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On the occurrence of testate amoebae (Protozoa, Rhizopoda) in Brazilian inland waters. II. Families Centropyxidae, Trigonopyxidae and Plagiopyxidae

Luiz Felipe Machado Velho, Fábio Amodêo Lansac-Tôha*, Cláudia Costa Bonecker and Maria Cláudia Zimmermann-Callegari

*Núcleo de Pesquisas em Limnologia, Ictiologia e Aqüicultura, Curso de Pós-Graduação em Ecologia de Ambientes Aquáticos Continentais, Universidade Estadual de Maringá, Av. Colombo, 5790, 87020-900, Maringá-Paraná, Brazil. *Author for correspondence.*

ABSTRACT. The purpose of this study is to provide a checklist and a synthesis of the geographic distribution of the species within Centropyxidae, Trigonopyxidae and Plagiopyxidae (Protozoa, Amoebozoa, Rhizopoda). A total of 24 infra-generic taxa were listed, of which 15 belong to the genus *Centropyxis*, 5 to *Cyclopyxis,* 2 to *Bullinularia,* 1 to *Hoogenraadia* and 1 to *Trigonopyxis.* Some taxonomic information is also provided. *Centropyxis aculeata, C. constricta* and *C. marsupiformis* presented widespread distribution in the freshwater environments in Brazil.

Key words: testate amoebae, *Centropyxis*, *Cyclopyxis*, *Trigonopyxis, Hoogenraadia*, *Bullinularia,* geographical distribution, Brazil.

RESUMO. Ocorrência de tecamebas (Protozoa, Amoebozoa, Rhizopoda) em águas continentais brasileiras. II. Famílias Centropyxidae, Trigonopyxidae e Plagipyxidae. O presente estudo tem por objetivo relacionar as espécies das famílias Centropyxidae, Trigonopyxidae e Plagiopyxidae (Protozoa, Amoebozoa Rhizopoda), e fornecer uma síntese sobre a distribuição geográfica das mesmas em nosso País. Um total de 24 táxons infra-genéricos é listado, sendo 15 taxa do gênero *Centropyxis,* 5 de *Cyclopyxis,* 2 de *Bullinularia,* 1 de *Hoogenraadia* and 1 de *Trigonopyxis*. Algumas informações taxonômicas são fornecidas. *Centropyxis aculeata, C. constricta* e *C. marsupiformes* foram as espécies que apresentaram uma maior freqüência de ocorrência e mais amplamente distribuidas nos sistemas de água doce no Brasil.

Palavras-chave: tecamebas, *Centropyxis*, *Cyclopyxis*, *Trigonopyxis, Hoogenraadia*, *Bullinularia*, distribuição geográfica, Brasil

In Brazil, there is little information on assemblages of testate amoebae. Thus, the knowledge on their occurrence, distribution and main species diversity is scarce.

Early records in Brazil are the work of Ehrenberg (1841), and at beginning of this century the works of Daday (1905), Prowazek (1910) and Cunha (1913, 1916). Since those works, testate amoebae were forgotten for a long time. Only with Closs and Madeira (1962, 1967) and Closs and Medeiros (1965, 1967) on sediments of coastal lagoons in the state of Rio Grande do Sul, testate amoebae occurrence, distribution and some ecological aspects were studied again.

During the 90's some representative studies were carried out on testate amoebae, that generated knowledge on the occurrence of this group in Brazil, considering geographic distribution and distribution on different types of habitats studied (plankton, benthos, lichens, and fauna associated with macrophytes (Torres and Jebran, 1994; Torres, 1996; Hardoim and Heckman, 1996; Dabés, 1995; Velho *et al*., 1996; Velho and Lansac-Tôha, 1996; Hardoim, 1997; Oliveira; 1999 and Rhoden and Pitoni, 1999).

It is important to consider that part of the knowledge generated on testate amoebae assemblage came from more general studies, such as aquatic assemblages, specially plankton (zooplankton and protozooplankton). Among these are the works of

Neumann-Leitão and Nogueira-Paranhos (1987), Rolla *et al*. (1992), Neumann-Leitão *et al*. (1991), Lansac-Tôha *et al*. (1992, 1993, 1997, 1999), and Bonecker *et al.* (1996, 1997).

Thus, this paper is a continuation of our surveys on testate amoebae, such as Arcellidae (Lansac-Tôha *et al*. 2000a). Herein, we will give a synthesis on the knowledge of Centropyxidae, Trigonopyxidae and Plagiopyxidae species occurrence and distribution.

