

# ENVIRONMENTAL RISK ASSESSMENT OF WASTED CATALYSER FROM EUROARGO VENEZIA SHIP INCIDENT: A MULTIDISCIPLINARY APPROACH

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## Abstract

After the lost at sea of 198 barrels of spent catalyst from RO-RO ferry "Eurocarga Venezia", an assessment of possible environmental impact was performed. A multidisciplinary approach including bioassays, laboratory bioaccumulation tests, investigations on benthic communities and bioaccumulation analyses on organisms from the accident area were performed. Results revealed high toxicity and bioaccumulation of the catalyst, but the absence of toxic substances in organisms from the impacted area.

*Keywords: Bio-accumulation, Deep sea sediments, Ecotoxicology, Metals, Ligurian Sea*

## Introduction

On the 17th December 2011, crossing the route Catania-Genoa, the RO-RO ferry "Eurocarga Venezia" lost at sea, near the Isle of Gorgona (Tyrrhenian Sea), 198 barrels of spent catalyst rich in trace metals, especially nickel, vanadium and molybdenum oxides. The catalyst is a residue of desulfurization process in the crude oil refining and when in contact with sea water, it can release chemicals harmful to the ecosystem. After the accident, a technical advisory group developed a multidisciplinary monitoring plan to assess possible environmental impacts.

## Materials and methods

We evaluated the toxicity of the spent catalyst and investigated the bioaccumulation of metals in the area of the barrel release. In particular elutriate obtained from barrel contents were tested with the unicellular alga *Phaeodactylum tricorutum* and the sea urchin *Paracentrotus lividus* [1]. Furthermore laboratory bioaccumulation test with polychaete *Hediste diversicolor* was performed [2]. Investigations on benthic communities were also performed, identifying the crustacean *C. macandreae* as a target species for bioaccumulation analysis of critical metals for its feeding habits (i.e., deposit-feeder) and its abundance in the survey sites. After that bioaccumulation analysis were performed on the burrowing crustacean *Calocaris macandreae*, collected during 9 surveys in the area of the accident and in two control areas.

## Results and discussion

Bioassays showed that elutriates obtained from spent catalyst is extremely toxic until a dilution of more than 1000:1. In particular *P. tricorutum* showed an EC50 (5.95%) and an EC20 (1.82%), while *P. lividus* EC50 values obtained in the fertilization test ranged from 5.01% to 16.09%, whereas for the embryo development ranged from 9.07% to 0.71%.

Laboratory bioaccumulation test with *H. diversicolor* showed that metals contained in the spent catalyst and released in the sediment, may concentrate in the tissues of marine organisms and therefore can be potentially transferred within the local food web. In particular Ni and Mo shows higher values than V, more than 40 times greater with respect to controls.

The analyses of benthic communities revealed the presence of 67 taxa, with significant differences between areas but not related with the incident. Also bioaccumulation levels on *C. macandreae* were not significantly different between impacted and control areas. Only results from one survey showed that Ni and V values were significantly greater in one of the two control areas, while Mo generally present lower concentrations than other metals, with no differences between areas.

## Conclusions

In conclusion, barrels contained a very toxic material, potentially affecting marine organisms, especially in the area where catalyst was dispersed. Considering results obtained for *C. macandreae*, we hypothesize that sea

water column may remarkably dilute toxic substances, avoiding their bioaccumulation in benthic organisms and in turn along the food web.

## References

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