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## Bryophytes from some Caatinga areas in the state of Bahia (Brazil)

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**Abstract:** The caatinga is a deciduous and xerophilous vegetation that covers large areas in Brazil. An irregular rainfall with a marked dry period is a characteristic feature. This paper represents the first contribution to the knowledge of the bryoflora from caatinga vegetation in the State of Bahia. The survey was carried out in several areas from Bahia in which eighteen species of bryophytes were found (15 mosses and 3 liverworts). The bryoflora from caatinga is composed mainly of generalists and xerophilous taxa, but even some hygrophilous species can be found. A number of species including *Hyophiladelphus agrarius*, *Hyophila involuta*, *Calymperes palisotii* ssp. *richardii*, *Bryum argenteum*, *Entodontopsis leucostega*, *Octoblepharum albidum*, *Frullania ericoides* also occur in other vegetation types. However, there are a number of species restricted to this type of vegetation, such as *Helicophyllum torquatum* and *Riccia vitalii*, at least in Bahia. Most moss species were acrocarpous with erect and short (short-turf) growth-form, whereas the foliose hepaticae were of incubous, and thallose forms.

Caatinga is a type of deciduous and xerophilous vegetation of woody, thorny and small leaved plants bare of leaves during the dry season, in addition to cacti, bromeliads and seasonal herbs. Caatinga is a Tupi native word that means «white copse» because of the aspect it takes without leaves, with the sun shining on

the smooth, white bark of many trees. Climatic conditions are an irregular rainfall and a long dry period which ranges from 7 to 11 months in duration but in the drier inland it can last even 6 years. The soil is clayey, dry and hard, or sandy, and crystal rock outcrops may be found.

Caatinga occupies 1.000.000 km<sup>2</sup> in Brasil, 91% of them belonging to the Northeast (Rizzini, 1979). In the State of Bahia, caatinga occurs in northern, northeastern and

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centralwestern areas (Bautista, 1986). The physiognomy and floristic composition of caatinga are variable depending on the amount of rainfall (280-1000 mm/year) and edaphic conditions (Eiten, 1992). Shrubby and arboreal caatinga can be distinguished, both open or closed-canopied, and with or without crystal rock outcrops. Concerning the vascular flora, there are some more or less constant species like the legumes *Caesalpinia microphylla* and *Mimosa caesalpiniaefolia*, the belly trees *Cavanillesia arborea* and *Chorisia crispifolia*, the Cappariaceae *Capparis yco*, several cacti of the genera *Cereus* and *Opuntia*, the Euphorbiaceae *Jathropa* and *Cnidoculus phyllacanthus*, the Apocynaceae *Aspidosperma pyriformium*, the Rhamnaceae *Ziziphus joazeiro*, and the Anacardiaceae *Spondias tuberosa* (Rizzini, 1979; Ferri, 1980).

Caatinga bryoflora has been poorly studied with the only reference being that of Pôrto *et al.* (1994) about bryophytes of caatinga in the State of Pernambuco. Compared to other Brazilian vegetation types this flora appears very poor due to the extreme dryness of the climate. Actually, it is not easy to find any bryophyte in open areas because most of them take refuge in microhabitats where the dryness is mitigated. The present work is the first contribution to the knowledge of the caatinga bryoflora in the State of Bahia.

Materials from the Alexandre Leal Costa Herbarium (ALCB) of the Instituto de Biologia at the Universidade Federal da Bahia and others donated by the CEPEC Herbarium (Centro de Pesquisa do Cacau, Ilheus, Bahia), all from caatinga areas, as well as bryophytes collected by the authors have been studied. The localities where the collections were made are the following (fig. 1):

#### OPEN SHRUBY CAATINGA

1. Brumado. Km 121 of road BA 262.
2. Cansansno. Between Cansansno and Itiuba. With rock outcrops.
3. Paulo Afonso. Raso da Catarina. Reserva Indígena Pankararé.
4. Planaltino. Lagedo do Pacheco. With rock

outcrops.

5. Planaltino. Lagedo do Gerônimo. With rock outcrops.
6. Tremedal. Km 79 of road BA 262. With rock outcrops.
7. Tucano. Buraco do Vento. With rock outcrops.

#### OPEN SHRUBY CAATINGA AND ARBOREAL CAATINGA

8. Cravolândia. Fazenda Palestina.
9. Ipirá. Fazenda Nova Favela.

#### OPEN ARBOREAL CAATINGA

10. Vitória da Conquista. Ladeira do Marçal.

The relation of families and species, with comments on the ecology and distribution is given below, as well as a summary table (Tab. 1). The localities are indicated with the numbers given above. Classification follows Vitt (1984) for Bryopsida and Schuster (1984) for Hepaticopsida.

