): Effects of the duration of flooding on species richness and floristic composition in three hectares in the Jaú National Park in floodplain forests in central Amazonia. - Biodiv. Conserv. **6**: 1353-1363.

FERREIRA, L.V. (2000): Effects of flooding duration on species richness, floristic composition and forest structure in river margin habitat in Amazonian blackwater floodplain forests: implications for future design of protected areas. - Biodiv. Conserv. **9**(1): 1-14.

FILOSO, S. & M.R. WILLIAMS (2000): The hydrochemical influence of the Branco River on the Negro River and Anavilhanas archipelago, Amazonas, Brazil. - Arch. Hydrobiol. **148**(4): 563-585.

FILOSO, S., WILLIAMS, M.R. & J.M. MELACK (1999): Composition and deposition of throughfall in a flooded forest archipelago (Negro River, Brazil). - Biogeochemistry **45**(2): 169-195.

GOULDING, M. (1983): The role of fishes in seed dispersal and plant distribution in Amazonian floodplain ecosystems. - Sonderbd. Naturwiss. Ver. Hamburg **7**: 271-283.

IRION, G. & J. ADIS (1979): Evolução de florestas amazônicas inundadas, de igapó - um exemplo do rio Tarumã-Mirím. - Acta Amazonica **9**(2): 299-303.

JUNK, W.J. (1989): Flood tolerance and tree distribution in Central Amazonian floodplains. - In: NIELSEN, L.B., NIELSEN, I.C. & H. BALSLEV (eds.): Tropical forests: Botanical dynamics, speciation and diversity: 47-64. Academic Press London.

KANESHIRO, K.Y. (1995): Evolution, speciation, and the genetic structure of island populations. - In: VITOUSEK, P.M. & H. ADERSON (eds.): Islands: Biological diversity and ecosystem function: 23-33. Ecological Studies 115. Springer, Berlin.

KEEL, S.H.K. & G.T. PRANCE (1979): Studies of the vegetation of a white-sand black-water igapó (Rio Negro, Brazil). - Acta Amazonica **9**(4): 645-655.

KLINGE, H. (1985): Foliar nutrient levels of native tree species from central Amazonia. 2. Campina. - Amazoniana **9**(3): 281-295.

KLINGE, H., JUNK, W.J. & C.J. REVILLA (1990): Status and distribution of forested wetlands in tropical South America. - For. Ecol. Manag. **33/34**: 81-101.

KUBITZKI, K. (1989): The ecogeographical differentiation of Amazonian inundation forests. - Plant Syst. Evol. **162**: 285-304.

KUBITZKI, K. & A. ZIBURSKI (1994): Seed dispersal in flood plain forests of Amazonia. - Biotropica **26**(1): 30-43.

LEENHEER, J.A. & H. SANTOS (1980): Considerações sobre os processos de sedimentação na água preta ácida do Rio Negro (Amazônia central). - Acta Amazonica **10**(2): 343-355.

MOREIRA, F.M.S. & F.W. MOREIRA (1996): Características da germinaçao de sementes de 64 espécies de leguminosas florestais nativas da Amazônia, em condições de viveiro. - Acta Amazonica **26**(1/2): 3-16.

NESSIMIAN, J.L., DORVILLE, L.F.M., SANSEVERINO, A.M. & D.F. BAPTISTA (1998): Relation between flood pulse and functional composition of the macroinvertebrate benthic fauna in the lower Rio Negro, Amazonas, Brazil. - Amazoniana **15**(1-2): 35-50.

PIEDADE, M.T.F. (1985): Ecologia e biologia reprodutiva de *Astrocaryum jauari* MART. (Palmae) como exemplo de população adaptada às áreas inundáveis do rio Negro. - M.Sc.-thesis INPA/FUA, Manaus, Brazil.

PRANCE, G.T. (1978): The origin and evolution of the Amazon flora. - Interciencia **3/4**: 207-222.

PRANCE, G.T. (1979): Notes on the vegetation of Amazonia. III. Terminology of Amazonian forest types subjected to inundation. - Brittonia **31**(1): 26-38.

PRANCE, G.T. (1980): A terminologia dos tipos de florestas amazonicas sujeitas a inundação. - Acta Amazonica **10**(3): 495-504.

PRANCE, G.T. (1982): Forest refuges: evidence from woody angiosperms. - In: PRANCE, G.T. (ed.): Biological diversification in the tropics: 137-158. Columbia Univ. Press.