Material and methods

With respect to previous registers of occurrence and geographical distribution of Centropyxidae, Trigonopyxidae and Plagiopyxidae species we considered only those 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 and thus provide an update on the state of the art of the distribution of Centropyxidae, Trigonopyxidae and Plagiopyxidae species in Brazil. The taxonomic classification was basically that proposed by Loeblich and Tappan (1964) which was also adopted by Ogden and Hedley (1980).

Results

Centropyxidae Jung, 1942

***Centropyxis aculeata* (Ehrenberg, 1838)**

Ehrenberg, 1838: 133, pl. IX, fig. 6; Pénard, 1890: 149, pl. V, figs. 21-37; 1902: 303, fig. 1; De la Rua, 1912; 45, fig. 5; Deflandre, 1929: 344-348, fig. 80-92; 1953, fig.89K-L; Schönborn, 1966, fig. 3a-d; Chardez, 1967, pl. II, fig. 26; Dioni, 1970: 206, fig. 8; 1971: fig. 2; Vucetich, 1970: 47; 1973: 322, pl. VIII, fig. 66; Grospietsch, 1972: 11, fig. 15; Laminger, 1972, fig. 12.3h-i; Lena and Cachi, 1972, pl. I, figs. 23-25; Boltovskoy and Lena, 1974, pl. V, fig. 10; Kudo, 1975: 450, fig. 206g; Chardez, 1970, figs. 1-2; Ogden and Hedley, 1980: 46, pl. XII, figs. A-D; Scott and Medioli, 1983: 817, fig. 9L; Medioli and Scott, 1985: 36, fig. 13; Velho *et al*., 1996: 44, pl. III, fig. 16; Hardoim, 1997: 206, fig. 66; Rhoden and Pitoni, 1999: 95, fig. 3.

Comments: Ehrenberg (1841) made the first citation of this species in Brazil, without the description of collection site. Other authors also found the species, in different localities: in the state of Piauí (Cunha, 1916); state of Bahia (Cunha, 1916; Neumann-Leitão and Nogueira-Paranhos, 1987); state of Rio de Janeiro (Prowazek, 1910; Cunha, 1913, 1916; Wailes, 1913); state of Minas Gerais (Rolla *et al.,* 1990, 1992; Dabés, 1995; Bonecker *et al*., 1996, 1997); state of Goiás (Lansac-Tôha *et al*., 1999, 2000b); state of São Paulo (Prowazek, 1910; Rolla *et al.,* 1990; Neumann-Leitão *et al*., 1990; Oliveira *et al.,* 1992; Durigan *et al*., 1992; Eichler-Coelho *et al*., 1996, 1997; Bonetti and Eichler, 1997; Oliveira, 1999); state of Mato Grosso (Green, 1975; Hardoim and Heckman, 1996; Hardoim, 1997); state of Mato Grosso do Sul (Velho *et al*., 1996, 1999; Lansac-Tôha *et al*., 1997; Bonecker *et al*., 1998); state of Paraná (Cunha, 1916; Lopes, 1993; Barbosa, 1995; Nunes *et al*., 1996; Velho *et al*., 1996, 1999; Lansac-Tôha *et al*., 1997); and state of Rio Grande do Sul (Torres, 1996; Rhoden and Pitoni, 1999) (Figure 1).

***Centropyxis aculeata* var. *tropica* Deflandre, 1929**

Deflandre, 1929: 348-349, figs. 94-95; Stepánek, 1967, fig. 6.9; Dioni, 1970: 207, fig. 10; Vucetich, 1973: 322, pl. VIII, fig. 67; Velho *et al*., 1996: 44, pl. III, fig. 17.

Comments: This species has been recorded only in plankton samples from the upper Paraná River floodplain, state of Mato Grosso do Sul (Velho *et al*., 1996) (Figure 1).

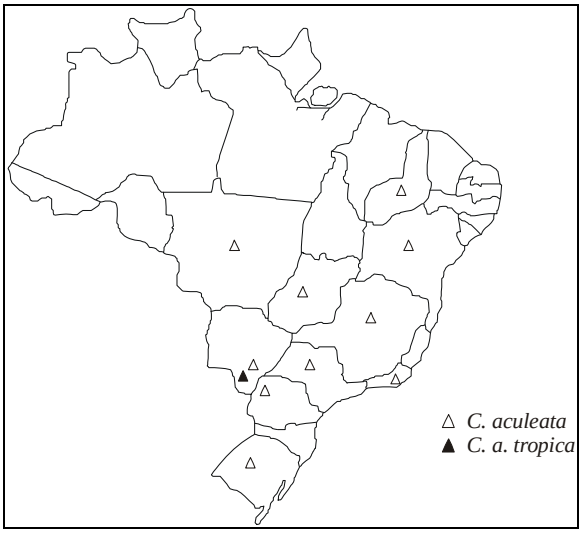

Figure 1. Geographic distribution of the species *Centropyxis aculeata* and *C. aculeata tropica* in Brazilian inland waters

