On the occurrence of testate amoebae (Protozoa, Amoebozoa, Rhizopoda) in Brazilian inland waters. IV. Families Difflugiidae (genera *Cucurbitella, Lagenodifflugia, Pentagonia, Pontigulasia, Protocucurbitella, Suiadifflugia*) and Lesquereusiidae (genera *Lesquereusia, Quadrulella*, *Netzelia*)

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ABSTRACT. Current research is a contribution towards the knowledge of testate amoebae (Protozoa, Amoebozoa, Rhizopoda) in Brazilian inland waters, specifically of the genera *Cucurbitella, Lagenodifflugia, Pentagonia, Pontigulasia, Protocucurbitella*, *Suiadifflugia* (Difflugiidae), and *Lesquereusia, Quadrulella, Netzelia* (Lesquereusiidae). In this paper the occurrence and geographical distribution of these genera in Brazil are discussed. A total of 22 infra-generic taxa are recorded, among which 6 belong to the genus *Cucurbitella*, 5 to *Lesquereusia*, 3 to *Netzelia,* 2 to *Pontigulasia*, 2 to *Quadrulella,* 1 to *Lagenodifflugia,* 1 to *Pentagonia*, 1 to *Protocucurbitella* and 1 to *Suiadifflugia. Pontigulasia compressa* (Carter), *Lesquereusia spiralis* (Ehrenberg), *L. modesta* Rhumbler and *Netzelia tuberculata* (Wallich) are species with the greatest number of records in Brazil. Some taxonomic information is also provided.

Key words: aquatic Protozoa, testate amoebae, Difflugiidae, Lesquereusiidae, geographical distribution, Brazil.

RESUMO. Ocorrência de tecamebas (Protozoa, Amoebozoa, Rhizopoda) em águas continentais brasileiras. IV. Famílias Difflugiidae (Gêneros *Cucurbitella, Lagenodifflugia, Pentagonia, Pontigulasia, Protocucurbitella* e *Suiadifflugia*) e Lesquereusiidae (*Lesquereusia*, *Quadrulella, Netzelia*). O objetivo deste trabalho é incrementar o conhecimento sobre as tecamebas (Protozoa, Amoebozoa, Rhizopoda) em ambientes aquáticos continentais brasileiros, especificamente os gêneros *Cucurbitella, Lagenodifflugia, Pentagonia, Pontigulasia, Protocucurbitella Suiadifflugia* (Difflugiidae), e *Lesquereusia, Quadrulella, Netzelia* (Lesquereusiidae). Neste trabalho, são discutidas a ocorrência e distribuição geográfica desses gêneros no Brasil. Um total de 22 táxons infragenéricos foi registrado, sendo 6 de *Cucurbitella,* 5 de *Lesquereusia,* 3 de *Netzelia,* 2 de *Pontigulasia*, 2 de *Quadrulella,* 1 de *Lagenodifflugia,* 1 de *Pentagonia*, 1 de *Protocucurbitella* e 1 de *Suiadifflugia.* As espécies com maior número de registros são: *Pontigulasia compressa* (Carter), *Lesquereusia spiralis* (Ehrenberg), *L. modesta* Rhumbler e *Netzelia tuberculata* (Wallich). Algumas informações taxonômicas são fornecidas.

Palavras-chave: protozoários aquáticos, tecamebas, Difflugiidae, Lesquereusiidae, distribuição geográfica, Brasil.

Knowledge on the distribution and occurrence of testate amoebae species, particularly those with agglutinated tests, has become complicated because many studies have basically taken into consideration the shape, constituition and dimensions of the shells. This fact has introduced many problems in identification, at both specific and generic levels (Ogden and Meisterfeld, 1989).

Studies on agglutinated testate amoebae (Ogden, 1979, 1988; Ogden and Meisterfeld, 1989) have shown that a great number of characteristics are necessary for an accurate identification of species, including, for example, cytoplasmic features and production of idiosomes. Basing himself on the idiosome production, Ogden (1979) transfered some agglutinated *Difflugia* to the genus *Netzelia*, and

proposed the inclusion of this genus in the family Lesquereusiidae, which was redefined and now includes the genera *Lesquereusia* and *Quadrulella*.