PRANCE, G.T., RODRIGUES, W.A. & M.F. DA SILVA (1976): Inventário florestal de um hectare de mata de terra firme km 30 da estrada Manaus-Itacoatiara. - Acta Amazonica **6**(1): 9-35.

RANKIN-DE-MERONA, J.M., PRANCE, G.T., HUTCHINGS, R.W., SILVA, M.F.DA, RODRIGUES, W.A. & M.E. UEHLING (1992): Preliminary results of a large-scale tree inventory of upland rain forest in the central Amazon. - Acta Amazonica **22**(4): 493-534.

REVILLA, J.D.C. (1981): Aspectos florísticos e fitossociológicos do igapó de Praia Grande, Rio Negro, Amazonas. - M.Sc.-thesis, INPA/FUA, Manaus, Brazil.

RIBEIRO, M. DE N.G. & J. ADIS (1994): Local rainfall variability - a potential bias for bioecological studies in the Central Amazon. - Acta Amazonica **14**(1/2): 159-174.

RIBEIRO, J.E., HOPKINS, M.,VICENTINI, A., SOTHERS, C.A., COSTA, M.A., BRITO, J.M., SOUZA, M.A., MARTINS, L.H., LOHMANN, L.G., ASSUNÇAO P.A., PEREIRA, E., SILVA, C.F., MESQUITA, M.R. & L.C. PROCÓPIO (1999): Flora da Reserva Ducke. Guia de identificação das plantas vasculares de uma floresta de terra firme na Amazônia Central. INPA, Manaus.

RODRIGUES, W. (1961): Estudo preliminar de mata de várzea alta de uma ilha do baixo Rio Negro de solo argiloso e úmido. - Inst. Nac. Pesq. da Amazônia, Botânica, Publ. no. 10, Manaus.

ROSALES, J.G., KNAB-VISPO, C. & G. RODRIGUEZ (1997a): Bosques ribereños del Bajo Caura entre el Salto Para y los Raudales de la Mura: su clasificación e importancia en la cultura Ye'kwana. - Scientia Guaianae **7**: 171-213.

ROSALES, J., PETTS, G. & C. KNAB-VISPO (2001): Ecological gradients within the riparian forests of the lower Caura River, Venezuela. - Plant Ecology **152**(1): 101-118.

SILVEIRA, R.D. & W.E. MAGNUSSON (1999): Diets of spectacled and black Caiman in the Anavilhanas Archipelago, Central Amazonia, Brazil. - J. Herpetol. **33**(2): 181-192.

SILVEIRA, R.D., MAGNUSSON, W.E. & Z. CAMPOS (1997): Monitoring the distribution, abundance and breeding areas of *Caiman crocodilus crocodilus* and *Melanosuchus niger* in the Anavilhanas Archipelago, Central Amazonia, Brazil. - J. Herpetol. **31**(4): 514-520.

VIEIRA, E.F., FABRE, N.N. & U. SAINT-PAUL (1999): Aspects of the life cycle of *Semaprochilodus taeniurus* and *Semaprochilodus insignis* (Characiformes: Prochilodontidae) in Lake Inacio and Lake Prato of the Central Amazon basin, Brazil. - Bol. Museu Para. Emílio Goeldi, sér. Zoologia **15**(1): 71-93.

WORBES, M. (1983): Vegetationskundliche Untersuchungen zweier Überschwemmungswälder in Zentralamazonien - Vorläufige Ergebnisse. - Amazoniana **8**(1): 47-65.

WORBES, M. (1986): Lebensbedingungen und Holzwachstum in zentralamazonischen Überschwemmungswäldern. - Scripta Geobotanica: 1-112. E. Goltze, Göttingen.

WORBES, M. (1997): The forest ecosystem of the floodplains. - In: JUNK, W.J. (ed.): The Central Amazon floodplain: Ecology of a pulsing system: 223-266. Ecological Studies **126**. Springer, Berlin.

Table 1: Tree families in the study plot of 50 x 30 m including trees ≥10 cm DBH in the floodplain of the Anavilhanas archipelago. FIV = family importance value index = relative dominance (basal area in %) + relative tree density + relative frequency (excluded here, because it is 100 % for all species).