***Centropyxis aerophila* Deflandre, 1929**

Deflandre, 1929: 330-332, figs. 11-21; 1953, fig.89M-N; Schönborn, 1965, fig. 3b-d; 1966: 536, fig. 4a-i; 1975, fig. 3g-h; Chardez, 1967, pl. II, fig. 46; Vucetich, 1972: 318-319, pl. VII, fig. 59; Chardez and Hellebaut, 1978, fig. 15; Ogden and Hedley, 1980: 48, pl. XIII, figs. A-E; Hennuy and Chardez, 1988, fig. 2; Rhoden and Pitoni, 1999: 95-96, fig. 4.

Comments: The only record of this species in Brazil was from samples of *Sphagnum* in the state of Rio Grande do Sul (Rhoden and Pitoni, 1999) (Figure 2).

***Centropyxis cassis* (Wallich, 1864)**
Pénard, 1902: 299, fig. 3; Deflandre, 1929: 335-336, figs. 35-40; Schönborn, 1965, fig. 3f; Chardez, 1967, pl. II, fig. 48; Godeanu, 1970, fig. 1d-f; Boltovskoy and Lena, 1971a, pl. I, figs. 2-3; Grospietsch, 1972: 11, fig. 18; Green, 1975, fig. 3; Ogden and Hedley, 1980: 50, pl. XIV, figs. A-C.

Comments: This species was cited only in plankton samples from the state of Mato Grosso (Green, 1975) and from the state of Goiás (Lansac-Tôha *et al*., 1999, 2000b) (Figure 2).

***Centropyxis constricta* (Ehrenberg, 1841)**
Ehrenberg, 1841: 410, pl. IV, fig. 35, pl. V, fig. 1; Leidy, 1879, pl. XVIII, figs. 29-30; Pénard, 1902: 299, figs. 1-2; Deflandre, 1929: 340-341, figs. 60-67; Closs and Madeira, 1962: 14-15, pl. VII, fig. 3; 1967, pl. I, fig. 9; Schönborn, 1965, fig. 3g; Boltovskoy and Lena, 1966: 58, pl. I, figs. 15-16; 1971b, pl. II, fig. 15; 1971b, pl. I, fig. 8; 1974, pl. III, fig. 11; Brant-Ribeiro, 1970: 12-13, pl. I, fig. 8a-c; Grospietsch, 1972: 11, fig. 19; Laminger, 1972, fig. 12.3r; 1973, fig. 29q; Green, 1975: 547, fig. 4; Ogden and Hedley, 1980: 52, pl. XV, figs. A-E; Medioli and Scott, 1983: 41, pl. VII, figs 1-9; 1985: 30, fig. 7; Chardez, 1986a, pl. I, fig. 5; Haman, 1990, pl. I, figs. 1-3; Hardoim, 1997: 210, fig. 67; Rhoden and Pitoni, 1999: 96, fig. 5; Oliveira, 1999, pl. VI, figs. 1-6.

Comments: This species has been collected in the state of Rio Grande do Sul (Closs and Madeira, 1962, 1967; Closs and Medeiros, 1967; Madeira-Falcetta, 1974; Rhoden and Pitoni, 1999); state of Paraná (Hoogenraad and Groot, 1951; Barbosa, 1995); state of Mato Grosso (Green, 1975; Hardoim and Heckman, 1996; Hardoim, 1997); state of São Paulo (Eichler-Coelho *et al*., 1996, 1997; Bonetti and Eichler, 1997; Oliveira, 1999); state of Minas Gerais (Brant-Ribeiro, 1970); and state of Goiás (Lansac-Tôha *et al*., 1999, 2000b) (Figure 2).

***Centropyxis discoides* (Pénard, 1890)**
Pénard, 1890: 150, pl. V, figs. 38-41; 1902: 306, figs. 1-7; Deflandre, 1926: 517, figs. 2-3; 1929: 351-353, figs. 104-107; Chardez, 1967, pl. II, fig. 44; 1986b, fig. 1.8; Dioni, 1970: 297-298, pl. II, fig. 11; Grospietsch, 1972: 12, fig. 21; Vucetich, 1972: 278-279, pl. II, fig. 6; 1973: 317-318, pl. VII, fig. 57; Netzel, 1972: 46, fig. 1; Green, 1975: 548, fig. 1; Ogden and Hedley, 1980: 54, pl. XVI, figs. A-E; Velho *et al*., 1996: 46, pl. III, fig. 19; Hardoim, 1997: 213, fig. 68.

