

ENVIRONMENT EFFECTS OF MARITIME ACTIVITIES

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Review

The Mediterranean Sea was formed about 10 million years ago following the collision of the African and Eurasian landmasses which contracted the ancient "Thetys Sea" into a landlocked basin. Severe evaporation, desiccation and extinction of its Indo-Pacific species occurred about 6 million years ago. A million years later, the Gibraltar re-opened and introduced seawater and new life forms from Atlantic into Mediterranean basin. Finally, the Gibraltar Sill was elevated about 1 million years ago to yield the restricted circulation patterns of the present day Mediterranean.

Over the last 20,000 years, the Mediterranean has been the cradle for a sequence of civilizations, science, commerce and conflict. The Mediterranean has been the artery for spread of culture, trade, navigation, and in recent years has also been exploited for fisheries, tourism, industrial wastes and urbanization.

The coastal Mediterranean zone is under increasing demographic, industrial and environmental pressures that risk the economic investment and living resources of its coastal nations. We are therefore faced with the challenge of developing a strategy of sustainable exploitation for the whole Mediterranean Sea, and this requires a new strategic partnership between marine scientists, managers and decision makers from all the Mediterranean countries.

Compared to the Atlantic ocean, the Mediterranean is relatively unproductive and fragile ecosystem, and acts as long term trap for man's wastes. Currently the coastal environment is accumulating increasing levels of sewage products, heavy metals, agrochemicals and industrial pollutants. The UNEP has estimated that each year the Mediterranean receives 120,000 tons of mineral oil, 60,000 tons of detergents, 100 tons of

mercury, 3800 tons of phosphates as a result of human activity on land.

Much of Southern Europe's oil, manufacturing and mineral industries are strategically located along the Mediterranean coast for access to the global trade and shipping routes, and for discharge of their wastes. Up to one million tons of crude oil is discharged annually from accidental spills and supertankers, which then pollutes, kills marine biota and ends up as tar balls on beaches. The harbors lack the facilities to collect waste oil or clean tanks. In addition, waste quantities of ballast water are discharged into the Mediterranean coastal waters bringing nonindigenous species and changing its typical fauna and flora. It has been reported that in last 20 years only in European waters more than 23 new species were introduced.

Despite circulation, dispersion and deep mixing, many environmental contaminants including organic micropollutants, toxic metals and pathogens have been shown to accumulate in coastal sediments.

The environmental capacity of the Mediterranean Sea is being put under extreme pressure.

Our task, within the framework of IMAM, is to help Mediterranean and to show the best possible ways to prevent and avoid additional load of wastes through maritime activities.

For this, Seventh Congress of IMAM 11 authors tried to contribute to this task. Two papers are dealing with the problem of exhausting gases, one with increased safety and decreased emissions of dangerous gas component, three with oil-spill problem, one with the problem of ballast water, two with the environmental problems of strictly coastal ecosystems, one with the problem of human impact on changes of newly constructed harbour installations, and one with the problem of ship's crew under the stress conditions.

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During combustion, oil diesel engines exhaust a number of pollutant compounds. Among them one of the most serious regarding the air quality is a group of nitrogen oxides. These pollutants are under the strict control of international authorities and any paper contributing decrease of the NO_x in exhausting gases of diesel engines is welcome. Having anticipated this, development and mapping of diesel engine emission characteristics started at Wartsila Diesel International Ltd., Vaasa, Finland some ten years ago. G. HELLEN from this company contributes to the task with his paper: Controlling NO_x emissions in ships. Authors will elaborate principal achievements of the contribution, but it is to emphasize that proposed technology could achieve better standards than EPA strict regulations asks for.

Three authors from ITU, Maritime Faculty, Istanbul, Turkey, I. K. RODOPMAN, G. BILICAN and S. YUCEKAYA also contribute to the problem of pollution decrease from exhaust gases. Their "*Rodop-cankaya*" process on ships could substantially solve present problems, especially if 20,000 DWT or above tankers start to experiment the system. Some of initial experimentation problem (requirement of special space, adjustment and inter-connection of a various parts of the system, etc.) could be a challenge because of a noted benefit of the proposal. Authors themselves, would explain the main outputs of the paper much better than I can do.

The low-speed diesel engines are nowadays in wide use. The pollution problems they generate could probably be solved by introduction of redundant medium-speed engine based on propulsion machinery. Redundancy will drastically reduce the changes for oil spills due to the lost propulsion, while proposed NO_x emission techniques that are better applicable to medium-speed engines than to lowspeed one will reduce pollution from exhaust gases. This is suggested by I. AHLQUIST from Wartsila Diesel International Ltd., Vaasa, Finland. Author will give us short comments on his main achievement in the paper: Less Environmental Hazards by Increased Safety and decreased Emissions.