	Family	Number of genera	Number of species	Number of trees	Relative basal area (%)	Relative tree density (%)	FIV
1	Fabaceae	5	6	43	70,15	16,10	86,25
2	Apocynaceae	1	1	48	0,87	17,98	18,85
3	Violaceae	1	1	35	1,75	13,11	14,86
4	Annonaceae	2	2	8	9,32	3,00	12,32
5	Caesalpiniaceae	4	4	21	2,32	7,87	10,19
6	Undet. b	1	1	22	0,46	8,24	8,69
7	Undet. e	?	?	11	2,87	4,12	6,99
8	Lecythidaceae	2	2	12	1,15	4,49	5,65
9	Clusiaceae	3	3	9	1,07	3,37	4,44
10	Chrysobalanaceae	2	2	8	0,53	3,00	3,53
11	Vochysiaceae	1	1	1	2,99	0,37	3,36
12	Mimosaceae	1	1	7	0,37	2,62	2,99
13	Elaeocarpaceae	1	1	2	1,36	0,75	2,11
14	Euphorbiaceae	1	1	1	1,53	0,37	1,90
15	Meliaceae	1	1	1	1,34	0,37	1,71
16	Lauraceae	2	2	4	0,20	1,50	1,70
17	Myrtaceae	2	2	4	0,18	1,50	1,68
18	Tiliaceae	1	1	2	0,88	0,75	1,63
19	Boraginaceae	1	1	4	0,09	1,50	1,59
20	Sapindaceae	3	3	4	0,06	1,50	1,56
21	Undet. a	1	1	2	0,06	0,75	0,81
22	Undet. c	1	1	2	0,06	0,75	0,81
23	Styracaceae	1	1	2	0,05	0,75	0,80
24	Undet. d	1	1	2	0,04	0,75	0,79
25	Ebenaceae	1	1	2	0,03	0,75	0,78
26	Arecaceae	2	2	2	0,01	0,75	0,76
27	Lacistemaceae	1	1	1	0,11	0,37	0,48
28	Linaceae	1	1	1	0,08	0,37	0,45
29	Bombacaceae	1	1	1	0,03	0,37	0,40
30	Melastomatacae	1	1	1	0,02	0,37	0,39
31	Flacourtiaceae	1	1	1	0,02	0,37	0,39
32	Moraceae	1	1	1	0,01	0,37	0,39
33	Rubiaceae	1	1	1	0,01	0,37	0,38
34	Myristicaceae	1	1	1	0,01	0,37	0,38
	Total	50	51	267	100	100	

Table 2: Tree species of the floodplain study plot (50 x 30 m, tree dbh ≥10 cm) in the Anavilhanas archipelago, in alphabetical order, with typical ecosystem where the species are found (+! characteristic environment, + occurring, 0 not occurring, according to REVILLA 1981; PRANCE 1982; WORBES 1983, 1997; KUBITZKI 1989; RANKIN DE MÉRONA et al. 1992; AYRES 1993; AMARAL et al. 1997; ROSALES et al. 1997, 2001; RIBEIRO et al. 1999).

	Scientific name	Family	Number of trees	Mean DBH (cm)	Mean basal area (m^2)	Mean height (m)	Floodplain Igapó	Floodplain Várzea	Terra firme
1	*Aldina latifolia* SPR. ex BENTH. var. *latifolia*	Fabaceae	21	37,0	2323,8	19,0	+!	0	0
2	*Amphirrhox longigolia* SPRENG	Violaceae	35	6,3	39,5	6,5	+!	0	+
3	*Astrocaryum jauari* MART.	Arecaceae	1	1,9	2,9	8,5	+!	+	0
4	*Bactris* sp.	Arecaceae	1	2,5	5,1	15,5	+	+	+
5	*Bombax aquaticum* (AUBL.) K. SCHUM.	Bombacaceae	1	5,4	23,0	8,0	+	+	+
6	*Caraipa grandifolia* MART. ssp. *grandifolia*	Clusiaceae	7	11,1	107,0	10,9	+	+	+
7	*Casearia javitensis* KUNTH	Flacourtiaceae	1	4,0	12,4	8,0	only this study	0	+!
8	*Clarisia ilicifolia* (SPRENG) LANJ. & ROSSBERG	Moraceae	1	3,5	9,6	5,0	only this study	0	+!
9	*Clathrotropis nitida* (BENTH.) HARMS	Fabaceae	14	10,4	104,2	11,9	+!	+	0
10	*Cordia nodosa* L.	Boraginaceae	4	4,6	17,2	5,6	only this study	+!	+
11	*Diospyros guianensis* (AUBL.) GÜRKE	Ebenaceae	2	4,0	12,5	5,8	only this study	+	+
12	*Erisma calcaratum* (LINK) WARM.	Vochysiaceae	1	54,8	2355,4	28,0	+!	0	0
13	*Eschweilera* sp.	Lecythidaceae	9	8,5	84,2	9,4	+	+	+
14	*Eugenia* sp.	Myrtaceae	3	6,3	37,2	8,3	+	+	+
15	*Guatteria phanerocampta* DIELS	Annonaceae	6	31,1	1220,6	16,8	+	0	0
16	*Gustavia hexapetala* (AUBL.) SM.	Lecythidaceae	3	7,8	50,2	8,3	only this study	+	+
17	*Heterostemon mimosoides* DESF.	Caesalpiniaceae	12	8,1	64,0	9,5	+!	+	+
18	*Hirtella racemosa* L. var. *racemosa*	Chrysobalanaceae	5	9,3	70,1	7,7	+	+	+
19	Undet. a	Undet. a	2	5,6	24,9	6,5			
20	Undet. b	Undet. b	22	4,4	16,3	6,0			