Comments: This species has been cited in Brazil by Closs and Medeiros (1965; 1967) from bottom samples of the Patos and Mirim Lagoons, state of Rio Grande do Sul; by Velho *et al*. (1996) and Lansac-Tôha *et al*. (1997) in plankton samples from the upper Paraná River floodplain, States of Mato Grosso do Sul and Paraná; by Hardoim and Heckman (1996) and Hardoim (1997) in periphyton samples from the Pantanal do Poconé, state of Mato Grosso; by Bonecker *et al.* (1996) in the plankton from Doce river, state of Minas Gerais; and by Lansac-Tôha *et al*. (1999, 2000b) in the plankton from Corumbá Reservoir and tributaries, state of Goiás (Figure 2).

***Centropyxis ecornis* (Ehrenberg, 1841)**
Ehrenberg, 1841: 368; Leidy, 1879: 181, figs. 20-34; Deflandre, 1929: 359-362, figs. 123-138; Vucetich, 1970: 47; 1973: 318, pl. VII, fig. 58; Boltovskoy and Lena, 1971a, pl. II, figs. 2-3; 1974: 17, pl. I, figs. 1-2; Grospietsch, 1972: 12; Laminger, 1972, fig. 13e; Lena and Cachi, 1972, pl. I, figs. 21-22; Ogden and Hedley, 1980: 56, pl. XVII, figs. A-E; Velho *et al*., 1996: 46, pl. III, fig. 20; Hardoim, 1997: 216, fig. 69.

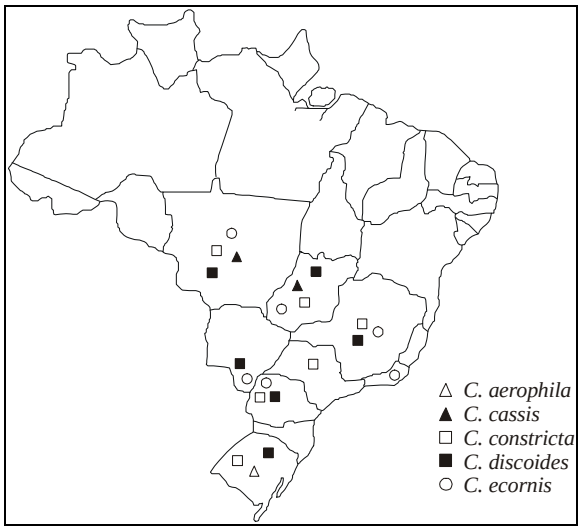

Figure 2. Geographic distribution of the species *Centropyxis aerophila, C. cassis, C. constricta, C. discoides* and *C. ecornis* in Brazilian inland waters

Comments: With regard to Brazil, it was cited by Wailes (1913) in samples from mosses, state of Rio de Janeiro; by Green (1975) in lake plankton samples from the Suia Missu River basin, and by Hardoim (1997) in periphyton samples from the Pantanal do Poconé , state of Mato Grosso; by Velho

et al. (1996, 1999) and Lansac-Tôha *et al*. (1997) in plankton samples from the upper Paraná River floodplain, States of Mato Grosso do Sul and Paraná; by Bonecker *et al*. (1998) in plankton samples from the Pantanal, state of Mato Grosso do Sul; by Bonecker *et al*. (1996) in plankton samples from the Doce river, state of Minas Gerais; and by Lansac-Tôha *et al*. (1999, 2000b) in plankton samples from Corumbá Reservoir and tributaries, state of Goiás (Figure 2).

***Centropyxis hemisphaerica* (Barnard, 1875)**
Deflandre, 1929: 356, figs. 116-117; 1953, fig. 89o; Vucetich, 1980: 398-399, fig. 1.

Comments: In Brazil, this species has been registered only in the state of Rio Grande do Sul, in samples from aquatic plants (Torres, 1996) and in the plankton sample from the state of São Paulo (Durigan *et al*., 1992; Oliveira *et al*., 1992) (Figure 3).

