The CORAL Project in Guanabara Bay

For an Almost Forgotten Peripheral Community

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Received: _08 Aug 2024_/ Accepted: _20 Aug 2024_ / Published: _12 Oct 2024_.

Abstract: This article discusses some socioeconomic advantages of an environmental development project that goes by the acronym CORAL (Brazilian abbreviation for "Lacustrine Complex for Observation, Recreation and Administration"). The CORAL project features the potential recovery of peripheral fishing communities in Guanabara Bay. Better biological and coastal management of Guanabara Bay is required because this ecosystem has been degraded by untreated sewage and oil industries installed along its shores. The purpose of the CORAL project is to link its conceptual and architectural design to public policy that targets artisanal fishermen, who fear that their means of survival is increasingly threatened in an irreversible manner. The CORAL proposal arose due to the fact that there has been almost complete abandonment of this important littoral periphery, which is rarely mentioned or seriously considered in Rio's debates on social development.

Key words: Periphery, artisanal fishing, biological and coastal management, public policy.

Resumo: Este artigo apresenta o projeto de desenvolvimento social CORAL (Complexo de Observação, Recreação e Administração Lacustre) voltado à recuperação das comunidades pesqueiras periféricas da Baía de Guanabara e, simultaneamente, ao manejo biológico e costeiro desse corpo d'água degradado pelo esgoto sem tratamento e pelas indústrias petroleiras instaladas em suas margens. A ideia é vincular o conceito e o próprio projeto arquitetônico a uma política pública voltada aos pescadores artesanais, que veem seus meios de sobrevivência cada vez mais ameaçados de forma irreversível. A proposta surgiu em razão do abandono quase total da referida periferia, pouco mencionada nos debates cariocas sobre desenvolvimento social.

Palavras-chave: Periferia, pesca artesanal, gestão biológica e costeira, política pública.

1. Introduction

Artisanal fisheries are the basis of survival for many families in the littoral zone of Guanabara Bay (GB for short). One of the peripheral areas most in need of public attention within the limits of Grande Rio (name given to the urban transshipment region of the city of Rio de Janeiro, in full process of conurbation) is the deep shore of GB, forming part of the marine border line of Baixada Fluminense between latitudes 22º40'00" and 23º05'00" S, and longitudes 43º00'00" and 43º20'00" W. Home to multiple colonies of artisanal fishermen, this peripheral area is rarely discussed by the government. This state of affairs probably exists because this littoral ecosystem suffers from daily environmental aggressions by causative actors who no one is willing to confront with severe measures that feature curtailment or remedial actions [1]. The petroleum industry is responsible for the largest discharges of non-degradable fluid pollutants that mix with sea water, compromising fish populations and the general health of the GB ecosystem [2]. Additionally, floating waste, notably various types of plastic, infiltrate mangrove stands along the north-northeastern shore. This plastic pollution adversely impacts the habitat of several species that are, as a result, gradually becoming scarcer.

The GB is an extremely resilient biome [3]. Its 412 square kilometers receive water from more than 35 rivers; its ecosystem, despite degradation, still displays native vegetation species from the Atlantic Forest, marshy forests, swamps, and mangroves, with 242 identified bird species, 167 fish species, 34 reptile species and 32 mammal species [8]. Highlights of aquatic biodiversity include dolphins and sea turtles. It is hard to believe that all this environmental wealth has been so degraded by the lack of education and ethics, which over time have transformed the GB into a spatially huge unregulated aquatic civic dump. Recent initiatives to stem degradation of this littoral zone showed social solidarity and cohesion. Although some proposals were very welcome and guided by a nostalgic romanticism, they unfortunately proved to be insufficient or ineffective given the proportions of the disaster.