Table 2: Continuation.

21	Undet. c	Undet. c	2	5,1	22,4	6,8			
22	Undet. d	Undet. d	2	4,3	14,5	5,3			
23	*Lacistema* sp.	Lacistemaceae	1	10,5	86,7	13,0	+	+	+
24	*Licania macrophylla* BENTH.	Chrysobalanaceae	3	5,3	22,6	7,2	+	+	+
25	*Luehea* sp.	Tiliaceae	2	21,0	347,1	18,0	only this study	+	+
26	*Mabea* sp.	Euphorbiaceae	1	39,2	1204,5	20,0	+	+	+
27	*Macrolobium angustifolim* (BENTH.) R.S. COWAN	Caesalpiniaceae	5	13,5	189,0	11,9	+	+	+
28	*Matayba* sp.	Sapindaceae	1	3,2	8,0	4,5	+	+	+
29	*Nectandra* sp.	Lauraceae	2	8,6	71,5	10,8	+	+	+
30	*Ocotea* sp.	Lauraceae	2	3,2	8,0	6,8	+	+	+
31	*Peltogyne* sp.	Caesalpiniaceae	2	6,8	37,4	9,0	+	0	+
32	*Pithecellobium* sp.	Mimosaceae	7	6,3	41,6	11,7	+	+	+
33	*Pseudima* sp.	Sapindaceae	1	4,3	14,5	7,0	only this study	0	+!
34	*Pseudoxandra polypheba* (DIELS) R.E. FRIES	Annonaceae	2	4,1	13,5	6,6	+	+	0
35	*Psidium* sp.	Myrtaceae	1	6,1	28,7	6,0	+	+	0
36	*Psychotria* sp.	Rubiaceae	1	3,2	8,0	4,0	+	+	+
37	*Pterocarpus* sp.	Fabaceae	2	23,5	433,6	19,0	+	+!	+
38	*Rheedia acuminata* (RUIZ & PAV.) PLANCHON & TRIANA	Clusiaceae	1	9,2	67,0	11,5	+	+	+
39	*Roucheria* sp.	Linaceae	1	8,9	62,4	13,0	+	+	+
40	*Sloanea* sp.	Elaeocarpaceae	2	23,4	536,2	19,0	+	+	+!
41	*Styrax guyanensis* A. DC.	Styracaceae	2	4,8	18,2	6,4	+!	+	+
42	*Swartzia macrocarpa* SPR. ex BENTH.	Fabaceae	2	5,7	30,9	10,0	+	0	0
43	*Swartzia polyphylla* DC.	Fabaceae	1	1,2	1,2	34,0	+	+	0
44	*Tabernaemontana rupicola* BENTH.	Apocynaceae	48	4,2	14,3	4,2	0	0	+
45	*Tachigali* sp.	Caesalpiniaceae	2	5,1	21,1	8,0	+	+	+

Table 2: Continuation.