***Centropyxis hirsuta* Deflandre, 1929**
Deflandre, 1929: 354-355, figs. 112-115; Schönborn, 1965, fig. 4d-e; Chardez, 1967, pl. II, fig. 25; Dioni, 1970: 208, pl. II, fig. 12; Vucetich, 1970: 47; 1972: 279, pl. I, fig. 1; 1973: 317, pl. VII, fig. 56; Laminger, 1972, fig. 12.3f-g; Green, 1975: 548, fig. 6; Ogden and Hedley, 1980: 58, pl. XVIII, figs. A-C; Velho *et al*., 1996: 44, pl. III, fig. 18; Hardoim, 1997: 218, fig. 70.

Comments: In Brazil this species has been found in lake plankton of the Suia Missu River basin, state of Mato Grosso (Green, 1975); São Francisco River basin, state of Minas Gerais (Dabés, 1995); Corumbá Reservoir and tributaries, state of Goiás (Lansac-Tôha *et al*., 1999, 2000b); upper Paraná River floodplain, States of Mato Grosso do Sul and Paraná (Velho *et al*., 1996; Lansac-Tôha *et al*., 1997); lagoons of a protected area, state of Paraná (Nunes *et al.,* 1996), and in periphyton samples from the Pantanal do Poconé, state of Mato Grosso (Hardoim, 1997) (Figure 3).

***Centropyxis laevigata* Pénard, 1890**
Pénard, 1890: 151, pl. V, figs. 42-44, 49-55; Laminger, 1973, fig. 8g-h.

Comments: This species was cited in Brazil only for the state of Rio de Janeiro (Cunha, 1913) (Figure 3).

***Centropyxis marsupiformis* (Wallich, 1864)**
Wallich, 1864: 241, pl. XV, fig. 5a-d, m, pl. XVI, figs. 3-4; Deflandre, 1929: 342-343, figs. 68-75; Closs and Madeira, 1962: 14, pl. III, fig. 2, pl. VI, figs. 8-9; Chardez, 1967, pl. II, fig. 62; Vucetich, 1973: 320, pl. VIII, fig. 62; Madeira-Falcetta, 1974, pl. IV, fig. 18; Velho *et al*., 1996: 46, pl. III, fig. 21.

Comments: In Brazil this species has been recorded in the state of Rio Grande do Sul, in bottom samples of coastal lakes (Closs and Madeira, 1962, 1967; Closs and Medeiros, 1965, 1967; Madeira-Falcetta, 1974); state of Santa Catarina in bottom samples from São Francisco do Sul estuary (Madeira-Falcetta, 1974); States of Mato Grosso do Sul and Paraná in plankton samples from the upper Paraná River floodplain (Velho *et al*., 1996; Lansac-Tôha *et al*., 1997); state of Mato Grosso in periphyton samples from the Pantanal do Poconé (Hardoim and Heckman, 1996; Hardoim, 1997); state of Goiás in plankton samples from the Corumbá Reservoir and tributaries (Lansac-Tôha *et al*., 1999, 2000b); and state of Sergipe in bottom samples from the estuary of Piauí River (Zucon and Loyola e Silva, 1992) (Figure 3).

***Centropyxis minuta* Deflandre, 1929**
Leidy, 1879, pl. XVIII, figs. 15-16 (as *Difflugia constricta*); Pénard, 1902: 299, figs. 13-14 (as *Difflugia constricta*); Deflandre, 1929: 366, fig. 148-152; Oye, 1956, fig. 2; Chardez, 1967, pl. II, fig. 51.

Comments: The only record of this species in Brazil was for the state of Mato Grosso (Green, 1975) (Figure 3).

***Centropyxis orbicularis* Deflandre, 1929**
Deflandre, 1929: 334-335, figs. 31-34; Schönborn, 1966: 536, fig. 4o; Laminger, 1972, fig. 12. 3o; Vucetich, 1976: 31, figs. 11-12; Rhoden and Pitoni, 1999: 96, fig. 6.

Comments: In Brazil, this species was found only in state of Rio Grande do Sul in aquatic macrophytes samples (Torres, 1996; Rhoden and Pitoni, 1996) (Figure 3).

