

## II - ARTIGOS TÉCNICOS

### THE CREATION OF A SHIPWRECK PARK OFF THE COAST OF PERNAMBUCO, BRAZIL

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**Abstract** - Sinking solid structures in marine environment to create artificial reefs has been developed in several countries of the world aiming to recovery impacted areas in coastal zone, increase subaquatic tourism, fisheries enhancement and develop scientific researches. This short paper intend to describe the sinking proceedings of three vessels, off the coast of Pernambuco, and creation of a shipwrecks park with the purpose to increase diving activities in the State and to develop scientific researches.

**Key words:** shipwreck, artificial reefs, coastal management, continental shelf.

### CRIAÇÃO DE PARQUES DE NAUFRÁGIOS NA COSTA DE PERNAMBUCO, BRAZIL

**Resumo** - O afundamento de estruturas sólidas em ambiente marinho para criação de recifes artificiais vem sendo desenvolvido em vários países do mundo objetivando recuperar áreas costeiras impactadas, incrementar o turismo subaquático, aumentar pescarias e desenvolver pesquisas científicas. O objetivo desta nota científica é descrever os procedimentos de afundamento de três embarcações na costa de Pernambuco e criação de um parque de naufrágios com a finalidade de incentivar as atividades de mergulho no Estado e desenvolver pesquisas científicas.

**Palavras-chave:** naufrágio, recifes artificiais, gerenciamento costeiro, plataforma continental.

## INTRODUCTION

The sinking of decommissioned ships to create artificial reefs is becoming increasingly common worldwide (Seaman & Seaman, 2000). In Pernambuco, a State located in northeast Brazil, the first ship intentionally sunk to create an artificial reef was a tug boat, in 1998. Since then, five more vessels found the same destiny, aiming mainly at the creation of new diving spots. Within a few months in the sea floor, sunken vessels become coated with a variety of marine organisms, from barnacles to algae, attracting small fish, which, in turn, lure larger predators (Grossman *et al.*, 1997; Bohnsack *et al.*, 1997; Claudet & Pelletier, 2004). The rich marine life associated to those shipwrecks, as well as their beautiful and mysterious aura which have inspired human imagination for centuries, make them a perfect place for diving. Already being the Brazilian coastal state with the largest number of shipwrecks, with calm, warm and transparent waters almost all year round, the sinking of these ships has helped to strengthen even more Pernambuco's natural vocation for diving and ecotourism.

In this context, the State Association of Dive Companies, together with the two federal universities located in Pernambuco State, Universidade Federal Rural de Pernambuco and Universidade Federal de Pernambuco, decided to lead a project to sink 3 decommissioned tug boats, named Taurus, Saveiros and Mercurius, under controlled conditions, for both commercial, as well as scientific purposes. Before sinking, the 3 vessels underwent a thorough preparation, which strictly followed the guidelines contained in Brazilian Navy rule NORMAM-07 (DIRETORIA DE PORTOS E COSTAS, 1998), as well as those compiled by Gulf States Marine Fisheries Commission, of the United States of America (USFWS, 1997). The main objective was to create an opportunity to study the process of colonization of these structures since the very beginning, helping, at the same time, to foster the tourism industry in Pernambuco State, by creating new and exciting diving alternatives.

The research project was conceived in a multidisciplinary way, in order to cover the different facets of the marine environment, including its physical (currents), chemical (hydrology), geological (morphology and sediments), and biological (colonization and succession of periphyton and ichthyofauna) aspects. The scientific staff, composed by sete Ph.D., seis M.Sc., and quatro graduate students, belonging to both universities aforementioned, included biologists, fishing engineers, oceanographers, environmental managers, as well as divers.

