

PANEL REPORT BY THE MODERATOR

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During the introductory session, the Panel Moderator noted that at a similar CIESM Congress some 35 years earlier, the famed explorer Jacques Cousteau had drawn international attention to the health of the Mediterranean by stating his observations had led him to believe that the Mediterranean Sea was "dying" and in fact could be "dead" in a few decades if nothing was done to stop the problems of increasing pollution and over-fishing. Fortunately 35 years on, the Mediterranean Sea is far from dead but his comments did more to raise public awareness about the problems of protecting the marine environment and spur international actions to stem pollution in the Mediterranean than much of the sound scientific data being produced by scientists studying the problem at that time. Although over the ensuing years much effort has been put into assessing the degree and extent of chemical contamination in the Mediterranean Sea, an overall lack of baseline information still exists for a broad area of its eastern and southern coasts, as well as for new classes of chemical contaminants that are just now coming to light. It was therefore the task of this Panel to probe and analyze those two aspects in detail and finally debate and suggest approaches and mechanisms for better assessing the overall health of the Mediterranean Sea. To accomplish this the panelists, composed of scientists from both leading national and international institutions, gave seven presentations which dealt with measurement and monitoring of conventional and emerging chemical contaminants in the Mediterranean Sea as well as the ways and means to better integrate ongoing studies, and to build analytical capabilities and monitoring expertise in areas where they are lacking.

With respect to contaminants, a presentation by Francesco Regoli discussed the distribution and bioaccumulation of heavy metals in certain sentinel (bio-indicator) species that have been used to assess metal pollution in both industrialized and relatively clean areas of the Mediterranean. He highlighted the fact that mercury appears to be higher in certain Mediterranean species of top predator fish than in similar species from the Atlantic, and that while the reasons for this observation are far from clear, the increased concentrations might be due in part to the natural mercury anomaly that is present off the northwest coast of Italy. Moreover, his presentation stressed the utility of integrating chemical analyses with determining molecular, biochemical and cellular biomarkers in the species analyzed in order to assess biological effects in the different areas. In one example, using caged mussels placed beneath an offshore drilling platform in the Adriatic Sea, it was demonstrated that early warning signals of environmental stress could be readily detected through specific biomarker analysis. The source and origin of petroleum hydrocarbons along the west coast of Algeria was highlighted in the presentation by Sellali *et al.* These authors reported the presence of heavy oil contamination in sediments in this sector, most likely derived from the petrochemical complex in the Gulf of Arzew. The very high levels of PAHs noted near Oran were believed to originate from industrial and domestic wastes released from the city, whereas near the outflow of various oueds entering the sea, the hydrocarbons contained a land-based, pyrolytic signal. Their dataset represents one of the first reported for an area of the southern shore where data have consistently been lacking, and it clearly indicates a land-based rather than maritime shipping origin of the contamination.

As concerns emerging contaminants in the Mediterranean, the report of Héline Budzinski highlighted the need for basic information on the various classes of pharmaceutical substances that have been recently identified in seawater. Her studies have focused on developing analytical techniques for their quantitative measurement in seawater, in particular the use of semi-permeable membrane devices for carrying out integrative sampling. Using these techniques her group has found concentrations of a wide variety of pharmaceuticals in seawater collected off Marseille ranging from a few nanograms to several micrograms per liter, with most of the contamination residing in the dissolved phase.

In terms of strategies for undertaking integrated monitoring studies on contaminants, Hervé Thebault and Alessia Rodriguez y Beana presented results of the first phase of the CIESM Mussel Watch monitoring study of radionuclides using the Mediterranean mussel *Mytilus galloprovincialis*. Some 20 laboratories from 15 countries were involved in the study, and from that network a regional map for ^{137}Cs has been produced showing generally very low concentrations in mussels, *viz.* on the order of 1 Bq kg^{-1} or less. Somewhat higher levels were found in mussels from the Black Sea and northern Aegean Sea indicating residual concentrations from Chernobyl fallout. During Phase II the programme will be extended to cover the natural radionuclide ^{210}Po as well as include some emerging trace contaminants. In connection with the Mussel Watch monitoring approach, Mai Khanh Pham *et al.* reported that the quality of the data have been verified by ensuring that all laboratories involved participated in a Quality Assurance intercomparison exercise for radionuclides in mussels. The IAEA Marine Environment Laboratories produced a mussel reference material that was analyzed by all the participating laboratories. During the exercise various analytical problems in some laboratories came to light, and capacity building needs were thereby identified. Based on these results and those from nine additional laboratories located outside the region, information values for ^{137}Cs and several other radionuclides were determined. Further work is presently underway to certify this intercomparison material as an IAEA Reference Material.

Concerning regional programme activities, Michel Warnau presented a concrete proposal for linking and integrating on a basin-wide scale many of the similar monitoring programmes that are underway in the Mediterranean region. Difficulties in project implementation often arise owing to the participating countries having major industrial, agricultural, cultural and regulatory differences. Furthermore current programmes are supported by several different entities including national, regional, European, and international funding bodies, a fact which often leads to overlap in both scope and efforts. These programmes often run in parallel with little or no information exchange amongst them. The proposal aims to better integrate all these projects having similar objectives by coupling, reinforcing and equipping them in a similar fashion which would ultimately result in a synergistic effect thereby enhancing the overall output. Within this integrated effort, key international organizations with expertise in organizing training and capacity building would furnish similar support to all the programmes involved thus making the entire monitoring effort far more cost effective. Furthermore such an approach would lead to enhanced quality assurance of monitoring data since all parties' analytical techniques and methodologies would be unified through inter-comparison exercises of the various analyses. In support of such of obtaining such an integrated monitoring network, Oscar Acuña from the IAEA Technical Cooperation Department explained how IAEA could support such a proposal through its current and future technical cooperation programmes in the Mediterranean and West Asian regions. The overall goal would be to eventually enhance the level of expertise in trace contaminant measurements in participating groups from the southern and eastern rim, in order to bring it up to par with that available in the more developed Mediterranean regions.

Following these formal presentations, the panel was open to comments and discussion and the panelists were queried on a number of points raised by the participants. Regarding conventional contaminants such as metals and hydrocarbons, some participants felt that many contaminant data had already been gathered from a large portion of the Mediterranean and that perhaps it was time to synthesize what is now known before proceeding with more monitoring surveys. There was general agreement that much information had already been obtained through some 30 years of monitoring within MedPol and other programmes, but it was also acknowledged that the geographical distribution of those data was "patchy" at best, and that reliable data still lacked for large areas of the eastern and southern shores of the Mediterranean. It was in these areas that the group felt