



# Environmental Characterisation and Macro-benthic Communities of the Northern Adriatic “Paguro” Wreck



Massimo Ponti, Alessandro Capra, Giovanni Gabbianelli & Victor Ugo Ceccherelli

Corso di Laurea in Scienze Ambientali, University of Bologna, Via Tombesi Dall'Ova 55, 48100 Ravenna, Italy



Wreck location on the sedimentological map of the Northern Adriatic Sea (Brambati et al., 1988). From the coast: littoral sand, pelitic sand, very sandy pelite, sandy pelite, pelite.

The area covered by the present research is that of the AGIP “Paguro” drilling platform wreck. The platform sank 12 miles offshore from Ravenna (Adriatic Sea) on September 29, 1965 owing to the eruption of underground methane gas. The wreck currently lies on a 24-m deep pelitic soft bottom.

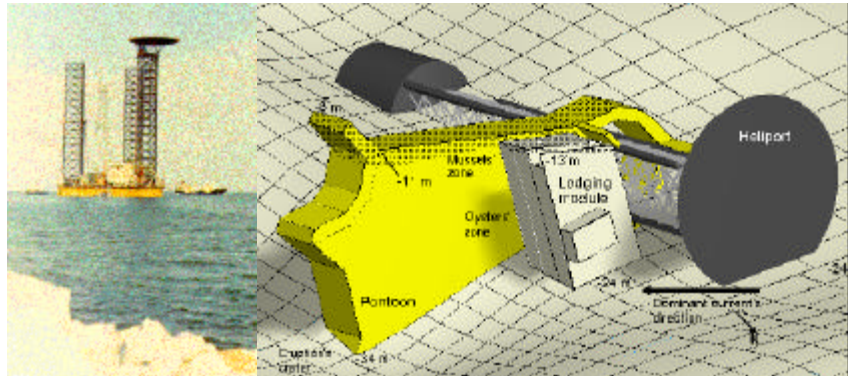
The wreck provides refuges and burrows which afford protection to the reproducing organisms, to the juvenile forms of many species, and to Crustacea during moulting. It also constitutes an ideal environment for the spawning of Cephalopoda and Gastropoda. These reefs represent an attraction centre for esteemed fish (tertiary consumer), thanks to the protection and abundant nourishment afforded by them, and moreover become an important tourist attraction.

The survey permitted the graphical reconstruction of the wreck. Gas eruption has created a crater about 10 metres in depth so that the metallic structures raise up to a height of 8 to 34 metres below the surface. The three-dimensional model of the wreck was then entered, according to its actual position, in a digital cartography obtained by the geographical information system (GIS), on the basis of which it was possible to highlight the interactions between communities and environment and to follow their development over time.

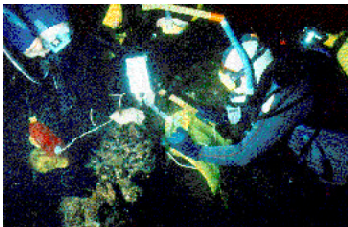
Amongst the more important environmental parameters taken into consideration are the meteorological ones (wind, current, wave) and chemical and physical ones such as temperature, dissolved oxygen, salinity, pH, etc.. All these parameters were closely monitored over time.

Direct samples were taken on areas of standard size in order to study the benthic communities on the basis of preliminary visual and photographic evidence.

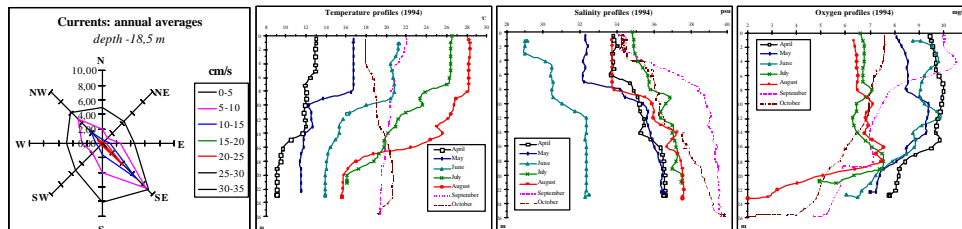
Moreover, vertical photographic transects were made. These transects permitted to extend the information derived from the samples to a wider area and to identify the transitions from one community to another along the vertical gradients.



