

Phycological Flora Of Rio Mongaguá, Sp.

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ABSTRACT: This study aims to present the biodiversity of the flora of continental waters of the Mongaguá River, located in the municipality of Mongaguá, presents 5 km in length, its source is 400 m high, it is born in the Serra do Mar and flows into the central region of Mongaguá, a municipality belonging to the Metropolitan Region of Baixada Santista, with geographical coordinates 24°05'659 "S and 46°37'245" W. The climate of the region is subtropical (Cfa) humid with annual average between 18-25°C. The banks of the river are vegetation of virgin forest (primary) and capoeira (secondary). The inhabitants of the municipality use the river for fishing for sea bass, mullet and catfish. Among the local flora are guava, red mangrove, brejaúva, guajuvira, taquara, jervivá, palmito-juçara, guaricanga, indaiá, pacuri and vines. Some stretches close to the city center are already polluted. The region suffers from actions of palmiters, hunters and illegal fishermen. The Mongaguá River is located in the Atlantic Forest region. Knowing that the Mongaguá river is part of the daily life of the local population and the current quality of the water is unknown, since some people use the river for food, bath, and fun, it was sought to inventory the fictional flora, being that many algae are bioindicators of pollution. Real estate speculation, suppression of terrestrial ecosystems, predatory exploitation are worries, leading us to carry out this project. To date, 23 genera and 29 species have been identified.

KEYWORDS: continental waters algae, Mongaguá river, taxonomy.

I. INTRODUCTION

The term alga has no taxonomic value, its stem is not differentiated in leaves and stems, in addition to gathering characteristics of other organisms, such as plants containing chlorophyll and bacteria containing cell wall. Its size ranges from macro to microscopic. This study sought to carry out a taxonomic survey of the phycological flora of the Mongaguá River, located in the municipality of Mongaguá, south coast of the State of São Paulo, Metropolitan Region of Baixada Santista. The municipality of Mongaguá has a population of 54,257 people in an area of 143,205 km², according to data from IBGE - Brazilian Institute of Geography and Statistics (2017). The Mongaguá River rises in the Serra do Mar at an altitude of 400 m, with 5 km in length, flowing into the central region of the municipality that bears the same name as the river. The meaning of the word Mongaguá comes from the Guarani meaning "sticky waters". Classified as a regular water river. The anthropic alteration occurs in some areas close to the urbanized region of the municipality. The surrounding population uses the river as a source of resources and leisure. The region's climate is humid subtropical (Cfa) with an annual average between 18-25°C. The banks of the river are vegetation of virgin forest (primary) and capoeira (secondary). Citizens and tourists use the river for fishing for gravel, sea bass, catfish and mullet. Water birds such as cormorants, herons and seagulls are also found in the river. Among the local flora, we find guava, red mangrove, brejaúva, guajuvira, taquara, jervivá, palmito-juçara, guaricanga, indaiá, pacuri and vines. The urbanization in the region where the river flows into the sea has compromised the quality of the river, so much so that in some sections it is already polluted. The region suffers from the actions of palm growers, hunters and illegal fishermen. The Mongaguá River is located in the Atlantic Forest region. Knowing that the Mongaguá river is part of the daily life of the local population and the current quality of its waters is unknown, as some people use the river for food, bathing, entertainment, an attempt was made to inventory the ficological flora, being that many algae are bioindicators of pollution. Real estate speculation, suppression of terrestrial ecosystems, predatory exploitation are concerns, leading us to carry out this project. 3 (three) samplings were carried out on the following days: 08/26/2017, 10/28/2017, 12/3/2017 and 03/31/2018, capsizing the vial laterally in the water column when in shallow environments and use plankton net was used in order to obtain a more concentrated sampling of microalgae, in deeper environments, in addition to peripheral material that was also analyzed.

II. MATERIALS AND METHODS

The area covered by this study is the Mongaguá River, located in the municipalities of the same name. Classified as a regular water river, located in the metropolitan region of Baixada Santista, State of São Paulo and composed of 9 (nine) municipalities. According to Ross (2003), the region has a tropical climate. An attempt was made to cover the river's geographical area in its maximum extension and in the most uniform way possible, covering materials in both plankton and periphyton. Periphyton and phytoplankton materials were sampled in the most

uniform coverage possible and the materials represent the same with respect to planktonic and peripheral habitats in environments lentic, semi-lentic and lotic. Four random samplings were carried out on the following days 8/26/2017, 10/28/2017, 12/3/2017 and 3/31/2018, capsizing the flask sideways in the water column at the desired depth, careful not to lose material with the entry of air or dragging the plankton net with a 20 µm diameter mesh made of nylon fabric, with the help of a rope, an integral part of the plankton net, in the horizontal directions at superficial layer of the water column, about 30 cm deep and vertical along the water column, in order to sample the phytoplankton at the most varied levels. This collection method basically consists of passing the net successively at different levels of the water column in order to allow water to flow through the tissue and fill the bottle attached to the net. The collections took place in bright and poorly lit areas close to wooded regions, preferably close to the margin, where floating aquatic plants (totally or partially submerged), leaves and other debris dispersed in the water commonly occur. Environments with these characteristics are considered phytoplankton and periphyton concentrators.