	Scientific name	Family	Number of trees	Mean DBH (cm)	Mean basal area (m^2)	Mean height (m)	Floodplain Igapó	Floodplain Várzea	Terra firme
46	*Talisia* sp.	Sapindaceae	2	4,1	13,8	7,5	+	+	+!
47	*Tococa* cf. *caudata* MARKGR.	Melastomatacae	1	4,1	13,5	5,5	+	+	+
48	*Tovomita* cf. *macrophylla* (POEPP. & ENDL.) WALP.	Clusiaceae	1	5,7	25,8	5,0	+	0	0
49	*Trichilia* sp.	Meliaceae	1	36,6	1052,9	27,0	+	+!	+!
50	*Vatairea guianensis* AUBL.	Fabaceae	3	39,5	1378,6	24,0	+	+	0
51	*Virola elongata* (BENTH.) WARB.	Myristicaceae	1	2,9	6,4	4,5	+!	+!	+
52	Undet.	Undet.	11	9,9	212,5	9,6			

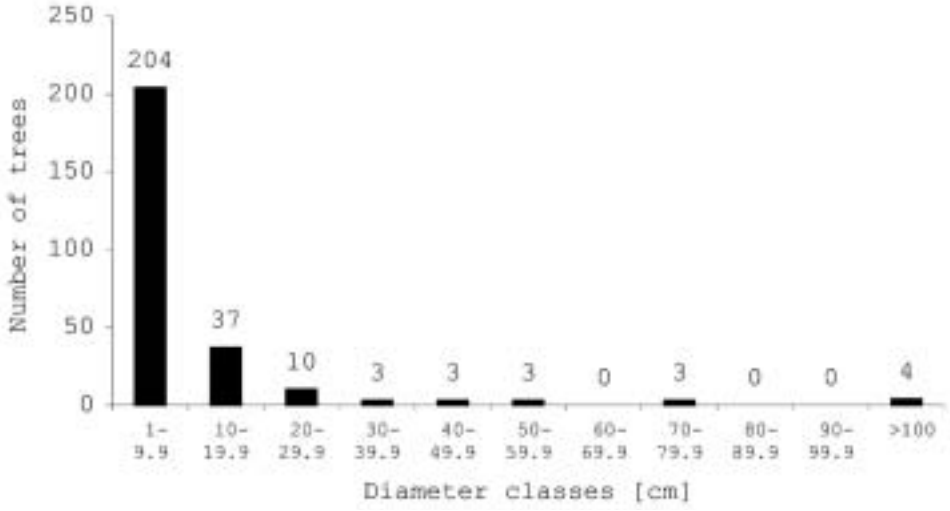

Fig. 1:
Diameter classes of 267 trees inventoried in a floodplain stand of the Anavilhanas archipelago.

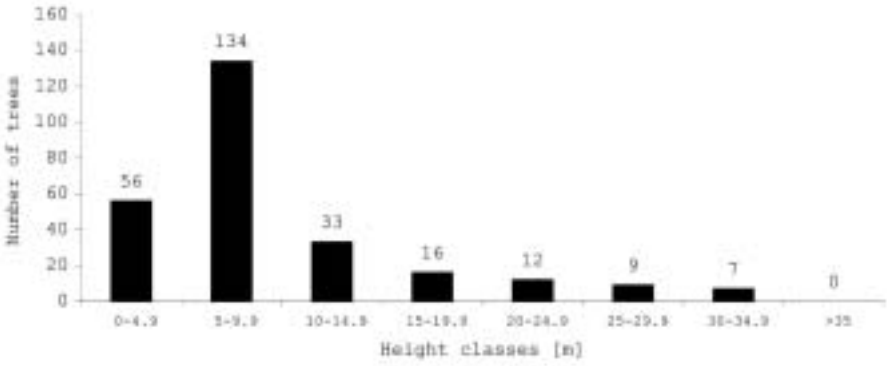

Fig. 2:
Height classes of 267 trees inventoried in a floodplain stand of the Anavilhanas archipelago.