Without adequate public policies for environmental protection, fishermen from Barão do Irirí, Suruí, Barão de Mauá (Guia de Pacobaíba) and Piedade are forced to travel further and further with their rudimentary boats to support their families. It should be noted that artisanal fisheries have the potential to go beyond the simple reason for survival because increasing gastronomic tourism can be guided by historical cultural aspects of the region that are undoubtedly rich in natural beauty. At the same time, the recovery of the biome would establish the necessary conditions for the proposal of a cultural center like the Museu do Amanhã, definitively changing the local panorama of abandonment and degradation. This paper discusses the social development project CORAL (Brazilian abbreviation for "Lacustrine Complex for Observation, Recreation and Administration") as an architectural complex that combines the functions of a marine biology observatory, cultural space, and center for public environmental management. Facilities could be built near various locations that promote coastal research and monitoring of water quality. Such efforts would clearly signal to the government the significance of salient transgressions by the pernicious oil industry. CORAL is thus not a mere hypothetical or theoretical academic exercise because it marks the presence of public governance as an oversight institution for the protection and control of animal and human health. Also included within the purview of CORAL is monitoring the dynamics of schools of fish, dolphin families, and crustacean colonies.

2. Good-bye GB, and thanks for all the fish

The literature on GB is extensive [6, 7, 9, 10, 11, 12], with varied approaches to its rampant degradation over the last six decades. This degradation has critically affected artisanal fishing and the suitability of its shores for bathing. Because of sea water pollution, sea bass (*Mycteroperca spp*) and hake (*Merluccius hubbsi*) have all but disappeared. Since 26 July 2024, artisanal fisher folk have used a specifically designed media app that documents and reports the exact geographical co-ordinates of GB oil films, illegal waste water purges as well as the location of noxious floating macro-plastics. Presently, there are no official reports of Rio de Janeiro State "cocaine shark" catches within GB [4]. It is thus essential that near-shore GB planning and development is fervently matched with consideration of the use of aquatic habitats and as well as with migration corridors of resident marine species [5]. By way of one example, the City of Linhares leads the way in Brazil by passing a municipal law (in August 2024) that legally bestows "life' to its world-famous surfing waves while recognizing their intrinsic right to exist, their natural generation and non-anthropogenic restoration, along with cleanliness of ocean water comprising the incoming waves!

3. Potential architectural defacement of coastal landscape

Another city, Balneário Camboriú in Santa Catarina State (Figure 1), is contemplating the erection of the world's tallest residential tower. The Senna Tower supposedly symbolizes the heroic overcoming of human limitations via metaphor and the manifestation of individual character by featuring luxury accommodations for international elites. Its proposed width-to-height ratio, as shown in flattering drawings (Figure 1-a), makes the tower appear as a building best named "The Fishing Rod & Reel Building." A tower exceeding 500m in height, directly facing a body of tidal sea water, will surely have very complicated foundational issues. Two recent structures serve as examples of what might occur if such issues are not properly addressed. In New York City there is the 161 Maiden Lane building (also known as One Seaport, 1 Seaport, or Seaport Residences) and in San Francisco, California, sits the Millennium Tower (301 Mission Street). In addition, due to future climate changes, fluctuating sea levels and non-stationarity of local wind regimes will have important impacts on the reliability of the Senna Tower.

Figure 1 – A view of Balneário Camboriú (credits to CNN Brasil).

Figure 1-a - Artistic conceptualization of the proposed Senna Tower, a 500-m high building with a very thin width-to-height ratio, shown on the foreshore of Balneário Camboriú (Santa Catarina State). The buildings proposed location close to the seashore and constructed on unconsolidated sediments poses potential engineering problems for stability of this skyscraper. This architectural projection of the Senna Tower would theoretically provide citizens of Balneário Camboriú with a metaphorical sundial "time-piece" (copyright free Google image).