All samples, without exception, were stored in polypropylene flasks and then stored in the refrigerator until the material was analyzed in the microscopy laboratory at UNIP - Universidade Paulista. The information on the geographic provision of the material (as complete as possible), including the date of collection and the name of the collector, was recorded. For fixing the material, 4-5% formalin was used in polypropylene flasks, with identification of the place, date of collection and collector. 10 (ten) slides were analyzed per sample, until the presence of the material under study was exhausted. The fixation and preservation of the materials were provided immediately after collection, still in the field, with 3-5% aqueous formalin solution (40% commercial formaldehyde), in glass or plastic bottles. Immediate fixation prevents the rate of cell division from being accelerated due to adverse conditions (sample concentration), which can promote the appearance of anomalous phenotypes. The preparation of the slides for observation under the optical microscope followed the following routine: (1) one or two drops of the material of the homogenized sample were placed on a common microscope slide; (2) a drop of alcoholic lugol solution was added to that of the material to evidence the starch (pyrenoid); and (3) a coverslip was placed over the set of drops, taking care not to form a bubble. In some cases, a drop of methylene blue was also added to evidence mucilage and another, of pure glycerin, to densify the medium and, consequently, facilitate the specimens' rotation on themselves and observe them from other angles.

III. RESULTS

23 genera and 29 species were identified, listed below:

Actinocyclus curvirostrum Ehrenberg

Figure 9

Irregular, diffuse colonies; hyaline mucilage, indistinct; sparse, irregularly distributed, spherical cells (hemispherical after division); 1.8-2 (2.4) µm diam.

Aphanocapsa annulata McGregor

Figure 11

Irregular colonies, formed by spherical cells arranged throughout the mucilage; homogeneous mucilage; 2-4 µm diam.; bluish-green color; without aerotopes.

Aphanocapsa elachista West & G.S. West

Irregular, diffuse colonies; hyaline mucilage, indistinct; sparse, irregularly distributed, spherical cells (hemispherical after division), 1.8-2 (2.4) µm diam.

Aulacoseira distans (Ehrenberg) Simonsen

Figure 1

Cylindrical frustules in pleural view, forming straight, short chains, joined by short, inconspicuous connecting spines; presence of shallow groove and pseudogroove; mantle ornamented by delicate sanded streaks, arranged parallel to the perivalvar axis. In the valve view, the areolas are present on the entire surface of the valve. Perivalvar axis: 6.4-11.8 µm length; 4.8-5.6 µm diam.; stretch marks: 17-20 in 10 µm.

Aulacoseira brasiliensis Tremarin, Torgan et Ludwig

Figure 8

Cylindrical frustules that are generally solitary and can be joined by means of long separation spines with 4-7 µm length; forming straight, short filaments with up to three cells. Absent heterovalvarity. Valve face is fully ventilated. Valve mantle ornamented by straight streaks. Rounded areolas to ellipticals. Shallow 'U' shaped groove and deep 'V' shaped pseudo-furrow. Rimoportula inconspicuous; 8-24 µm diam.; 4-10 µm alt.; 10-16 streaks in 10 µm; 10-15 areolas in 10 µm. Height / diameter ratio: 0.20-0.88.

Coelastrum proboscideum Bohlin

Figure 12

Tetrahedral cenobes, formed by 4-8-16-32 cells; triangular cells in lateral view, external poles with thickening in the form of a crown, 3 processes joining cells to each other, quadratic intercellular spaces, 7.2-13.0 µm length; single, parietal chloroplast, 1 central pyrenoid.

Coscinodiscus asteromphalus Ehrenberg

Spherical cells; marine habitat; present at the mouth of the river with the sea; 90-200 µm diam.