### HEPATICOPSIDA

#### FRULLANIACEAE

*Frullania ericoides* (Nees) Mont.

9. Corticolous on isolated phorophytes along the way in open arboreal caatinga.

Very frequent in Bahia, appearing also in formations of cerrado and restinga.

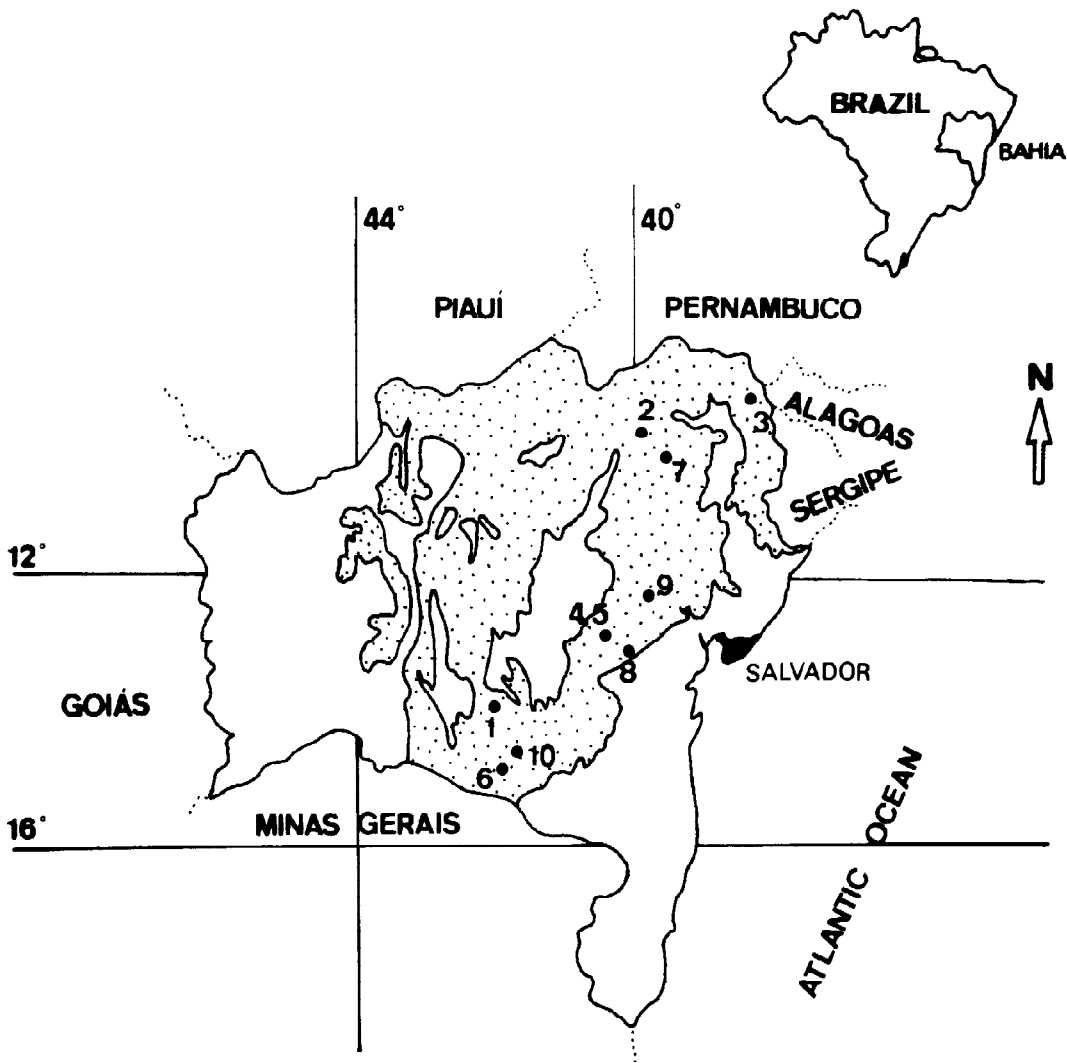
Specimens examined: C. Bastos 732, S. B. Vilas Bôas & B. Albertos, 17-09-1995 (ALCB 28170); C. Bastos 746 *et eiusdem*, 17-09-1995 (ALCB 28184); C. Bastos 747 *et eiusdem*, 17-09-1995 (ALCB 28185); C. Bastos 748 *et eiusdem*, 17-09-1995 (ALCB 28186); C. Bastos 751 *et eiusdem*, 17-09-1995 (ALCB 28189); C. Bastos 755 *et eiusdem*, 17-09-1995 (ALCB 28193).