In marked contrast, the CORAL Project on the other hand could become a low-rise, inexpensive GB development that is sited entirely on sand, silt and clay sediments. This alternative CORAL Project would barely protrude above the sea water surface in the form of an inverted "coral" formation! Indeed, were its exterior painted in "coral" tones of orange, red and pink known in English since 1513 AD, it would brand the facility as well as be easily visible during foggy weather within the upper GB! Sylvia Lavin, in her 2011 text ***Kissing Architecture (POINT: Essays on Architecture)***, defined it as "…architecture in contact with incommensurable forms of time, movement and immateriality that coalesce to produce enveloping and therefore political effects". In so doing, she attempted to describe what she perceived as the ever-growing intimacy between architecture and just-dawning types of Art—namely multimedia installation on the outside surfaces of buildings. The Salomon Eye seafood restaurant, established in the Norwegian Hardangerfjord in AD 2024, mostly derives its cuisine ingredients from adjacent aquaculture installations. This real-life example provides our readers with a realistic appreciation of the potential of the CORAL Project. Sitting well out in the fjord with approximately the same kind of wave regimes as the CORAL Project's GB location, the Salmon Eye restaurant can only be reached by boat.

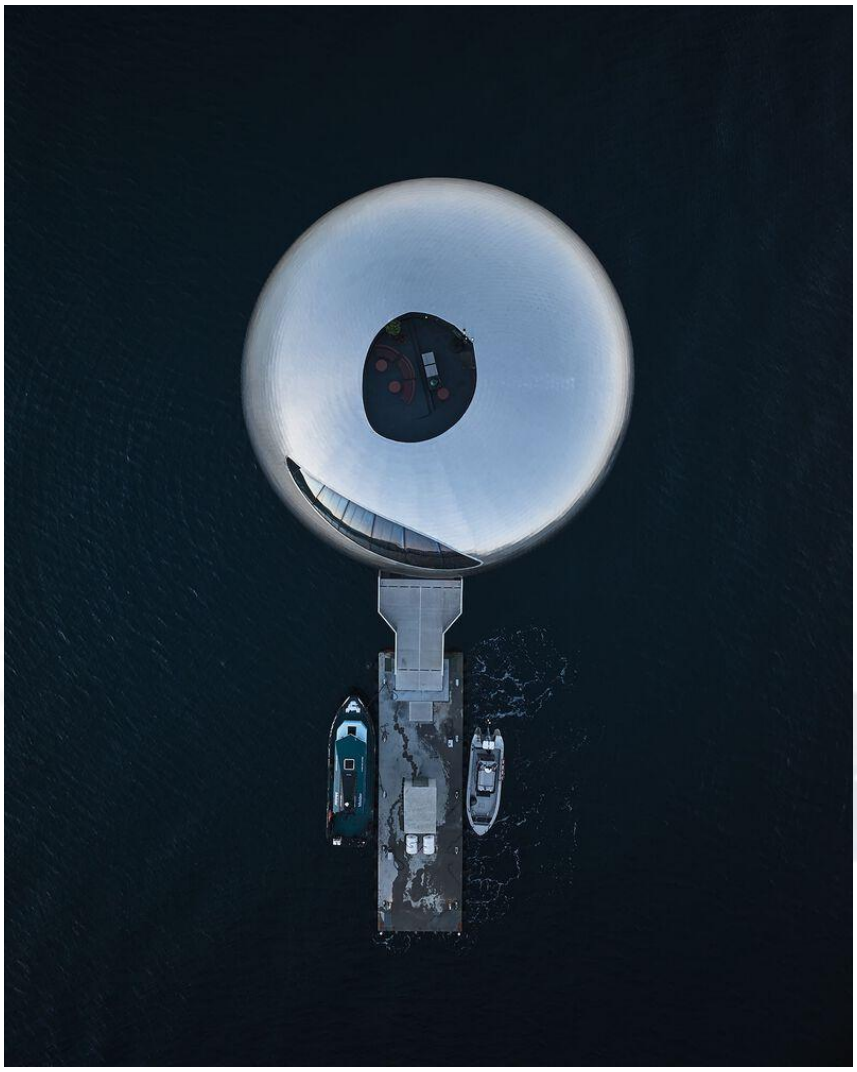


Figure 2. The Salomon Eye floating restaurant is located 'at sea' in a Norwegian fjord. The restaurant is symbolically housed inside an ellipsoid-shaped salmon eye structure. This floating art installation conceptualized by Eide Fjordbruk, is considered the world's first CarbonNeutral-certified salmon producer. Note the floating dock that provides access to the restaurant. As seen from above in planform, the shape of this floating restaurant is remindful of a school fire-alarm bell (copyright free Google image).