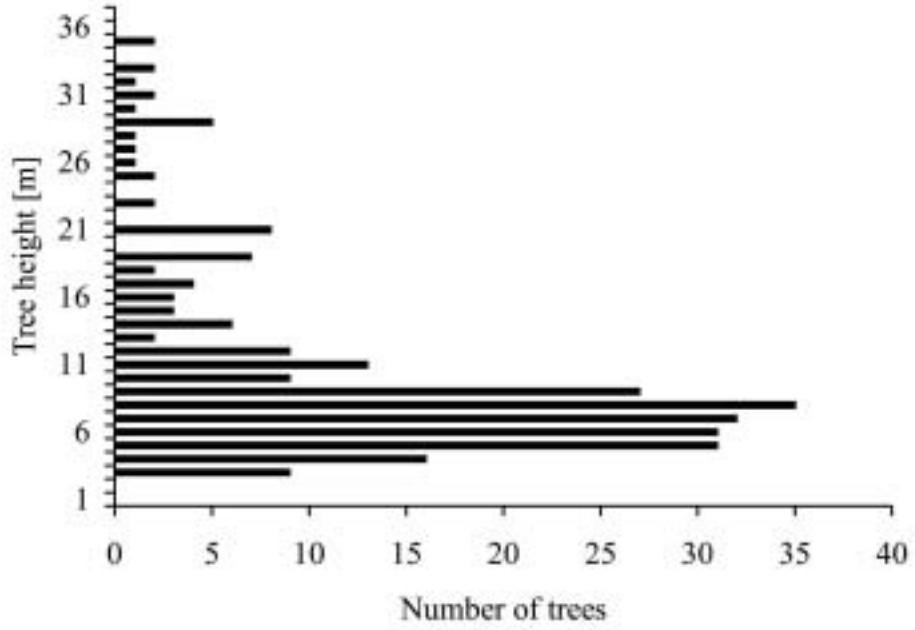

Fig. 3:
Frequency of tree height of 267 trees inventoried in a floodplain stand of the Anavilhanas archipelago.

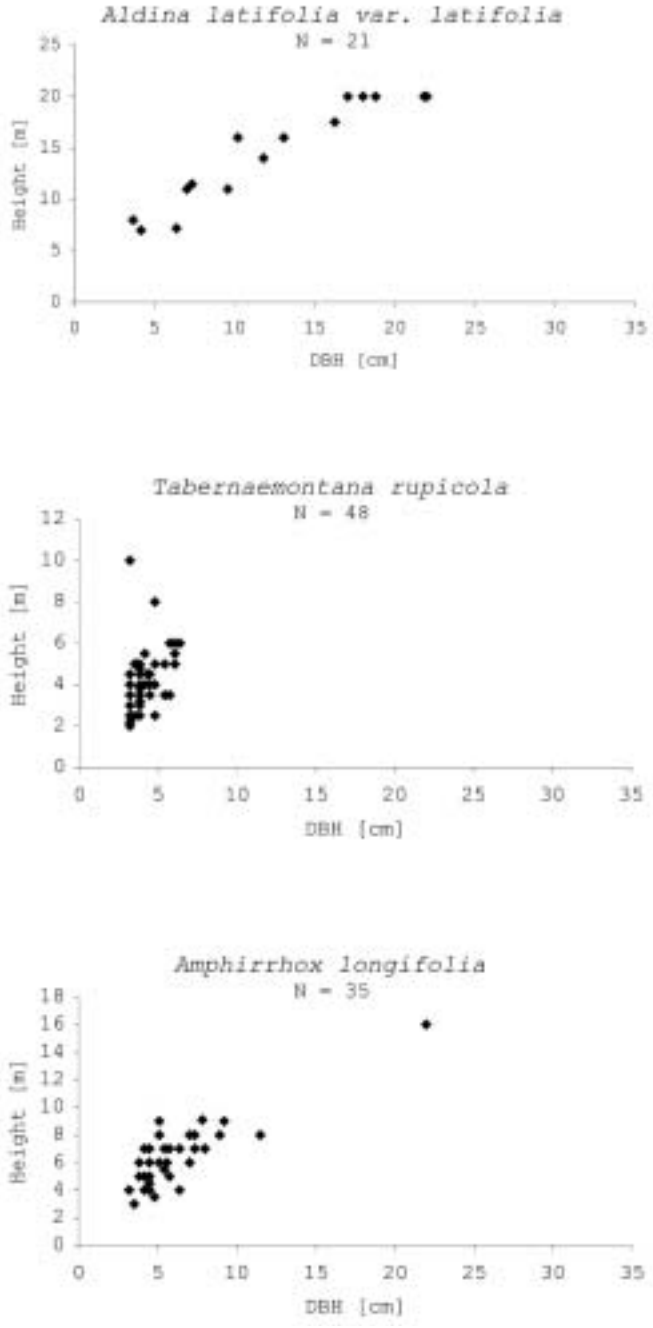

Fig. 4:
Height plotted against diameter at breast height (DBH) for the typical emergent *Aldina latifolia* var. *latifolia* and the two most frequent species in the analysed floodplain stand of the Anavilhanas archipelago, *Tabernaemontana rupicola* (Apocynaceae) and *Amphirrhox longifolia* SPRENG. (Violaceae).