In recent studies we described the distribution and occurrence of the families Arcellidae (Lansac-Tôha *et al.*, 2000a), Centropyxidae, Plagiopyxidae and Trigonopyxidae (Velho *et al.*, 2000) and of the genus *Difflugia* (Lansac-Tôha *et al.*, 2001). In the present work we intend to summarize current knowledge on the distribution and occurrence of other genera of the families Difflugiidae (*Cucurbitella, Lagenodifflugia, Pentagonia, Pontigulasia, Protocucurbitella*, *Suiadifflugia*) and Lesquereusiidae (*Lesquereusia*, *Quadrulella*, *Netzelia*). State of the art distribution of these species in Brazilian inland waters is provided.

Material and methods

Regarding previous registers on the occurrence and the geographical distribution of *Cucurbitella, Lagenodifflugia, Pentagonia, Pontigulasia, Protocucurbitella* and *Suiadifflugia* species (Difflugiidae) and *Lesquereusia*, *Quadrulella* and *Netzelia* species (Lesquereusiidae), we will only take into account those found in scientific publications (journals, papers in congresses and symposiums), dissertations and theses. For each species we list, if not all, the principal pertinent taxonomic references.

Results

Family Difflugiidae Awerintzev, 1906

***Cucurbitella crateriformis* Gauthier-Lièvre and Thomas, 1960**

Gauthier-Lièvre and Thomas, 1960: 573, fig. 3 and pl. XLI, fig. 6; Dioni, 1970: 221, pl. IV, fig. 41; 1971, fig. 8.

Comments: The only register of this species in Brazil has been made in plankton samples from the Upper Paraná river floodplain, states of Paraná and Mato Grosso do Sul (Velho *et al.*, 1999) (Figure 1).

***Cucurbitella dentata* f. *quinquilobata* Gauthier-Lièvre and Thomas, 1960**

Gauthier-Lièvre and Thomas, 1960: 575, fig 4.2 and pl. XXXIX, figs. b-d; Velho and Lansac-Tôha, 1996:189-190, pl. III, fig. 22.

Comments: The taxon has been collected only in plankton samples from the Upper Paraná river floodplain, states of Paraná and Mato Grosso do Sul (Velho and Lansac-Tôha, 1996; Lansac-Tôha *et al.*, 1997; Velho *et al.*, 1999) (Figure 1).

***Cucurbitella dentata* var. simplex f. *trilobata* Gauthier-Lièvre and Thomas, 1960**

Gauthier-Lièvre and Thomas, 1960: 577, fig.4b and pl. XLIII, fig. 2.

Comments: In Brazil this taxon has been registered only by Madeira-Falcetta (1974) from bottom samples in a coastal lagoon in the state of Rio Grande do Sul (Figure 1).

***Cucurbitella madagascarensis* Gauthier-Lièvre and Thomas, 1960**

Gauthier-Lièvre and Thomas, 1960: 579-580, fig. 6a-h and pl. XLI, fig. 4; Dioni, 1970: 220-223, pl. IV, fig. 42; Medioli *et al.*, 1987, fig. 3.7; Velho and Lansac-Tôha, 1996:190, pl. III, fig. 23.

Comments: In Brazil, *C. madagascarensis* has been registered in plankton samples from the Upper Paraná river floodplain, states of Paraná and Mato Grosso do Sul (Velho and Lansac-Tôha, 1996; Lansac-Tôha *et al*., 1997) and in aquatic macrophyte samples from a marginal lake of the São Francisco river floodplain, state of Minas Gerais (Dabés and Velho, 2001) (Figure 1).

***Cucurbitella mespiliformis* Pénard, 1902**

Pénard, 1902: 311, textfigs. 1-8; Deflandre, 1953, fig. 91D-G; Gauthier-Lièvre and Thomas, 1960: 582-583, fig. 8a-d and pl. XLI, fig. 6; Chardez, 1967a, pl. IV, fig. L; 1968, pl. I, fig. 3; Godeanu, 1970, fig. 1r; Grospietsch, 1972: 19, fig. 16; Vucetich, 1972: 278, pl. II, figs. 4-5 (as *C. mespiliformis* v. *africana* f. *trilobata*); 1973: 315-316, pl. VI, fig. 53; Kudo, 1975, fig. 206i; Ogden, 1980: 133-135, figs. 26-30; Medioli *et al.*, 1987, fig. 3. 4-5; Ogden and Meisterfeld, 1989: 121, figs. 1-2; Velho and Lansac-Tôha, 1996: 188-189, pl. 3, fig. 2L (as *Cucurbitella mespiliformis* var. *africana*); Hardoim, 1997: 233, fig. 78.