4. The CORAL project

CORAL, designed by Santoro & Serpa, was developed by Santoro as a proposal for occupying water surfaces (applicable to lakes, lagoons and bays). The general concept includes suggestions from Cathcart and Finkl, rich in geographic and oceanographic content. The architectural conception is compartmentalized into three main platforms: 1) Observation Platform, 2) Administration Platform, and 3) Recreation Platform. An optional fourth logistics support platform can be implemented if required. This architectural concept was inspired by the morphology of marine animals (*e.g.*, jellyfish and Portuguese man-of-war) with volumes arranged to suggest the fluidity of water, whilst in the robust manner typical of contemporary architecture, forming an

architecturally attractive and simple structural ensemble. The Observation Platform is intended for biological and coastal research in general, in addition to offering short courses and educational events for fishermen. The Administrative Platform promotes socioeconomic support in collaboration with public backing for fishing communities. Such efforts could provide financial incentives in accordance with the solidarity organization of the communities. Lastly, the Recreation Platform is aimed at fishermen's families, providing entertainment and recreational activities for children and teenagers. The entire complex would be accessible to the mainland by interconnected bridges, which are for pedestrians and bicycles only. Alternatively, some sections of the interlinkage could be accomplished by installation of pontoon-supported connections which might be shifted horizontally by towboat to allow the unobstructed passage of small-draft masted boats.

Each platform has a suggestive name (Medusa, Ofelia and Hydra) and is supported by a structural "star" whose tips are mixed concrete/steel pillars (Figures 3, 4 and 5).

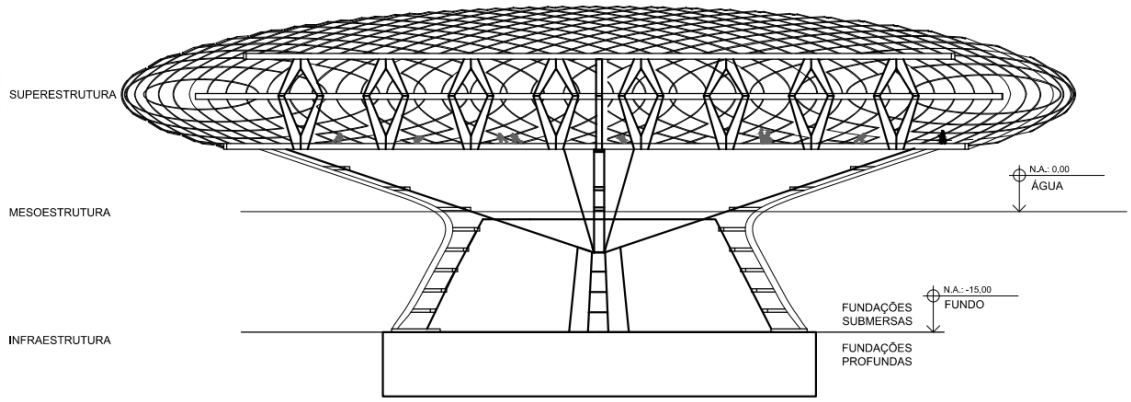


Figure 3 – The Hydra platform.

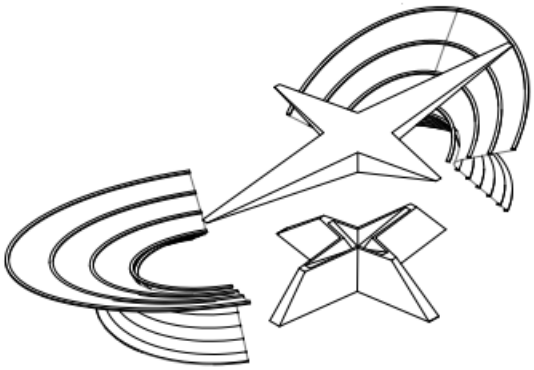


Figure 4 – The composed star-shaped pillar.