#### LEJEUNEACEAE

*Lejeunea trinitensis* Lindenb.

9. Corticolous in closed arboreal caatinga.

This is the first reference of this species from the State of Bahia.



**Figure 1.** Map of the State of Bahia showing areas of caatinga vegetation and collecting places. Source: Simposio Sobre Caatinga e sua Exploração Racional. EMBRAPA-DDT, 1986.

Specimens examined: C. Bastos 740, S. B. Vilas Bôas & B. Albertos, 17-09-1995 (ALCB 28178); C. Bastos 743 *et eiusdem*, 17-09-1995 (ALCB 28181).

common in the state. It is probably typical from caatinga environment.

Specimens examined: A. C. Messias & S. L. Oliveira 127, 18-07-1991 (ALCB 18679).

#### RICCIACEAE

*Riccia vitalii* S. Jovet-Ast

1. On soil in a heavily insolated gully.

At the moment, only collected in Bahia in this vegetation type although this family is relatively

#### BRYOPSIDA

##### ORTHOTRICHACEAE

*Macrocoma orthotrichoides* (Raddi) Wijk & Marg.

**7. Corticolous.**

Not very common in Bahia and always collected in caatinga.

Specimens examined: H. Maia 26, 28-12-1992 (ALCB 15720).

*Macromitrium richardii* Schwaegr.

**8. Corticolous in arboreal caatinga.**

Rare in Bahia and here always collected in caatinga.

Specimens examined: E. Fontes, 19-12-1991 (ALCB 18518).

## HELICOPHYLLACEAE

*Helicophyllum torquatum* (Hook.) Brid.

**2. Corticolous on *Syagurus coronata*. 4. Corticolous.**

Widely distributed in Brazil where it has been reported from 15 states (Yano, 1979, 1984). In Bahia, it has been reported from several localities, all within the area of caatinga. It seems to prefer open and insolated situations.

Specimens examined: E. Fontes, 28-01-1992 (ALCB 28525); C. S. N. Guimarnes, 03-03-1992 (ALCB 18569).

## BRYACEAE

*Brachymenium hornschuchianum* Mart.

**1. On a strongly insolated gully. 4. On soil.**

Very common in Bahia. Also present in cerrado. Specimens examined: A. C. Messias 131 & S. L. Oliveira, 18-07-1991 (ALCB 18854); C. S. N. Guimarnes, 03-03-1992 (ALCB 18568).

*Bryum argenteum* Hedw.

**1. On soil. 4. On soil. 8. On rock in open shrubby caatinga.**

Common in Bahia. This species is present in cerrado, restinga, ombrophilous forest, seasonal forest, campo rupestre and even in urban habitats, where it is frequent.

Specimens examined: E. Fontes, 19-12-1991 (ALCB 18522); A. C. Messias 132 & S. L. Oliveira, 18-07-1991 (ALCB 18803); C. S. N. Guimarnes, 03-03-1992 (ALCB 18574).

*Rosulabryum billardieri* (Schwaegr.) Spence

**4. On rock.**

Relatively common in Bahia; also present in cerrado.

Specimens examined: C. S. N. Guimarnes, 03-03-1992 (ALCB 18570).

## STEREOPHYLLACEAE

*Entodontopsis leucostega* (Brid.) Buck & Ireland

**9. On rock, base, and trunk in closed arboreal caatinga.**

Common in Bahia. Also present in ombrophilous and seasonal forests.

Specimens examined: C. Bastos 743, S. B. Vilas Bôas & B. Albertos, 17-09-1995 (ALCB 28172); C. Bastos 735 *et eiusdem*, 17-09-1995 (ALCB 28173); C. Bastos 736 *et eiusdem*, 17-09-1995 (ALCB 28174); C. Bastos 737 *et eiusdem*, 17-09-1995 (ALCB 28175); C. Bastos 742 *et eiusdem*, 17-09-1995 (ALCB 28180); C. Bastos 745 *et eiusdem*, 17-09-1995 (ALCB 28183); C. Bastos 749 *et eiusdem*, 17-09-1995 (ALCB 28187); C. Bastos 750 *et eiusdem*, 17-09-1995 (ALCB 28188); C. Bastos 753 *et eiusdem*, 17-09-1995 (ALCB 28191); C. Bastos 755 *et eiusdem*, 17-09-1995 (ALCB 28193); C. Bastos 756 *et eiusdem*, 17-09-1995 (ALCB 28194); C. Bastos 758 *et eiusdem*, 17-09-1995 (ALCB 28196); C. Bastos 759 *et eiusdem*, 17-09-1995 (ALCB 28197); C. Bastos 760 *et eiusdem*, 17-09-1995 (ALCB 28198); C. Bastos 763 *et eiusdem*, 17-09-1995 (ALCB 28200); C. Bastos 762 *et eiusdem*, 17-09-1995 (ALCB 28201).