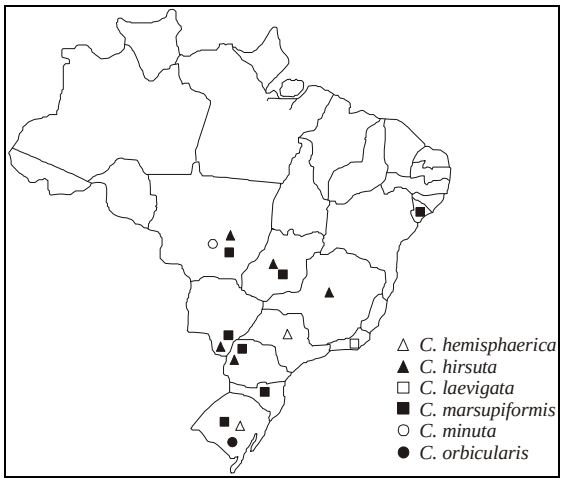

Figure 3. Geographic distribution of the species *Centropyxis hemisphaerica, C. hirsuta, C. laevigata, C. marsupiformis, C. minuta* and *C. orbicularis* in Brazilian inland waters

***Centropyxis platystoma* (Pénard, 1902)**
Pénard, 1902: 299, figs. 8, 11-12; Deflandre, 1929: 338-340, figs. 43-57; Schönborn, 1965, fig. 3a; 1966: 535, fig. 3g-k; Chardez, 1967, pl. II, fig. 40; Stepánek, 1967, fig. 3; Godeanu, 1970, fig. 1g; Grospietsch, 1972: 12, fig. 17; Laminger, 1972, fig. 12. 3p; 1973, fig. 29n; Vucetich, 1972: 319, pl. VII, fig. 61; Ogden and Hedley, 1980: 60, pl. XIX, figs. A-D; Opravilová, 1989: 37; Hardoim, 1997: 220, fig. 71.

Comments: In Brazil, this species has been registered in submerged plants samples from state of Mato Grosso (Hardoim and Heckman, 1996; Hardoim, 1997); in plankton samples from state of Mato Grosso do Sul (Velho *et al*., 1999); in plankton samples from state of Minas Gerais (Bonecker *et al*., 1996); and in plankton samples from state of Goiás (Lansac-Tôha *et al*., 1999, 2000b) (Figure 4).

***Centropyxis spinosa* (Cash, 1905)**
Deflandre, 1929: 353-354, figs. 108-111; Chardez, 1967, pl. II, fig. 59; Grospietsch, 1972: 12, fig. 13; Lena and Zaindwerg, 1975, pl. I, fig. 1; Ogden and Hedley, 1980: 62, pl. XX, figs. A-D; Fenchel, 1987, fig. 9.4a; Hardoim , 1997: 222, fig. 72.

Comments: In Brazil this species was registered only in aquatic macrophytes samples from the state of Rio Grande do Sul (Torres, 1996) and state of Mato Grosso (Hardoim and Heckman, 1996; Hardoim, 1997) (Figure 4).

Trigonopyxidae Loeblich and Tappan, 1964

***Cyclopyxis arcelloides* (Pénard, 1902)**
Pénard, 1902: 309, figs. 1-4; Deflandre, 1929: 367-368, figs. 153-158; Chardez, 1967, pl. II, fig. 6; Grospietsch, 1972: 13, fig. 14; Laminger, 1972, fig. 13c; Chardez and Hellebaut, 1978, fig. 42; Meisterfeld, 1979: 250-251, pl. I, figs. 4-5.

Comments: In Brazil this species has been recorded only in samples from mosses in the state of Rio de Janeiro (Wailes, 1913) (Figure 4).

***Cyclopyxis arenata* (Cushman, 1930)**
Cushman, 1930: 15, pl. I, fig. 3a-b; Boltovskoy, 1956: 310, pl. I, fig. 10; Closs, 1962: 62, pl. IX, fig. 10; Closs and Madeira, 1962: 13, pl. III, figs. 3-4, pl. VI, fig. 7; 1967, pl. I, fig. 10; Boltovskoy and Lena, 1966: 59, pl. I, fig. 19; 1971b, pl. I, fig. 9a-b; 1974, pl. IV, fig. 6; Decloitre, 1977: 34, fig. 7.

Comments: This species was registered in Brazil in bottom samples from the state of Rio Grande do Sul (Closs, 1962; Closs and Madeira, 1962, 1967; Closs and Medeiros, 1967; Madeira-Falcetta, 1974); state of São Paulo (Bonetti and Eichler, 1997), and state of Minas Gerais (Brant-Ribeiro, 1970) (Figure 4).

***Cyclopyxis eurystoma* (Deflandre, 1929)**
Deflandre, 1929: 371, figs. 168-171; Chardez, 1967, pl. II, fig. 7; Vucetich, 1973: 321, pl. VIII, fig. 64; Chardez and Hellebaut, 1978, fig. 13; Ogden and Hedley, 1980: 68, pl. XXIII, figs. A-C; Rhoden and Pitoni, 1999: 97, fig. 8.

Comments: *C. eurystoma* was found in Brazil only in samples of S*phagnum* from the state of Rio Grande do Sul (Rhoden and Pitoni, 1999) (Figure 4).