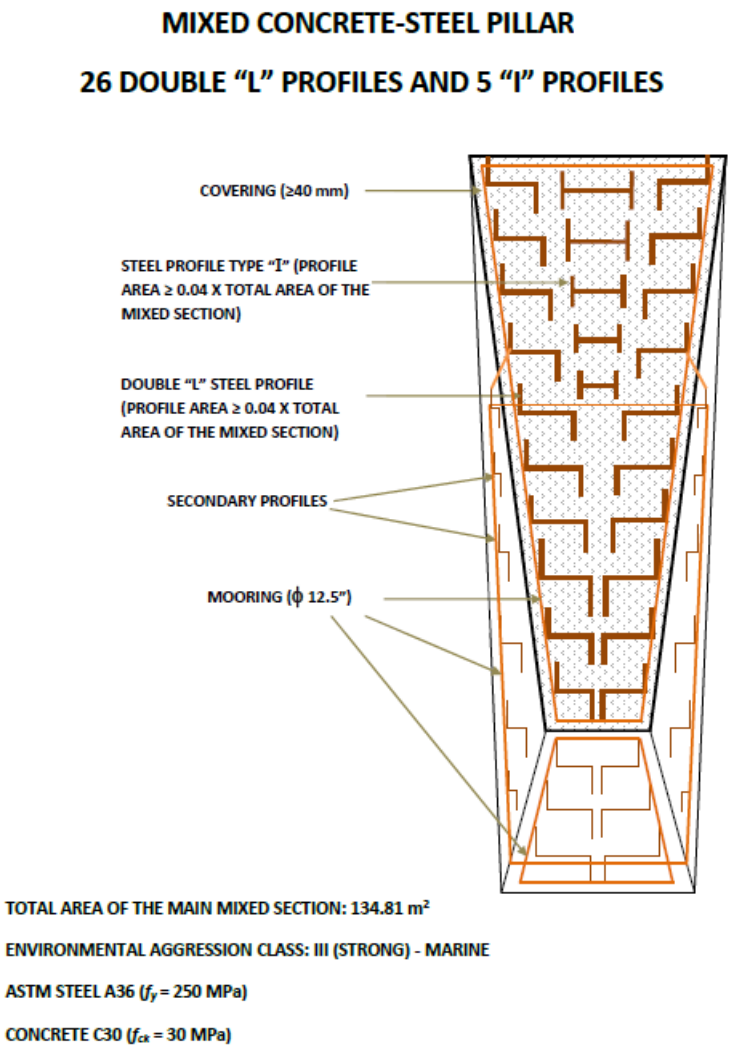


Figure 5 – The basic concrete-steel pillar designed by Serpa.

The platforms are placed over the water (Figures 6 and 7), with deep foundations topped by a large concrete block on which the star-shaped pillars are placed. The lattice structure of the platforms can be coated with Zeoform, a composite made from water and cellulose, suitable for many applications depending on the source material, being sustainable and compostable [15].