Comments: This species has been found in bottom and aquatic macrophyte samples from the Pantanal do Poconé, state of Mato Grosso (Hardoim and Heckman, 1996; Hardoim, 1997); in aquatic macrophyte samples from a reservoir in Porto Alegre, state of Rio Grande do Sul (Torres, 1996); and in plankton samples from the Upper Paraná river floodplain, state of Mato Grosso do Sul (Velho and Lansac-Tôha, 1996; Lansac-Tôha *et al.*, 1997, as *C. mespiliformis* var. *africana*) (Figure 1).

***Cucurbitella neotropicalis* Dioni, 1970**

Dioni, 1970: 221-222, pl. IV, fig. 44.

Comments: The species has been collected only in plankton samples from the Upper Paraná river floodplain, states of Paraná and Mato Grosso do Sul, by Velho *et al.* (1999) (Figure 1)

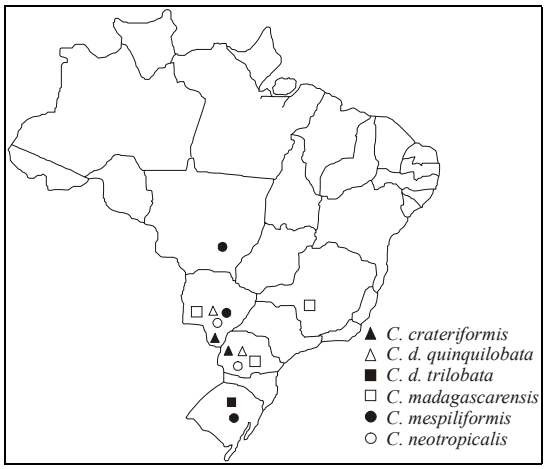

Figure 1. Geographic distribution of *Cucurbitella crateriformis, C. dentata quinquilobata, C. dentata trilobata, C. madagascarensis, C. mespiliformis* and *C. neotropicalis* in Brazilian inland waters

***Lagenodifflugia vas* (Leidy, 1874)**

Boltovskoy and Lena, 1966: 62, pl. I, fig. 4 (as *Difflugia pyriformis* f. *vas*); Medioli and Scott, 1983: 33-34, pl. II, figs. 18-23, 27-28 (comb. nov.); 1985: 31-32, pl. I, figs. 1-3; Patterson *et al*., 1985, pl. II, figs. 13-16; Haman and Kohl, 1994: 231, pl. II, figs. 1-4; Barbosa, 1995, fig. 3. 11-12; Oliveira, 1999, pl. I, fig. 3

Comments: The species has been registered only in bottom samples from estuaries in the states of Paraná (Barbosa, 1995) and São Paulo (Eichler and Bonetti, 1995; Eichler-Coelho *et al.*, 1997; Oliveira, 1999) (Figure 2).

***Pentagonia maroccana* Gauthier-Lièvre and Thomas, 1958**

Gauthier-Lièvre and Thomas, 1958: 349-360, fig. 56; Chardez, 1967a, pl. III, fig. 32; Vucetich, 1978: 84-85, pl. I, figs. 9-10; Todorov and Golemansky, 1998, fig. 9e-k.

Comments: The species has been registered only in samples of aquatic macrophytes from the states of Rio Grande do Sul (Torres, 1996) and Minas Gerais (Dabés and Velho, 2001) (Figure 2).