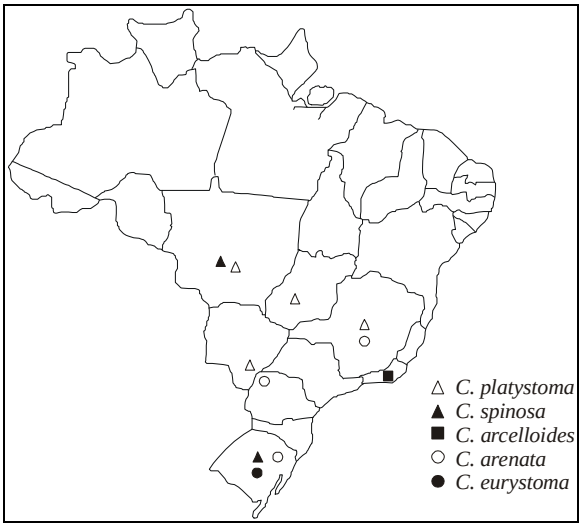

Figure 4. Geographic distribution of the species *Centropyxis platystoma, C. spinosa, Cyclopyxis arcelloides, C. arenata* and *C. eurystoma* in Brazilian inland waters

***Cyclopyxis impressa* (Daday, 1905)**
Daday, 1905: 44, pl. I, figs. 11-14; Deflandre, 1929: 372-373, figs. 174-176; Chardez, 1967, pl. II, fig. 1; Green, 1975: 548, fig. 2; Vucetich, 1978: 85-86, pl. I, figs. 1-2; Decloitre, 1982: 400, fig. 20; Lena, 1984: 17, pl. III, figs. 8-9; Velho *et al*., 1996: 16, pl. IV, fig. 24; Oliveira, 1999, pl. III, fig. I.

Comments: This species has been recorded in Brazil in Manguinhos, state of Rio de Janeiro (Cunha, 1913, 1916); state of São Paulo (Oliveira, 1999); state of Minas Gerais (Bonecker *et al*., 1996); state of Goiás (Lansac-Tôha *et al*., 1999, 2000b); state of Mato Grosso (Green, 1975); and state of Paraná (Velho *et al*., 1996; Lansac-Tôha *et al*., 1997) (Figure 5).

***Cyclopyxis kahli* (Deflandre, 1929)**
Deflandre, 1929: 370, figs. 164-167; Godeanu, 1970, fig. 1h-i; Vucetich, 1973: 320, pl. VIII, fig. 63; Green, 1975, fig. 5; Ogden and Hedley, 1980: 70, pl.

XXIV, figs. A-E; Foissner and Korganova, 1995: 14, figs. 17-21, 23-29, 47-60; Velho *et al*., 1996: 15-16, pl. IV, fig. 23.

Comments: In Brazil, it has been found in plankton samples of the Suia Missu River basin, state of Mato Grosso (Green, 1975); upper Paraná River floodplain, States of Mato Grosso do Sul and Paraná (Velho *et al*., 1996, 1999; Lansac-Tôha *et al*., 1997); Doce River, state of Minas Gerais (Bonecker *et al*., 1996); and Corumbá Reservoir and tributaries, state of Goiás (Lansac-Tôha *et al*., 1999, 2000b) (Figure 5).

***Trigonopyxis arcula* (Leidy, 1879)**

Leidy, 1879: 116, pl. XV, figs. 34-37, pl. XVI, figs. 30-31; Hoogenraad and Groot, 1937, fig. 32; Deflandre, 1953, fig. 90I-J; Schönborn, 1964, fig. 12g; Loeblich and Tappan, 1964: 26, fig. 8; Boltovskoy and Lena, 1966: 64, pl. I, fig. 14; 1971b, pl. I, figs. 12-13; 1974, pl. V, fig. 11; Chardez, 1967, pl. II, figs. 11-12; 1968, pl. I, fig. 6; Laminger, 1972, fig. 13d; Ogden and Hedley, 1980: 66, pl. XXII, figs. A-D; Bobrov *et al*., 1995: 120, figs. 1-3; Oliveira, 1999, pl. III, fig. 4.

Comments: This species has been found in samples of mosses in the state of Rio de Janeiro (Wailles, 1913) and state of Paraná (Hoogenraad and Groot, 1951); in bottom samples from the state of São Paulo (Oliveira, 1999); and in plankton samples from the state of Goiás (Lansac-Tôha *et al*., 2000b) (Figure 5).