(a) Old picture of drilling platform (1963). (b) Graphic three-dimensional reconstruction of the wreck obtained with a computer using CAD software integrated in a Geographical Information System. The highest biodiversity is observed in more exposed walls to the current of the lodging module.



Sampling method.



Currents direction and intensity.

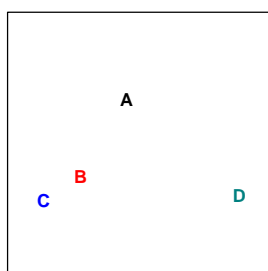
Seasonal evolution of temperature, salinity and oxygen along the water column near the wreck (Spring - Autumn 1994).

Analysis of the samples yielded interesting information, revealing in fact an unusual situation, not wholly falling within the parameters of traditional bionomic classifications. In fact organisms typical of infralittoral and circalittoral hard bottoms were here found to be associated with other organisms which normally populate various types of soft substrata. A possible explanation is that these organisms on the wreck may be able to exploit the organic and inorganic debris of the microhabitat which accumulate in crevices of the wreck structure and among the shells of mussels, found between -8 m and -12 m, and those of oysters, encountered between -12 m and the bottom.

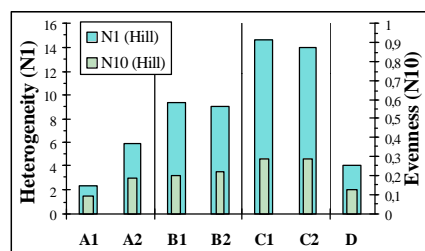
Typical organisms found in the samples include the common brittle star *Ophiothrix fragilis*, the polychaetes which are characteristic of detrital environments (*Harmathoe spinifera*, *Marphysa sanguinea*, *Polydora ciliata*, *Nereis succinea*, etc.) and of hard bottoms (*Syllis hyalina*, *Serpula vermicularis*, *Pomatoceros triquetus*, etc.), the decapods (*Alpheus* sp., *Pisidia longimana*, *Pilumnus hirtellus*, etc.), the isopod *Janira* sp. and the amphipods *Corophium sextone* and *Microdeutopus similis*. As it was to be expected, numerous bivalve species, amongst which the prevalent ones included *Mytilus galloprovincialis* and *Crassostrea gigas*, barnacles (*Balanus trigonus*), sponges, anthozoa (in particular *Epizoanthus arenaceus*) and sipunculida, were also found.



Photo by "Associazione Paguro"



Non-metric MDS plot for macrobenthos in 4 sampling site: A) underside of the pontoon, SE exposure; B) lodging module with NE exposure; C) lodging module with NW exposure; D) helipoint, NW exposure. (Bray-Curtis similarity index, ranked, stress <0.01)



Heterogeneity (N1) and evenness component (N10) in 4 sampling site at 2 different depth: 1) -16 / -25 m; 2) -13 / -16 m (D only deep zone).

All data were processed by non-parametric multivariate analysis. One of the most interesting aspects which emerged from statistical analyses is the interpretation of community distribution as a function of the different environmental variables considered. Amongst these variables, the most significant ones were found to be oxygen and salinity, which vary with depth, and exposure to dominant currents. Amongst the hypotheses formulated, there is the possibility for the mobile organisms such as echinoderms and crustaceans to avoid the risk of anoxia which may occasionally occur near the bottom, even in this area which is so far from the coast, by migrating along the structures. The “Paguro” wreck can therefore be considered an interesting example of

an artificial reef characterised by a high biodiversity and by a complex community distribution pattern. By furnishing a considerable surface area for the colonisation of sessile organisms, the wreck's structures permit an increase and diversification of algae and animal biomass production. Given the importance of this environment, the Italian Government has recently set up a biological reserve in this area, where all fishing activities are strictly prohibited. Local authorities have subsequently issued regulations governing access to the reserve for recreational and scientific purposes.