***Pontigulasia compressa* (Carter, 1864)**

Rhumbler, 1896: 105, pl. IV, fig. 13; Franken, 1933: 195, pl. V, fig. 6; Cushman and McCulloch, 1939: 42, pl. I, fig. 10; Boltovskoy, 1956: 308, pl. I, fig. 9; Closs and Madeira, 1962: 12-13, pl. IV, figs. 8-10, pl. V, figs. 10-11; 1967, pl. I, fig. 7; Chardez, 1967a, pl. V, fig. 14; Boltovskoy and Lena, 1971a, pl. II, figs. 1-2; 1974, pl. IV, fig. 11, pl. VI, fig. 14; Lena and Zaidenwerg, 1975, pl. IV, fig. 3; Chardez and Hellebaut, 1978, fig. 39; Ogden and Hedley, 1980: 162, pl. LXX, figs. A-D; Medioli and Scott, 1983:35, pl. VI, figs. 5-14; 1985:29, fig. 6; Lena, 1983, pl. I, figs. 17-19; Patterson *et al*., 1985, pl. II, fig. 7-8; Barbosa, 1995, fig. 3.4; Velho and Lansac-Tôha, 1996:190, pl. III, fig. 24; Hardoim, 1997:262, fig. 92; Bonetti and Eichler, 1997, pl. I, fig. 4; Oliveira, 1999, pl. II, fig. 2.

Comments: *P. compressa* has been registered mainly in bottom samples from the states of Rio Grande do Sul (Closs and Madeira, 1962, 1967; Closs and Medeiros, 1965, 1967; Madeira-Falcetta, 1974), Santa Catarina (Madeira-Falcetta, 1974), Paraná (Madeira-Falcetta, 1974; Barbosa, 1995), São Paulo (Eichler-Coelho *et al.*, 1997; Bonetti and Eichler, 1997; Oliveira, 1999), Mato Grosso (Hardoim and Heckman, 1996), Minas Gerais (Brant-Ribeiro, 1970), and Sergipe (Zucon and Loyola e Silva, 1992). This species has also been found in moss and sphagnum samples from the state of Rio de Janeiro (Wailes, 1913); in aquatic macrophyte samples from the Pantanal do Poconé, state of Mato Grosso (Hardoim, 1997); in plankton samples from a river of the Upper Paraná river floodplain, state of Mato Grosso do Sul (Velho and Lansac-Tôha, 1996; Lansac-Tôha *et al.,* 1997) and in periphyton samples from a marginal lake of the São Francisco river floodplain, state of Minas Gerais (Dabés and Velho, 2001) (Figure 2).

***Pontigulasia spectabilis* Pénard, 1902**

Chardez, 1967a, pl. V, fig. 11; Grospietsch, 1972: 19-20, fig. 44; Chardez and Hellebaut, 1978, fig. 40.

Comments: The only register of this species in Brazil was made by Madeira-Falcetta (1974) in bottom samples in coastal lagoons in the state of Rio Grande do Sul (Figure 2).

***Protocucurbitella coroniformis* Gauthier-Lièvre and Thomas, 1960**

Gauthier-Lièvre and Thomas, 1960: 593-594, fig. 13e-f and pl. XL A-C; Vucetich, 1970: 46, figs. 7-8; 1973: 314, pl. VI, fig. 50; Godeanu, 1971: 482, fig. 1n-o; Vucetich and Lopretto, 1995, figs. 10-11; Dabés and Velho, 2001, fig. 4e.

Comments: In Brazil the only register of this species has been made in periphyton samples from a marginal lake of the São Francisco river floodplain, state of Minas Gerais (Dabés and Velho, 2001) (Figure 2).

***Suiadifflugia multipora* Green, 1975**

Green, 1975: 553-554, figs. 13, 17-18; 1994, fig. 4A; Velho and Lansac-Tôha, 1996: 188, pl. III, fig. 20.

Comments: The only registers of this species in Brazil were made in plankton samples from lakes of the Suia Missu river basin and in stomach content of fishes from the Pantanal do Poconé, state of Mato Grosso (Green, 1975); from marginal lakes of the São Francisco River basin, state of Minas Gerais (Dabés, 1995; Dabés and Velho, 2001); and from marginal lakes of the Upper Paraná river floodplain, state of Mato Grosso do Sul (Velho and Lansac-Tôha, 1996; Lansac-Tôha *et al.*, 1997) (Figure 2).