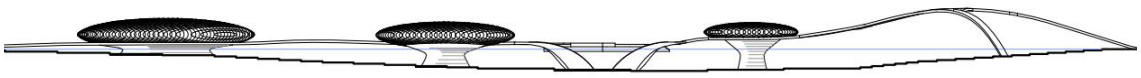
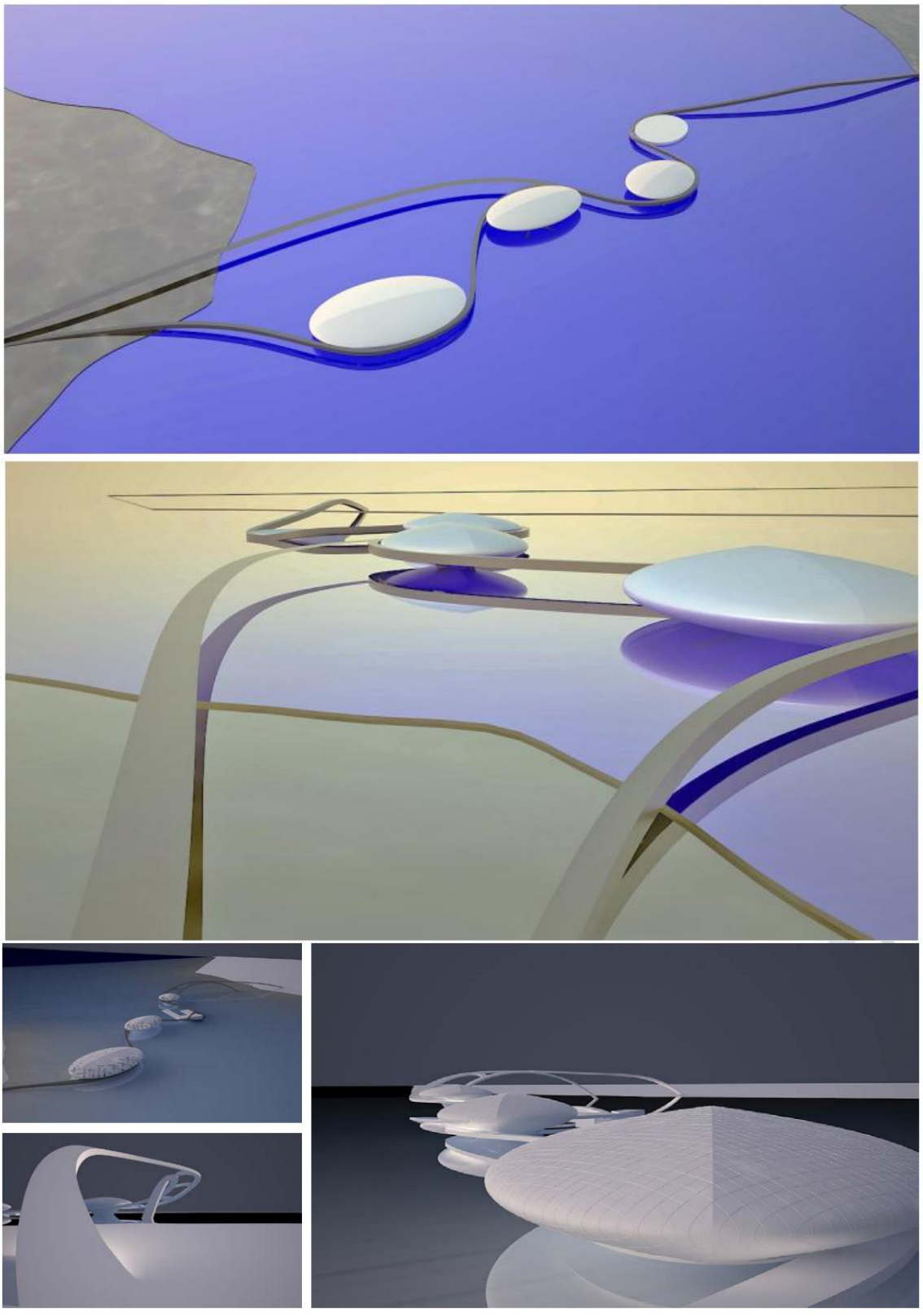


Figure 6 – A side view of the complex.