Desmodesmus armatus (Chodat) Hegewald var. *armatus*

Figure 13

Flat cenobes, 2-4 cells arranged linearly; inner ellipsoid cells, outer ellipsoid to arcuate cells, 1027 µm long; 4-9 µm wide; cells often with frontal ribs and sometimes with warts; main spines in linear arrangement, 9-25 µm length.; single, parietal chloroplast, 1 pyrenoid.

Desmodesmus communis (Hegewald) Hegewald

Flat cenobes, 32.5-41.0 µm length; formed by 4 cells arranged linearly; oblong internal cells, with rounded poles, without ornamentation, 10.5-18.5 µm length.; 3.5-6.0 µm wide; trapezoidal outer cells, with slightly convex outer margin, 10-18 µm long; 3-7 µm wide; with a long spine at each pole, 10-17 µm long; smooth cell wall; single chloroplast, parietal, with 1 pyrenoid.

Desmodesmus perforatus (Lemmermann) Hegewald

Flat cenobes, with four cells arranged linearly; internal biconcave cells, external with internal concave and external convex face; 15-18 µm length; 5-6 µm wide; presence of microtubules and, sometimes, frontal ribs; main spines in linear arrangement, 910 µm length; single, parietal chloroplast, a pyrenoid.

Dictyosphaerium tetrachotomum Printz

Colonies formed by groups of 4 cells joined by mucilage threads, 60-110 µm wide; adult oblong-enlarged cells, mucilaginous threads inserted in the basal portion of the cell, 6-8 µm wide; 8-9 µm length; single chloroplast, poculiform, 1 pyrenoid.

Encyonopsis aequalis (Smith) Krammer

Figure 7

Fusiform shape, with ridges facing the center, has dilated ends.

Eucapsis densa Azevedo, Sant'Anna, Senna, Komárek & Komárková

Colonies with various cubic arrangements of cells; hyaline mucilage; spherical cells after hemispheric division; 2-6 µm diam.

Fragilaria capucina var. *vaucheriae* (Kützing) Lange-Bertalot

Figure 2

Lanceolated to linear-lanceolated valves; capitated, undercapped to rostrate extremities; axial area narrowly lanceolate to linear; approximately rectangular central area, with a slightly swollen margin on one side; parallel grooves, position interleaved in relation to the grooves on the opposite margin. Apical axis: 7-28 µm length; transapical axis: 2-5 µm length; 11-24 streaks in 10 µm.

Geitlerinema amphibium (C. Agardh ex Gomont) Anagnostidis

Straight trichomes, not constricted, not attenuated; translucent septa or not, with 1-2 granules, mobile; cells longer than wide or isodiametric; 1-3 µm diam.; 2-7 µm length; cylindrical apical cell with rounded apex.

Komvophoron schmidlei (Jaag) Anagnostidis & Komárek

Solitary trichomes, short, simple, constricted, without mucilaginous sheath, cells shorter than long. Cells 4-5 µm diam.; 2-4 µm length

Limnococcus limneticus (Lemmermann) Komárková

Colonies with 4-32 spherical cells irregularly distributed or in indistinct groups of 2-4; homogeneous, hyaline mucilage, usually distinct; spherical or hemispherical cells after division, 5-9 µm dia.; without aerotopes.

Mastogloia exigua Lewis

Figure 10

Stalk showing a little less rostrum; 27 µm length.; 12 µm wide.; 20 transapical streaks in every 10 µm.

Microcystis aeruginosa (Kützing) Kützing

Figure 14

Micro or macroscopic colonies, elongated, irregular or lobed (spherical when young), sometimes clattered; hyaline mucilage, indistinct, wide; spherical cells, 4.0-6.5 µm dia.; with aerotopes; dark green cell content.

Microcystis protocystis Crow

Microscopic colonies, with irregular distribution of cells in the mucilage; hyaline mucilage, diffluent, wide and with an irregular border; spherical cells, surrounded by an individual mucilaginous envelope, 4-6 µm diam.; with aerotopes; bluish-green cell content.

Oscillatoria perornata Skuja

Solitary trichomes or bundles, straight or wavy, distinctly constricted, attenuated to the apexes, finely granular, mobile; cells shorter than wide, 10-15 µm diam.; 2-5 µm length.; with aerotopes; rounded conical apical cell, without calyptra.

Pinnularia divergens var. *divergens* Smith

Figure 5

Linear-lanceolated valves, slightly wavy, sub-rostrate valve extremities, sternum of the linear raphe, narrow, rhomboid central area, laterally expanded, reaching the margins, forming fascia, ornamented with silicon thickening on each margin, filiform raphe, proximal extremities slightly dilated; bayonet-shaped end ends, honeycomb streaks, strongly radiated, converging to the ends, 45-95 µm length.; 8-16 µm wide; 11-13 honeycomb grooves at 10 µm.