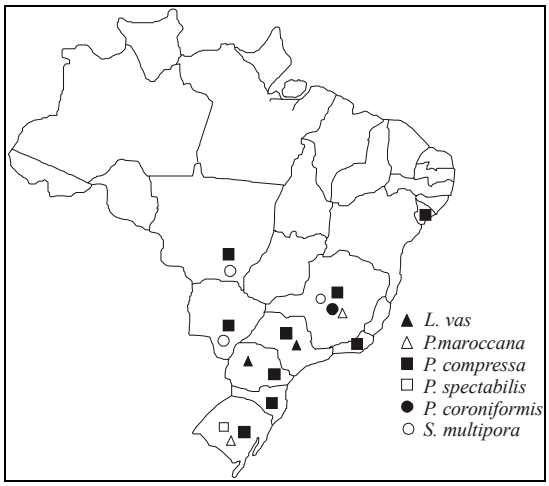

Figure 2. Geographic distribution of *Lagenodifflugia* vas, *Pentagonia maroccana, Pontigulasia compressa, P. spectabilis, Protocucurbitella coroniformis* and *Suiadifflugia multipora* in Brazilian inland waters

Lesquereusiidae Jung, 1942

***Lesquereusia epistomium* Pénard, 1902**

Pénard, 1902: 331, textfigs. 1-3; Thomas and Gauthier -Lièvre, 1959: 42-43, fig. 5a-e and pl. I, fig. 26; Schönborn, 1966: 538-539, fig. 6n; Ogden and Hedley, 1980: 82, pl. XXX, figs. C-D; Ogden, 1984: 255, figs. 39-41; Hardoim, 1997: 225, fig. 74.

Comments: The only registers of the species in Brazil were made from bottom and aquatic macrophyte samples from the Pantanal do Poconé, state of Mato Grosso (Hardoim, 1997) and in the state of Minas Gerais in samples of periphyton from a marginal lake of the São Francisco river basin (Dabés and Velho, 2001) (Figure 3).

***Lesquereusia mimetica* Pénard, 1911**

Pénard, 1911: 303-304, pl. X, fig. 7; Thomas and Gauthier-Lièvre, 1959: 49-50, fig. 9a-e and pl. I, fig. 26, pl. II, figs. 1-2; Chardez, 1967a, pl. VI, fig. 15.

Comments: *L. mimetica* has been registered only in samples of plankton from the Corumbá Reservoir, state of Goiás (Lansac-Tôha *et al.*, 2000b) (Figure 3).

***Lesquereusia modesta* Rhumbler, 1896**

Rhumbler, 1896: 101, pl. IV, fig. 2; Pénard, 1911: 329; Deflandre, 1953, fig. 92H; Thomas and Gauthier-Lièvre, 1959: 52-53, fig. 10a-g and pl. II, fig. 6; Chardez, 1967a, pl. VI, fig. 5; Boltovskoy and Lena, 1966: 62, pl. I, fig. 18; 1971b, pl. III, fig. 15; 1974: 28, pl. I, figs. 5-6; Grospietsch, 1972: 20-21, fig. 47; Laminger, 1973, fig. 32q; Vucetich, 1973: 324, pl. IX, fig. 70; Ogden and Hedley, 1980: 84, pl. XXXI, figs. A-D; Hardoim, 1997: 226, fig. 75; Torres, 1998: 548-549, fig. 9.

Comments: The species has been registered in bottom and aquatic macrophyte samples from the Pantanal do Poconé and in plankton samples from lakes of the Suia Missu river basin, state of Mato Grosso (Green, 1975; Hardoim, 1997); in plankton samples from the Pantanal do Mato Grosso do Sul, state of Mato Grosso do Sul (Bonecker *et al.*, 1998); in plankton samples from the Upper Paraná river floodplain, states of Mato Grosso do Sul and Paraná (Lansac-Tôha *et al.*, 1997; Velho *et al.*, 1999); in plankton samples from the fish culture ponds, state of São Paulo (Oliveira *et al.*, 1992, Durigan *et al.*, 1992); in plankton samples from the Grande river, states of São Paulo and Minas Gerais (Rolla *et al.,* 1992); in plankton samples from Doce river (Bonecher *et al.,* 1996); in plankton samples from Corumbá Reservoir and tributaries, state of Goiás (Lansac-Tôha *et al.*, 1999, 2000b); and in aquatic macrophyte samples from a reservoir located in Porto Alegre, state of Rio Grande do Sul (Torres, 1996, 1998) (Figure 3).