## FABRONIACEAE

*Fabronia ciliaris* (Brid.) Brid. var. *polycarpa* (Hook.) Buck

**3. Corticolous. 4. Corticolous.**

Rare in Bahia. It has been reported from Bahia by Buck (1983) and by Egunyomi & Vital (1984). Specimens examined: C. S. N. Guimarnes, 03-03-1992 (ALCB 18575).

## POTTIACEAE

*Hyophiladelphus agrarius* (Hedw.) Zander

**9. On soil and trunk base of an isolated tree in open shrubby caatinga. 10. On rock.**

Very common; also present in cerrado and ombrophilous forest. Frequent in urban habitats, growing on soil and artificial substrates.

TAXA	SOIL TREE ROCK LOCAL. CAATINGA TYPE			
<i>Brachymenium hornschuchianum</i>	X			1/4 OSC/OSC, R
<i>Bryum argenteum</i>	X		X	1/4/8 OSC/OSC,R
<i>Calymperes palisotii</i> ssp. <i>richardii</i>		X		9 OSC
<i>Entodontopsis leucostega</i>		X	X	9 CAC
<i>Fabronia ciliaris</i> var. <i>polycarpa</i>		X		3/4 OSC/OSC, R
<i>Fissidens bryoides</i>	X			9 OSC
<i>Fissidens gardneri</i>	X			6 OSC
<i>Fissidens radicans</i>	X			4 OSC, R
<i>Frullania ericoides</i>		X		9 OAC
<i>Helicophyllum torquatum</i>		X		2/4 OSC, R/OSC
<i>Hyophila involuta</i>	X			5 OSC, R
<i>Hyophiladelphus agrarius</i>	X	X	X	9/10 OSC/OAC
<i>Lejeunea trinitensis</i>		X		9 CAC
<i>Macrocoma orthotrichoides</i>		Y		7 OSC, R
<i>Macromitrium richardii</i>		Y		8 AC
<i>Octoblepharum albidum</i>		Y		3 OSC

**Table 1.** Summary table with localities, ecology and type of caatinga where the bryophytes have been collected. OSC: Open shrubby caatinga. OAC: Open arboreal caatinga. CAC: Closed arboreal caatinga. AC: Arboreal caatinga. R: with crystal rock outcrops.

Specimens examined: A. C. Messias 136 & S. L. Oliveira, 19-07-1991 (ALCB 18811); C. Bastos 731, S. B. Vilas Bôas & B. Albertos, 17-09-1995 (ALCB 28169); C. Bastos 738 *et eiusdem*, 17-09-1995 (ALCB 28176); C. Bastos 739 *et eiusdem*, 17-09-1995 (ALCB 28177); C. Bastos 741 *et eiusdem*, 17-09-1995 (ALCB 28179); C. Bastos 744 *et eiusdem*, 17-09-1995 (ALCB 28182).

*Hyophila involuta* (Hook.) Jaeg.

5. On soil.

Very common in Bahia; also present in other vegetation types and urban areas.

Specimens examined: C. S. N. Guimarnes, 02-03-1992 (ALCB 18571).

#### CALYMPERACEAE

*Calymperes palisotii* Schwaegr. ssp. *richardii* (C. Muell.) S. Edwards

9. Corticolous on isolated tree in open shrubby caatinga.

This species has a wide distribution in Bahia. May be found in different communities and is also very frequent in urban habitats. Frequently sterile and propaguliferous.

Specimens examined: C. Bastos 733, S. B. Vilas Bôas & B. Albertos, 17-09-1995 (ALCB 28171).

#### LEUCOBRYACEAE

*Octoblepharum albidum* Hedw.

3. Corticolous.

Probably the most widely distributed species in the State of Bahia and with the highest ecological range. It is present in all the vegetal formations and urban habitats. Always as saxicolous or epiphyte growing preferentially on *Elaeis guineensis* (Arecaceae) if present.