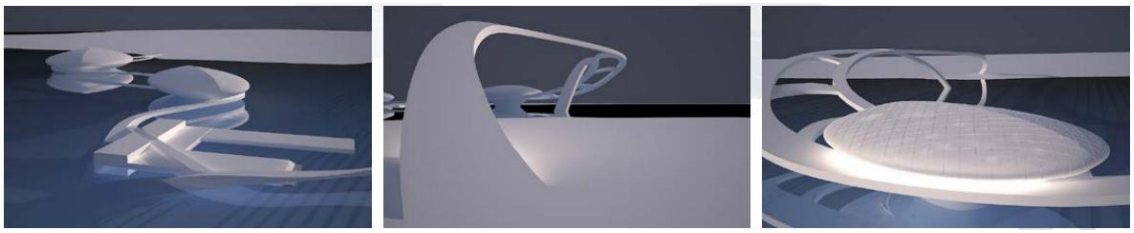


Figure 7 – Several perspectives of the complex. While dream-like visually, these could represent water-hugging fog.

The platforms were designed to withstand the aggressive environment, as well as the radical effects of climate changes [13]. The suggested locale for implementation of the complex includes the neighborhoods of Barão do Irirí, Suruí and Piedade (Figures 8 and 9). This location has the most beautiful landscapes in GB. Peak radiation fog occurrences are 5-7 A.M. local time. Afternoon foggy conditions almost never happen. In effect, a peekaboo architecture could exist.

Figure 8 – Ideal generalized shallow-water area for the CORAL project facilities, as marked by the red circle southwest of Paquetá Island (credits to http://www.rio-turismo.com/mapas/litoral.htm). As one of the most sequestered sub-bays of GB, this area is naturally sheltered from storm surge impacts.

Figure 9 – Possible sheltered vicinity (terrestrial and aquatic) for CORAL facilities demarcated in red. Potential locations of platforms (*cf*. Figures 3, 6, and 7) are shown white-colored formations.

5. The economics of CORAL

CORAL's social proposal in its broadest sense includes Gravatá's ideas about offering conceptual and material means to support improvements in the quality of housing at fishing communities. Such ideas result from discussions about the very fact that the eradication of poverty is the result of a long process of gradual improvement in people's living conditions, involving basic education, sanitation, correct disposal of waste, quality of built space and environmental conservation.

Poverty is a product of existing institutions and policies, not a creation of the poor. As self-evident as this observation may be, it was necessary to appear on the economics scene a man like Muhammad Yunus [14] to make it the basic premise of his own creation, the microcredit, which is now practiced everywhere. Microcredit, after the advent of Grameencredit (credit from the Grameen Bank), carries with it the principle that the poor have underutilized or even unknown skills. Keeping this basement in mind, the CORAL project, in its administrative and social functions, should promote credit as one of the fundamental human rights, helping fishing families to support themselves, and at the same time, increasing women's participation through special incentives for activities associated with fishing. This role should be exercised not through direct conventional banking, but by an official public representation designated to manage the municipality's resources allocated to microcredit exclusively via CORAL.

The microcredit provided by CORAL includes a commitment to invest the funds granted in fishing equipment, boat restoration, small home improvements, and culinary implements for the sale of typical dishes. Larger infrastructures such as piers and sheds for boat maintenance may be funded directly by CORAL outside of the microcredit lines, on account of investments in the operational sustainability of activities related to artisanal fishing. In particular, regarding amelioration of housing conditions as a fundamental topic, support for small repairs of fishermen's homes includes a

practical course with a manual on construction restoration and maintenance techniques, organized specifically for typical houses of peripheral communities.

6. Conclusions

The CORAL (Lacustrine Complex for Observation, Recreation and Administration) project is an environmental improvement proposal that focuses on potential recovery of artisanal fishing communities in GB that have been degraded by untreated sewage and oil industries extent in the littoral zone. It is proposed that better biological and coastal management of GB can be achieved through improved education and community involvement. Installation of these procedures is required because this coastal-marine ecosystem has been degraded to the point that part of GB have been turned into cesspools containing petrochemical waste products as well as plastic debris. The restoration of this habitat, which is an extremely resilient biome, is without precedent in Brazil but there are successful examples of supporting infrastructure commercialization as seen in some Norwegian fjords. The novel concept proposed here includes the construction of platforms that have pods placed on the water surface but which are stabilized with deep seabed foundations that are topped by large concrete blocks. Multiple platforms would be accessible to the mainland by interconnected bridges or pontoon-supported connections that could be shifted horizontally by towboat to allow the unobstructed passage of small-draft masted boats.