***Lesquereusia modesta* var. *dentata* Thomas and Gauthier-Lièvre, 1959**

Thomas and Gauthier-Lièvre, 1959: 56, fig. 10 and pl. I, fig. 24.

Comments: The taxon has been found only in bottom samples from a coastal lagoon, state of Rio Grande do Sul (Madeira-Falcetta, 1974) (Figure 3).

***Lesquereusia spiralis* (Ehrenberg, 1840)**

Oye, 1931: 62, fig. 6; Franken, 1933: 195, pl. V, fig. 1; Deflandre, 1953, fig. 92E-H; Thomas and Gauthier-Lièvre, 1959: 65-67, figs. 14-15, pl. I, fig. 1 and pl. II, figs. 7-9; Chardez, 1967a, pl. VI, fig. 1; Grospietsch, 1972: 21, fig. 47; Vucetich, 1973: 324-325, pl. IX, fig. 71; Lena and Zaidenwerg, 1975, pl. I, fig. 16; Ogden and Hedley, 1980: 86, pl. XXXII, figs. A-E; Patterson *et al.*, 1985, pl. II, figs. 9-10; Vucetich and Lopretto, 1995, fig. 12; Hardoim, 1997: 228, fig. 76; Rhoden and Pitoni, 1999: 98, fig. 10.

Comments: The species has been found in the state of São Paulo (Prowazek, 1910); state of Rio de

Janeiro (Cunha, 1913, 1916; Wailes, 1913); state of Minas Gerais (Dabés, 1995; Landa, 1997; Landa and Mourgués-Schurter, 2000a and b; Dabés and Velho, 2001); state of Goiás (Lansac-Tôha *et al.*, 1997, 2000b); state of Mato Grosso do Sul (Lansac-Tôha *et al.*, 1997; Bonecker *et al.*, 1998; Velho *et al.*, 1999); state of Mato Grosso (Green, 1975; Hardoim and Heckman, 1996; Hardoim, 1997); state of Paraná (Lopes, 1993; Nunes *et al.*, 1996; Lansac-Toha *et al.,* 1997; Velho *et al.,* 1999) and state of Rio Grande do Sul (Rhoden and Pitoni, 1999) (Figure 3).

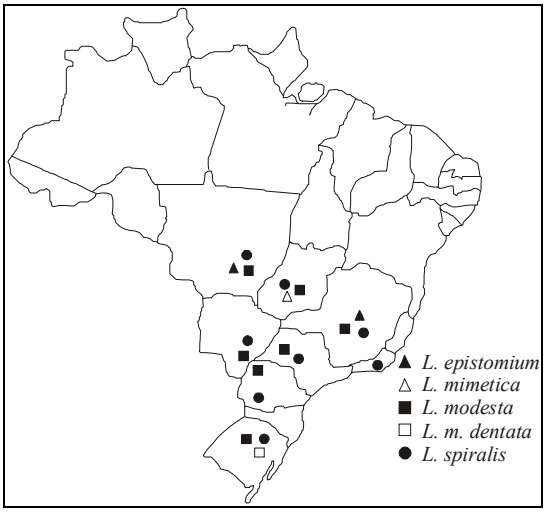

Figure 3. Geographic distribution of *Lesquereusia epistomium, L. mimetica, L.modesta, L. modesta dentata* and *L.spiralis* in Brazilian inland waters

***Quadrulella symmetrica* (Wallich, 1863)**

Pénard, 1890: 166, pl. VII, figs. 40-55; 1902: 377, textfig. 3 (as *Quadrula symmetrica*); Wailes, 1912, pl. XII, figs. 18-19 (as *Quadrula symmetrica*); Franken, 1933: 198, pl. IX, fig. 15 (as *Quadrula symmetrica*); Deflandre, 1936: 230-231, fig. 12 and pl. X, figs. 1-12 (as *Nebela* (*Quadrulella*) *symmetrica*); Gauthier-Lièvre, 1953: 328, fig. 1C-D,F (as *Nebela* (*Quadrulella*) *symmetrica*); Chardez, 1967a, pl. VI, fig. 48; 1967b: 234 and 236, pl. I, fig. 9, pl. III, fig. 6; Grospietsch, 1972: 20, fig. 43; Kudo, 1975, fig. 209e (as *Quadrula symmetrica*); Ogden and Hedley, 1980: 116, pl. XLVII, figs. A-D; Ogden, 1984: 261, fig. 42; Rhoden and Pitoni, 1999: 102-103, fig. 19.