In order to get authorization to sink the ships, from federal and state environmental authorities, respectively, IBAMA- Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Brazilian Institute for the Environment and Renewable Natural Resources)

and CPRH- Agência Estadual de Meio Ambiente e Recursos Hídricos (State Agency for the Environment and Water Resources), as well as from the Brazilian Navy, a so-called Simplified Environmental Study – SES was prepared, in conformity to the federal rules 001/86 and 237/97, of CONAMA-Conselho Nacional do Meio Ambiente (National Council for the Environment). Besides including a thorough evaluation of the sinking sites, the SES also devised the mitigation measures needed to minimize the possible environmental impacts resulting from the project. On the other hand, the SES also estimated the potential benefits, not only socio-economic but also environmental.

The SES was based on abiotic and biotic data, obtained through water and sediment samples, as well as from photograph records, collected from the sinking sites. The exact spots, about 12Km offshore, between the isobaths of 20 and 30m, were chosen upon consideration of several factors, including: distance to natural reefs (the largest possible); maritime traffic (the least possible); proximity of Recife Port (in order to facilitate touristic usage); etc.

All the 3 vessels were sunk in front of Recife on May 3<sup>rd</sup>, 2006, with a broad press coverage. Two of them, namely Saveiros and Mercurius, had exactly the same size (29.1m) and shape, whilst the third one, named Taurus, was a bit smaller, measuring 24.35m. Saveiros and Mercurius were placed at the same depth, within a 800m distance from each other, one of them being open to sport diving and the other one being closed to it. This strategy was pursued in order to allow an estimation of the impact of diver's presence on the colonization process, in general, but particularly on the occurrence of large predators near to structures (Figure 1; Table 1).

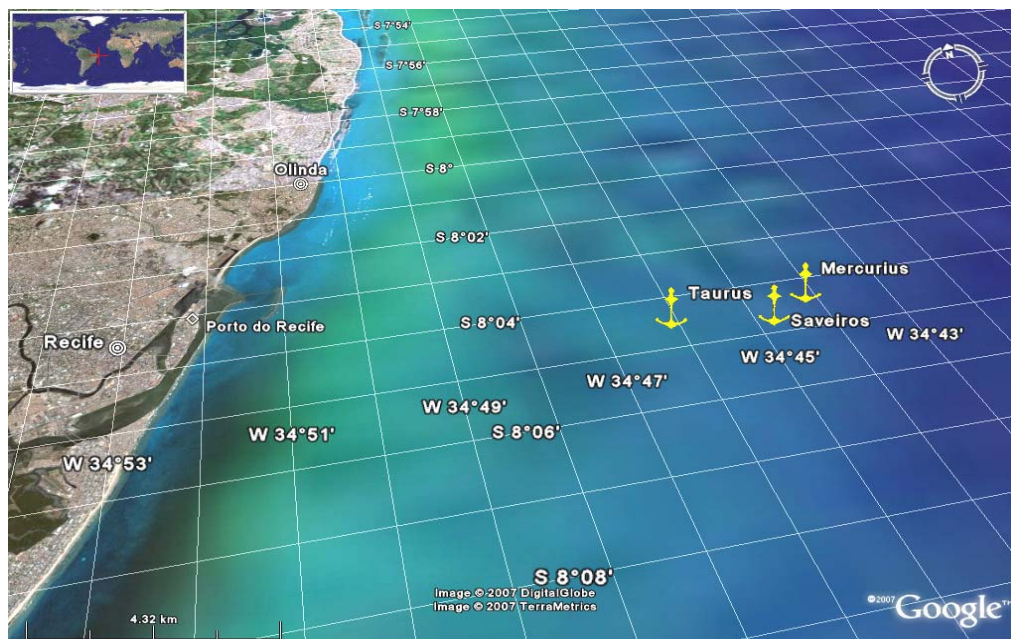


Figure 1 - Illustrative map of the Pernambuco coast with the shipwrecks locations.

Table 1 - Description of the three vessels geographical location.