Oil spill at sea causes many environmental changes in coastal ecosystems. The Adriatic Sea, being closed bay of the Mediterranean could a tragedy in the case of the larger oil spill, especially in the case of tanker's wreck. R. ABDULAJ and B. TEREK from Brodarski institut, Zagreb, Croatia warn us and propose an oil spill response decision diagram for the Adriatic Sea. Authors would stress principal facts and solutions they proposed in the article: Oil Spill at Sea and response Methods.

Same authors (R. ABDULAJ and B. TEREK from Brodarski institut, Zagreb, Croatia) are trying to contribute to the knowledge on usage of different oil spill booms. They analyze its functioning and propose performance of test for maximum performances of desir-

able booms. It will be good to hear their opinion on how to practically approach the purchase of oil spill boom.

The review paper "Maritime Pollution Caused by Accidents of Oil Tankers" written by S. MENDIOLA, J.J. ACHUTEGUI, A. TRUEBA, F.J. SANCHEZ and A. DIAZ from Department of Sciences and Techniques of Navigation and Shipbuilding, University of Cantabria, Spain analyze and comment the world-wide known case of "Torrey Canon" accident from 1967. Although authors presented a nice summary of the accident itself, and the efforts to minimize catastrophic consequences, it is a question on the value of the article for general knowledge about decrease of environmental impacts caused by maritime activities. (I REMEMBER THAT A TIME AGO CASE OF "TORREY CANYON" WAS COMPREHENSIVELY ANALYZED, AND IN PARTICULAR I HAVE SEEN FIRST RESULTS OF IMPACT OF CRUDE OIL SPILL ON ZOOPLANKTON. NO HARM BUT ZOOPLANKTON VERY QUICKLY TRANSFER DISPERSED OIL DROPLETS INTO THE BOTTOM LAYERS OF THE SEA, EVEN UP TO 8% OF ENTIRE SPILL!)

Three authors coming from various scientific fields, A. BENOVIĆ (Oceanography and Fishers), J. LOVRIĆ (Maritime activities - Shipbuilding) and N. RUŽINSKI (Technology of waste water treatment) joined their knowledge to review the world problem of transport of nonindigenous species. The present state of sea environments, especially changes of coastal ecosystems came recently into the focus of modern investigation. Being multidisciplinary problem and prospected to changes in the ship functions, ballast water problem should have international attention. Presenting the paper "Ballast" waters: problems and perspectives" authors from Dubrovnik and Zagreb, Croatia highlighted the problem and gave short comment on needs for future research. It is an open question if theirs taught about the treatment of ballast water on board ships is the properly chosen solution.

The importance of coastal ecosystems for a health of entire seas was many times stressed during the last decades in the world scientific literature. R. ŽUGAJ, from Elektroprojekt Consulting Engineers Ltd., Hydrology Section, Zagreb, Croatia describes one of the most important coastal ecosystems in the Adriatic Sea. The hydrological conditions, the influence of fresh water and the mixing with the sea water in the Krka river mouth and surrounding Šibenik harbor is very specific. The naturally established balance and the high values of entire area are analyzed. Environmentally sound conclusion highlights the threat of a possible construction of the hydroelectric power plant for entire ecosystem.

The Penang Harbor, historically one of the oldest and largest port in Western Peninsular Malaysia is heavily loaded with all-kinds of wastes. P. M. SIVAL-

INGAM and S. V. CHARLES, from School of Biological Sciences, University of Sciences Malaysia, Penang, analyzes the "Environmental Stress of Penang Harbor". A very comprehensive paper demonstrates all complexity of the Penang Harbor, and contribute to the general knowledge of the ecosystem functioning. Nevertheless that paper gives a valuable contribution to the general knowledge of that part of our common sea, and author's, suggestion for a possible solution of these severe pollution problems, there is a question on impact of maritime activities and their real contribution to the general problem.

Technical and technological projects could in many cases help to avoid a threat to some valuable coastal ecosystems. Of course, this could be applied only in very restricted areas, and only in the cases that the price of project would be profitable for the usage of the ecosystem. V. ANDROČEC from the Brodarski institutu, Zagreb, Croatia contributes to this knowledge. His paper: "The Sea Quality of Closed Basins Maintained

by Forced Circulation" analyzes the small spaced basin cleansing by a large propeller device and by appropriate jet nozzle system. Nevertheless that results and conclusions suggest the high value of the proposal, it is still a question of usefulness of the system considering environmental changes caused by artificial construction of marinas and harbors.

Environment of the people working on board of the ship is the ship itself. How the merchant fleet crew involved in humanitarian aid missions in Dubrovnik coped with a threat and what was their psychosocial status in the exchanged environment is subject of the paper of L.J. MARIĆ. She analyzed handling difficult situations' strategies of people emerged in dangerous war encounters. The highly appreciated results should be taken into account for many similar circumstances in the world problems. Still stays a question if the application of these particular experiences could be widely used.



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