

## BIODIVERSITY AND FUNCTIONING OF A SUBTROPICAL COASTAL ECOSYSTEM: A CONTRIBUTION TO AN INTEGRATED MANAGEMENT

Antônia Cecília Zacagnini Amaral

Institute of Biology / University of Campinas (UNICAMP)

Main researchers: Carmen Lucia Del Bianco Rossi Wongtschowski, Áurea Maria Ciotti, Yara Schaeffer Novelli and Alexander Turra

FAPESP Process 2011/50317-5 | Term: Mar 2012 to Sep 2017



*The study area was Araçá Bay, located in the São Sebastião Channel, Northern Coast of the State of São Paulo (23° 49'S, 45° 24'W). The area is part of the Marine Protected Area of the Northern Coast of São Paulo State and the Alcatrazes Municipal Protected Area*

The Biota-Araçá project aimed to understand the environmental, social and economic importance of a subtropical coastal ecosystem ([www.biota-araca.org/](http://www.biota-araca.org/); [www.facebook.com/baiadoaraca](https://www.facebook.com/baiadoaraca)). To achieve this goal, we characterized the ecosystem services provided by this environment in order to provide information that could be used in the development of proposals for the sustainability of the region. Araçá Bay, the study area of this project, is located on the North Coast of São Paulo (Brazil). The geographic and hydrographic characteristics (physical, chemical and geological parameters) of the bay, in addition to its high biodiversity, make this area a complex environment which can be used as a study model and information derived from here can be transposed to other regions.

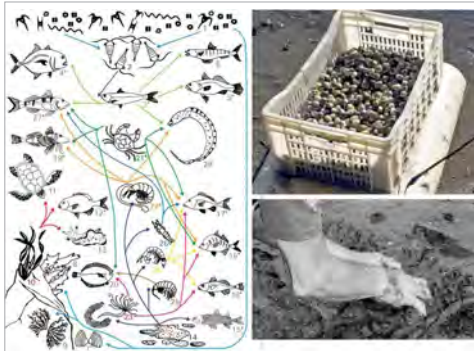
During the development of the project, data collection and analysis occurred simultaneously in the different habitats of the bay, which allowed us to investigate this region using an integrated approach. For this, the project was structured in research modules: 1- Planktonic System; 2- Nektonic System; 3- Benthic System; 4- Mangrove System; 5- Hydrodynamics; 6- Sediment Dynamics; 7- Trophic Interactions; 8- Fisheries Assessment; 9- Identification and Valuation of Ecosystem Services; 10- Integrated Management; 11- Ecological Modeling; and 12- Management and Data Sharing.

The Biota-Araçá project benefited from the integration of different areas of knowledge and a large number of researchers with different backgrounds and from different research institutions. This allowed us to better understand the current state of the area and its ecological, social, economic and political importance, thereby allowing a dialogue between science and decision makers. The project also provided training for a great number of young researchers, and helped improve the production of knowledge and the scientific competence of the State of São Paulo for studies on biodiversity, conservation and marine management.

## SUMMARY OF RESULTS TO DATE AND PERSPECTIVES

Araçá Bay is exposed to various impacts such as irregular constructions, sewage disposal and activities of the Port of São Sebastião and the Almirante Barroso Oil Terminal (TEBAR). The bay is therefore a reflection of the conflicts that affect several coastal regions in Brazil and worldwide.

The results obtained in the different research modules mapped the different habitats in Araçá Bay, and showed the composition and structure of their assemblages. Additionally, we managed to better understand the local trophic food web. Several works have been and are being produced about the biodiversity and functioning of the bay (more than 70 articles in indexed scientific journals have already been published). The results reveal Araçá Bay as an ecosystem of



*Trophic web of Araçá Bay. The arrows indicate the direction of the food flow. Species marked with an asterisk are used for human consumption (left). The clam *Anomalocardia brasiliiana* is abundant and largely consumed by the local population, accounting for 38% of the weight of capture fisheries Araçá Bay*

high species richness and diversity, with more than 1400 taxa identified. Among these, more than 300 were first recorded at the bay, and 50 are new species to science in addition to the description of new genera and a new family.