Pinnularia subgibba Krammer var. *sublinearis*

Figure 6

Linear valves, rounded valve ends, sternum of the lanceolate raphe, wide, rhomboidal central area, laterally expanded, reaching the margins, forming fascia, filiform raphe, slightly lateral, proximal ends in the shape of small pores; hook-shaped terminal ends, honeycombed, radiated grooves, converging towards the ends, 65-81 µm length.; 9-11 µm wide; 10 honeycomb grooves in 10 µm.

Planktothrix agardhii (Gomont) Anagnostidis & Komárek

Solitary trichomes, straight, not constricted, gradually attenuated; isodiametric cells or shorter than broad cells; 4-5 µm diam.; 2-4 µm length.; with aerotopes; conical apical cell, usually with thickening or calyptra.

Pseudanabaena mucicola (Naumann & Huber-Pestalozzi) Schwabe

Trichomes alone or in small aggregates, straight, short; maximum 6 cells; constricted, not attenuated, non-granulated septa; isodiametric or cylindrical cells, 1-2 µm diam.; 2-4 µm length; cylindrical apical cell with rounded apex; homogeneous cellular content.

Snowella lacustris (Chodat) Komárek & Hindák

Spherical or elongated colonies; hyaline mucilage; cells joined by mucilage filaments, ovoids; 2-4 µm diam.; 2-4 µm length; without aerotopes.

Sphaerocavum brasiliense Azevedo & Sant'Anna

Hollow, elongated colonies; spherical when young; narrow, hyaline, indistinct mucilage; spherical cells, 2-4 µm diam.; with aerotopes.

Synechocystis aquatilis Sauvageau

Single or spherical cells, spherical, hyaline mucilage, 4-6 µm dia.

Woronichinia naegeliana (Unger) Elenkin

Rounded or elongated colonies, with cells radially arranged on their periphery; wide, hyaline mucilage; ovoid cells, 3-4 µm diam.; 5-7 µm length; with aerotopes. The submitting author is responsible for obtaining agreement of all coauthors and any consent required from sponsors before submitting a paper. It is the obligation of the authors to cite relevant prior work. Authors of rejected papers may revise and resubmit them to the journal again.

IV. DISCUSSION

Bearing in mind that this is the first bibliographical reference regarding the taxonomy of algae of the Mongaguá River, it is possible to observe the richness of the local biodiversity, indicating that the environment is not yet totally degraded, despite being used by vessels and agricultural practices in the area. along the course of the river, it is also noted, an urbanization process in the region downstream of the river, close to the sea. The locality of the Mongaguá River contributed to the ease of collection in the coastal region of the same, there was collection in the limnetic region of the river in shallow regions, since we do not have a vessel for sampling in the deeper regions. However, despite some difficulties, it appears that the number of species identified is considerable so far, with the possibility of this number increasing, until the end of this study.

APPENDIX



Figura 1-5. 1.*Aulacoseira distans*. 2.*Fragilaria capucina* var. *vaucheriae*. 3.*Gyrosigma* sp. 4.*Nitzschia* sp.
5.*Pinnularia divergens* var. *divergens*.

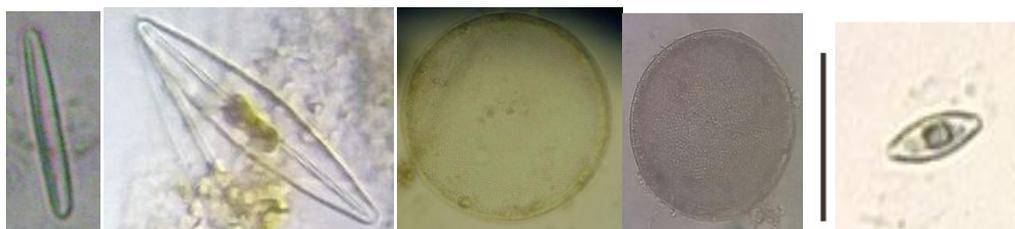


Fig. 6-10. 6.*Pinnularia subgibba* var. *sublinearis*. 7.*Encyonopsis aequalis*. 8.*Aulacoseira brasiliensis*.
9.*Actinocyclus curvirostrum*. 10.*Mastogloia exigua*.



Fig. 11-14. 11. *Aphanocapsa annulata*. 12. *Coelastrum proboscideum*. 13. *Desmodesmus armatus* var. *armatus*.
14. *Microcystis aeruginosa*.

Bar = 10 µm

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