Comments: The species has been found in moss and sphagnum samples, state of Rio de Janeiro (Wailes, 1913; as *Quadrula symmetrica*); in moss samples from the state of Paraná (Hoogenraad and Groot, 1951; as *Quadrula symmetrica*); and in plankton samples from the states of São Paulo and Minas Gerais (Rolla *et al.*, 1992); and in *Sphagnum* samples from the state of Rio Grande do Sul (Rhoden and Pitoni, 1999) (Figure 4).

***Quadrulella tropica* (Wailes, 1912)**

Wailes, 1912: 140 and 158, pl. XII, figs. 13-14 and 44 (as *Nebella* (*Quadrulella*) *tropica*); Deflandre, 1936: 232-233, figs. 15-17 (as *Nebella* (*Quadrulella*) *tropica*); Jung, 1942: 375-376, fig. 27; Gauthier-Lièvre, 1953: 332-333; Chardez, 1967b: 237 and 240, pl. I, fig. 16; Hoogenraad and Groot, 1979, fig. 13c; Vucetich, 1983: 527, figs. 9-10.

Comments: This species has been found only in moss and sphagnum samples, state of Rio de Janeiro (Wailes, 1913, as *Nebela tropica*) (Figure 4).

***Netzelia oviformis* (Cash, 1909)**

Oye, 1931: 59, fig. 4 (as *Difflugia oviformis*); Gauthier-Lièvre and Thomas, 1958: 273, fig. 9a-e (as *D. oviformis*); Grospietsch, 1958: 319 (as *D. oviformis*); Chardez, 1967a, pl. IV, fig. 46 (as *D. oviformis*); Vucetich, 1975: 110-111, fig. 11 (as *D. oviformis*); Ogden, 1979: 206 (type species of new genus *Netzelia*); Ogden and Hedley, 1980: 150, pl. LXIV, figs. A-D (as *D. oviformis*); Ogden and Meisterfeld, 1989: 123; Hardoim, 1997: 255, fig. 89.

Comments: This species has been registered in Brazil only in bottom and aquatic macrophyte samples from the Pantanal do Poconé (Hardoim and Heckman, 1996; Hardoim, 1997), state of Mato Grosso; and in macrophytes associated fauna samples from a marginal lake of the São Francisco river floodplain, state of Minas Gerais (Dabés and Velho, 2001) (Figure 4).

***Netzelia tuberculata* (Wallich, 1864)**

Wallich, 1864: 241, pl. XV, fig. 4g, pl. XVI, fig. 18 (as *Difflugia* subsp. *globularis* var. *tuberculata*); Pénard, 1902: 292-295 (as *D. tuberculata*); Gauthier-Lièvre and Thomas, 1958: 279-280, fig.14 (as *D. tuberculata*); Chardez, 1967a, pl. IV, fig. 42 (as *D. tuberculata*); Vucetich, 1972: 276-277, pl. II, fig. 2; 1973: 304, pl. III, fig. 29 (as *D. tuberculata*); Ogden and Hedley, 1980: 156, pl. LXVII, figs. A-C (as *D. tuberculata*); Ogden, 1980: 130, figs 18-22; 1984: 258 (as *D. tuberculata*); Netzel, 1983: 377 (comb. nov.); Anderson, 1987: 302-309; Ogden and Meisterfeld, 1989: 124; Hardoim, 1997: 257, fig.90.