Plagiopyxidae Bonnet, 1959

***Bullinularia gracilis* Thomas, 1959**

Thomas, 1959: 2, pl. I, figs. 9-10; Vucetich, 1976: 31, fig. 1.9.

Comments: The only register of this species in Brazil was taken in the state of Rio Grande do Sul, in samples of aquatic macrophytes (Torres, 1996) (Figure 5).

***Bullinularia indica* (Pénard, 1907)**

Hoogenraad, 1933: 122, pl. XII, figs. 1-3; Deflandre, 1953, fig. 90A-E; Grospietsch, 1967, fig. 2; Chardez, 1967, pl. II, fig. 24; Boltovskoy and Lena, 1971a, pl. I, figs. 4-5; 1974, pl. IV, figs. 8-10; Lena and Cachi, 1972, pl. I, fig. 36; Kudo, 1975: 451, fig. 207d; Ogden and Hedley, 1980: 64, pl. XXI, figs. A-D; Lena, 1984: 17, pl. III, fig. 3; Rhoden and Pitoni, 1999: 97, fig. 7.

Comments: In Brazil, this species has been registered in samples of mosses from the state of Rio de Janeiro (Wailles, 1913) and state of Rio Grande do Sul (Rhoden and Pitoni, 1999); in sediments samples from the state of São Paulo (Oliveira, 1999); and in samples of plankton from state of Goiás (Lansac-Tôha *et al*., 2000b) (Figure 5).

***Hoogenraadia cryptostoma* Gauthier-Lièvre and Thomas, 1958**

Gauthier-Lièvre and Thomas, 1958: 353-354, fig. 57; Green, 1975: 552.

Comments: This species was only registered in Brazil by Green (1975) in plankton samples from lakes of the Suia Missu River, state of Mato Grosso; by Lansac-Tôha *et al*. (2000b) in plankton samples from the Corumbá reservoir, state of Goiás; by Velho *et al*. (1996) and Lansac-Tôha *et al*. (1997) in plankton samples from the upper Paraná River floodplain, States of Mato Grosso do Sul and Paraná; and by Closs and Medeiros (1967) in bottom samples from the Mirim Lagoon, state of Rio Grande do Sul (Figure 5).

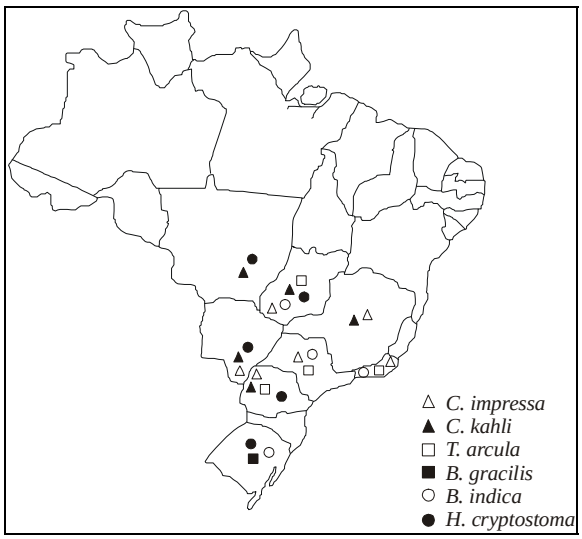

Figure 5. Geographic distribution of the species *Cyclopyxis impressa, C. kahli, Trigonopyxis arcula, Bullinularia gracilis, B. indica* and *Hoogenraadia cryptostoma* in brazilian inland waters

Discussion

Among the three families considered in this study, Centropyxidae presented greatest species richness (15 taxa), followed by Trigonopyxidae (6 taxa) and Plagyopixydae (3 taxa). As indicated by Lansac-Tôha *et al*. (2000a) for Arcellidae, greater species number of Centropyxidae were recorded from plankton samples (12 taxa) and vegetation (11 taxa). Only 4 taxa of this family were recorded in samples from sediments. But the studies considering sedments were conducted in coastal lagoons or estuaries, where salinity is a limitant factor for the

occurrence of testate amoebae (Bonetti and Eichler, 1997; Oliveira, 1999). On the other hand, there were no differences in the number of species for Trigonopyxidae and Plagiopyxidae among the three types of habitats considered.

Among the testate amoebae registred in Brazil, *Centropyxis aculeata* presented, in general, the broadest distribution. This species, together with *C. constricta*, are the most abundant and frequent species of Centropyxidae in estuaries and coastal lagoons, because they are able to support the restrictive conditions of these environments, such as high salinity (Boltovskoy and Lena, 1974; Oliveira, 1999).

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