CORAL is, above all, a social inclusion project, bringing a new perspective on life to the artisanal fishery communities on the interior coast of GB. The soft and imposing architectural proposal symbolizes not only the appreciation of local culture, but also opens up the consolidation of the feeling of belonging and full citizenship, an essential factor for including the periphery in the agenda of public power. Avoiding real estate speculation and the consequent gentrification of the urban landscape, CORAL is a milestone in environmental surveillance, supporting and being supported by a serious protective public policy aimed at disseminating and establishing the understanding that preserving the environment also means combating poverty and ensuring people's dignity.

References

[1] Buchan, P.M. et al. (2024) “A Transdisciplinary co-conceptualisation of marine identity” *People and Nature*, 1-25. DOI: 10.1002/pan3.10715.

[2] Guerra, W. de S.D. (2019) “Petrochemical Complex of Rio de Janeiro/Brazil: a contemporary resistance in Guanabara Bay” *Sociedade & Natureza* 31: 1-18.

[3] Barreto, C.F. et al. (2024) “Transport and distribution of fluvial pollen in the northern portion of Guanabara Bay, southeastern Brazil: A paleoenvironmental tool” *Quaternary International* 693: 49-59.

[4] Araujo, G. de F. et al. (2024) “’Cocaine Shark”: First report on cocaine and benzoylecgonine detection in sharks” *Science of the Total Environment* 948: 174798.

[5] Lear, K.O. et al. (2023) “Effects of coastal development on sawfish movements and the need for marine animal crossing solutions” *Conservation Biology* 38: e14263.

[6] Serpa, N. and Cathcart, R.B. (March 2019) “Guanabara Bay: Proposals for a Territory of Exclusion Born from Paradise — Part I, The Present-Day Mess” Revista Brasiliense de Engenharia e Fisica Aplicada 4: 1-11. SEE: Serpa, N. and Cathcart, R.B. (December 2019) “Proposals for a Territory of Exclusion Born from Paradise — Part II, For a Macro-Engineering Covenant” Revista Brasiliense de Engenharia e Fisica Aplicada 4: 19-27.

[7] Serpa, N. and Cathcart, R.B. (March 2021) “The devil on a dying bay: Brazilian marine plasticarianism at Guanabara Bay” Revista Brasiliense de Engenharia e Fisica Aplicada, suplemento - fevereiro: 1-25.

[8] CEDAE Socioambiental (2024) “Baía de Guanabara”. Available at https://cedae.com.br/baiadeguanabara. Accessed Aug 16 2024.

[9] Fistarol, G.O. et al. (2015) “Environmental and sanitary conditions of Guanabara Bay, Rio de Janeiro”, Frontiers in Microbiology 6: 1-17.

[10] Soares-Gomes, A. et al. (2016) “An environmental overview of Guanabara Bay, Rio de Janeiro” Regional Studies in Marine Science 8: 319-330.

[11] Fries, A.S. et al. (2019) “Guanabara Bay ecosystem health report card: Science, management, and governance implications” Regional Studies in Marine Science 25: 1-17.

[12] Olivatto, G.P. et al. (February 2018) “Microplastic contamination in surface waters at Guanabara Bay, Rio de Janeiro, Brazil” Marine Pollution Bulletin 139: 157-162.

[13] Valdez, B. et al. (2010) “Effect of climate change on durability of engineering materials in hydraulic infrastructure: an overview” Corrosion Engineering Science and Technology 45: 34.6.

[14] Yunus, M. (2008). *Um mundo sem pobreza: A empresa social e o futuro do capitalismo*,1ª Edição. Ática.

[15] ZEOFORM (2024) “So strong, so light, so eco”. Available at https://zeoform.com/ . Accessed Aug 16 2024.