The elaboration of trophic web models showed that the main energy sources of the Araçá Bay food web are planktonic and sediment organic matter, and microphytobenthos. We attempt to predict impacts of the expansion of the Port of São Sebastião (an ongoing issue) and found that the shading expected by the expansion of the port would deeply reduce the total primary production (algae and mangrove) in the bay. This would result in a decrease of more than 70% of the total biomass in less than 20 years, impairing the sustainability of the food web and completely modifying the ecosystem.

The characterization of the ecosystem services offered by the environment allowed us to evaluate the socioeconomic importance of the bay in a local context. Finally, a better understanding of the social processes that permeate the region enabled us to elaborate management and conservation proposals that resulted in a "Local Plan for Sustainable Development of Araçá Bay", a work done together with the local community.

## MAIN PUBLICATIONS

Amaral ACZ, Turra A, Ciotti AM, Wongtschowski CLDBR, Schaeffer-Novelli Y. (Orgs.). 2016. Life in Araçá Bay: diversity and importance. 3ª edição. São Paulo, SP: Lume, 98p. (on-line and printed in portuguese). <http://www.bibliotecadigital.unicamp.br/document/?code=73819&opt=1>

Checon HH, Corte, GN, Silva CF, Schaeffer-Novelli Y, Amaral ACZ. 2017. Mangrove vegetation decreases density but does not affect species richness and trophic structure of intertidal polychaete assemblages. *Hydrobiologia*. **795(1)**: 169-179.

Corte GN, Coleman RA, Amaral ACZ. 2017. Environmental influence on population dynamics of the bivalve *Anomalocardia brasiliiana*. *Estuar. Coast. Shelf. Sci.* **187**: 241-248.

Dottori M, Siegle E, Castro BM. 2015. Hydrodynamics and water properties at the entrance of an intertidal flat: Araçá Bay, Brazil. *Ocean Dyn.* **65**:1731-1741.

Lamas RA, Rossi-Wongtschowski CLDB, Contente RF. 2016. Checklist of the fish fauna of the Araçá Bay, São Sebastião Channel, northern coast of São Paulo, Brazil. *Check List*. **12(6)**:2004.

Mancini PL, Matinata BS, Fischer LG. 2017. Aves da Baía do Araçá e arredores. 1ª Edição, São Paulo, 108p (printed).

Pardal-Souza AL, Dias GM, Jenkins SR, Ciotti AM, Christofoletti RA. 2016. Shading impacts by coastal infrastructure on biological communities from subtropical rocky shores. *J. Appl. Ecol.* **54(3)**:826-835.

Turra A, Santos CR, Peres CM, Seixas SC, Shinoda DC, Stori FT, Xavier LY, Andrade MM, Santana MFM, Rodrigues MV, Grilli NM, Jacobi PR, Sarafini TZ. (Orgs.) 2016. Plano Local de Desenvolvimento Sustentável da Baía do Araçá. 1ª Edição. São Paulo: Instituto Oceanográfico da Universidade de São Paulo, 69p.

Xavier LY, Stori FT, Turra A. 2016. Desvendando os oceanos: Um olhar sobre a Baía do Araçá. 1ª Edição. São Paulo: Instituto Oceanográfico, Universidade de São Paulo. 62p.

### ANTÔNIA CECÍLIA ZACAGNINI AMARAL

Instituto de Biologia  
Universidade Estadual de Campinas (UNICAMP)  
Departamento de Zoologia  
Monteiro Lobato, 255 – Cidade Universitária  
CEP 13083-862 – Campinas, SP – Brasil

+55-19-3521-6343  
ceamaral@unicamp.br