Shipwreck	Taurus	Saveiros	Mercurius
Geographical coordinates	8°04'193"S 34°45'196"W	8°03'800"S 34°44'000"W	8°04'200"S 34°45'200"W
Depth	24m	30m	30m
Distance from the Coast	6,74 miles	7,93 miles	8,04 miles

For the proceeding of towing from port to the sinking site, the ships were tied together, stern to bow, in line, 30 m away from each other (Figures 2 and 3). By the time the last-of-the-row vessel reached its resting place, it was disconnected from the others and immediately anchored, to make sure it would not drift away from the originally planned position. After that, all bottom valves were entirely open to let it sink, a process that took about 15 minutes. The sinking of the three vessel took, in all, six hours, without any noteworthy incident (Figure 4). Immediately after the vessels had sunken, the exact geographical position was recorded by a GPS, and a diving team was sent to make photographic and audiovisual record of the shipwreck site. All the 3 vessels, after sunk, stood in a straight position on the sea floor, standing on their keels.

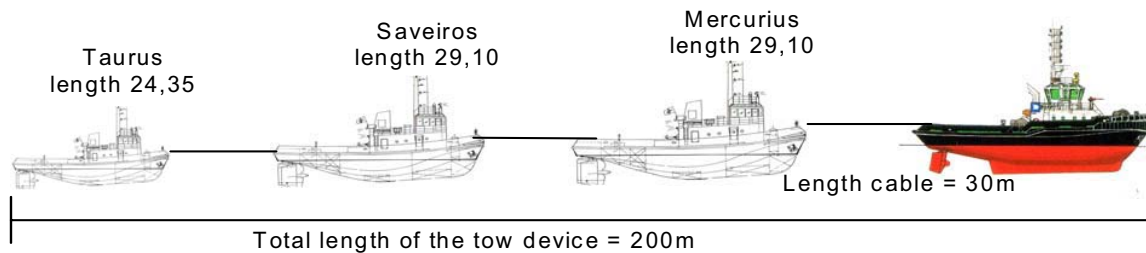


Figure 2 - Sketch of the vessels transport procedure.



Figure 3 - The three vessels been towing to their sinking sites.



Figure 4 - Detail of the concrete ballast used to anchor the vessels in their sink point.

There is a heated, ongoing, debate whether artificial reefs can serve as a useful tool to enhance productivity of coastal marine ecosystems (Seaman & Seaman, 2000; Alencar *et al.*, 2003) or if they merely act as fish aggregating devices, therefore aggravating the fishing effort on already overfished commercially important fish stocks (Bohnsack, 1989; Polovina, 1991; Munro & Balgo, 1995). In the case of Pernambuco State, however, due to a legal particularity which prohibits commercial fishing around shipwrecks (Law number 23.394/2001), either be it natural or intentional, such a debate is, to a large extent, settled, turning only to the actual capacity of official authorities to duly enforce such prohibition.

#### CONCLUSIVE COMMENTS

In this context, it is noteworthy that the FAO code of conduct for responsible fisheries, in its Article 8.11.1, clearly requests States to develop policies for increasing stock populations and enhancing fishing opportunities through the use of artificial structures, placed with due regard to the safety of navigation, on or above the seabed or at the surface (FAO, 1995). Likewise, IBAMA recently published Normative Instruction 125, of October 18<sup>th</sup>, 2006 (IBAMA, 2006), establishing new procedures for the creation of artificial reefs in Brazilian Coast. The presently existing legal framework, therefore, both domestically and internationally, should provide a sound guidance for the implementation and development of artificial reefs initiatives in Brazil. The expectation of the present research project, therefore, is to generate data, under a holistic approach, that might increase the present knowledge on the biological and oceanographic

aspects of the use of decommissioned ships as artificial reefs, including its environmental and socioeconomic impacts as well as benefits, in order to help the construction of an increasingly adequate public policy on this regard.

#### ACKNOWLEDGEMENTS

We would like to thanks IBAMA, CPRH, Navy of Brazil, Captaincy of Ports, Pernambuco' Marine Firemen Corp. and Wilson Son's Marine Agency for the supports.

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