Comments: The species has been registred in bottom and aquatic macrophyte samples from the Pantanal do Poconé, state of Mato Grosso (Hardoim and Heckman, 1996; Hardoim, 1997); in bottom samples from the Guaratuba Estuary, state of Paraná (Barbosa, 1995; as *Difflugia tricuspis*); in bottom samples from the Itapitangui and Itanhaem

estuaries, state of São Paulo (Bonetti and Eichler, 1997; Oliveira, 1999; as *D. tricuspis*); in aquatic macrophyte and plankton samples from marginal lakes of the São Francisco river basin and small reservoirs in the state of Minas Gerais (Dabés, 1995; Landa and Mourgués-Schurter, 1999, 2000a; Dabés and Velho, 2001; some registers as *D. tuberculata*); in plankton samples from Manguinhos, state of Rio de Janeiro (Cunha, 1913; as *D. tuberculata*); and in plankton samples from the Corumbá Reservoir and tributaries, state of Goiás (Lansac-Tôha *et al.*, 2000b; as *D. tuberculata*) (Figure 4).

***Netzelia wailesi* (Ogden, 1980)**

Ogden, 1980: 130 and 134, figs. 23-25 (as *D. wailesi* nom. nov.); Ogden and Zivkovic, 1983: 360, fig. 13; Ogden and Meisterfeld, 1989: 124, figs. 16-22; Hardoim, 1997: 260, fig. 91.

Comments: *N. wailesi* has been collected only in bottom samples from the Pantanal do Poconé (Hardoim, 1997), state of Mato Grosso; in moss samples, state of Rio de Janeiro (Wailes, 1913, as *Difflugia tuberculata* var. *minor*); and in aquatic macrophyte samples from a marginal lake of the São Francisco river basin, state of Minas Gerais (Dabés and Velho, 2001) (Figure 4).

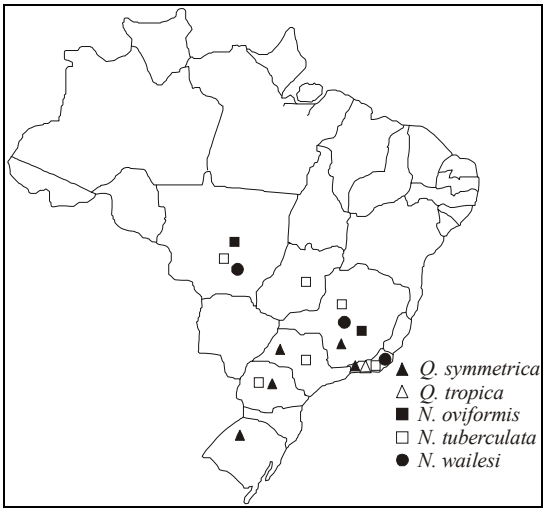

Figure 4. Geographic distribution of *Quadrulella symmetrica, Q. tropica, Netzelia oviformis, N. tuberculata* and *N. wailesi* in Brazilian inland waters

Discussion

In a previous study on the distribution and occurrence of *Difflugia* species, Lansac-Tôha *et al.* (20001) found a high species richness of this genus in Brazilian inland waters. Nevertheless, in spite of the increasing number of investigations on testate amoebae in Brazil, such studies are still restricted to few geographic regions.

Concerning other genera of the family Difflugiidae and those belonging to the family Lesquereusiidae, the absence of registers in certain regions is also evident. Further, the identification of species is based on cytoplasmactic characteristics and idiosome production. Cytoplasmatic characteristics are difficult to observe because the shell is often opaque (Ogden, 1983; Ogden and Meisterfeld, 1989) and idiosome production requires observation of the shell produced in cultures. It is thus probable that registers of species belonging to the genera *Netzelia* and *Lagenodifflugia* are still faulty.

According to Vucetich (1983) and Rhoden and Pitoni (1999), the taxonomy and distribution of the genus *Quadrulella* do not seem to be adequately investigated in neotropical regions. Probably there are species of this genus in South America that have not yet been described.

The general shape of the test in some species of *Quadrulella* is sometimes exactly the same as some species of *Nebela*. The two genera may differ by the test plates. In *Quadrulella* they are square or rectangular, and in *Nebela* they are round or elliptical.

Thus, the few species of these genera that have been identified in Brazil present a low frequency of occurrence and a restricted distribution, most probably the result of absence of specialists in this group. Most of the information on testate amoebae in Brazil also comes from studies carried out with benthic and planktonic communities and not specifically with testate amoebae.

The development of new studies on testate amoebae, especially those belonging to the families Difflugiidae and Lesquereusiidae, must take into account the various aspects of taxonomy and systematics of the group.

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