Specimens examined: F. P. Bandeira, 05-12-1992 (ALCB 18721).

## FISSIDENTACEAE

*Fissidens bryoides* Hedw.

9. On soil in open shrubby caatinga.

This is the first reference of this species from the State of Bahia.

Specimens examined: C. Bastos 730, S. B. Vilas Bôas & B. Albertos, 17-09-1995 (ALCB 28168).

*Fissidens gardneri* Mitt.

6. On soil.

Common; also present in cerrado.

Specimens examined: A. C. Messias 121 & S. L. Oliveira, 18-07-1991 (ALCB 18863).

*Fissidens radicans* Mont.

4. On soil.

Rare in Brazil and Bahia

Specimens examined: C. S. N. Guimarnes, 03-03-1992 (ALCB 18572).

Eighteen bryophytes were found, fifteen being mosses, distributed among nine families, and three liverworts belonging to three families. Most of the taxa here reported have been collected only in two caatingas (Fazenda Nova Favela, Ipirê and Lagedo do Pacheco, Planaltino) and the other localities have 3 or fewer species each and a lower number of samples. So we can expect that most of the localities have been poorly studied. Nevertheless, some conclusions can be obtained. First, a big part of the caatinga flora is not exclusive to this type of vegetation since some taxa such as *Hyophiladelphus agrarius*, *Bryum argenteum*, *Calymperes palisotii* ssp. *richardii* and *Octoblepharum albidum* are common even in urban areas. Second, other xeromorphic formations as restinga (vegetation growing on sand along the coast) and cerrado (savanna-like vegetation) share with caatinga some taxa like *Rosulabryum billardieri* and *Frullania ericoides* here quoted and *Frullania gibbosa* and *Acrolejeunea torulosa* found in caatinga by Yano & Costa (1992) and seen in restinga by the authors. On the other hand, species like *Riccia vitalii*, *Helicophyllum torquatum*, *Macrocoma orthotrichoides* and *Macromitrium richardii* have not been listed in Bahia from other environments, so they could be considered typical for caatinga.

Both *Macrocoma orthotrichoides* and *Macromitrium richardii* have been scarcely cited in this state so further studies must be expected to substantiate this feature. Besides these generalist and xerophytic taxa we also found hygrophilous ones like *Fissidens bryoides*, *F. microcladus* and *Fissidens radicans*, although this fact does not agree with the main characters of caatinga.

The ecological and taxonomical diversity of the taxa reported let us argue that more than a caatinga bryoflora, there are a group of mosses and liverworts with different ecologies that can colonize any favorable microenvironment within the caatinga. In fact, only four mosses occur in two areas, and *Hyophiladelphus agrarius* is the most frequent, appearing in three localities, the rest were recorded in only one of the 11 localities. As most of these localities have been poorly studied, we should expect a higher number of coincidences that substantiate the existence of a typical caatinga bryoflora. Nevertheless, Bryaceae, Orthotrichaceae, Pottiaceae, Fissidentaceae, Frullaniaceae and Lejeuneaceae seem to be important families in caatinga areas, as also found in Pernambuco (Pôrto *et al.*, 1994).

Growth-forms and substrates can also help in the description of the bryological communities that appear in caatinga. In open caatinga environment, acrocarpous mosses with erect and short growth-form forming short turfs are the most numerous ones. Pleurocarps are preferentially corticolous or occasionally saxicolous, forming mats in dense-canopy arboreal caatinga. Among the Hepaticae, xerophilous species of Ricciaceae appear on soil and leafy ones of Lejeuneaceae and Frullaniaceae are incubous, which are commonly better adapted to dry substrates like trunks and rocks (Smith, 1970). As to the substrate preference, terricolous (and heliophilous) and saxicolous species show the widest coverage. Epiphytes are only corticolous and appear mostly on tree bases, as evidence by the fact that humidity increases on the trunk from top to base (Smith, 1982). In general, the taxa from caatinga are heliophilous and most are generalists without substrate specificity. It is interesting to notice that

*Hyophiladelphus agrarius*, always known as terricolous or saxicolous has also been found as corticolous. This colonization of the epiphytic habitats by non-typical epiphytes also occurs in the Mediterranean region, where the main climatic feature is a dry and hot summer season (Mazimpaka & Lara, 1995). Further studies with intensive sampling of different caatingas including ecological and phytosociological tasks are needed to consolidate a description of the bryological communities of this wide and interesting type of vegetation.

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