United Nations Environment Programme

Distr.
RESTRICTED

UNEP/WG.103/1
23 January 1984

Original: ENGLISH

Workshop on Jelly-fish blooms in the Mediterranean

Athens, 31 October - 4 November 1983

Mediterranean Action Plan

Long-term programme for Pollution Monitoring and Research in the Mediterranean Sea (MED POL - PHASE II)

REPORT OF A WORKSHOP ON JELLY-FISH BLOOMS IN THE MEDITERRANEAN

Contents

Background

At the Third Meeting of the Contracting Parties held in Dubrovnik (28 February - 4 March, 1983), the problem of the occurrence of Jelly-fish blooms in some areas of the Mediterranean was raised, and a request to UNEP for action in the framework of the Long-term Programme for Pollution Monitoring and Research in the Mediterranean Sea (MED POL - PHASE II) was then formulated. A Seminar on Jelly-fish blooms organized by the Greek Government with UNEP support, helped to identify scientists from Mediterranean and other countries who had been particularly active in the field of jelly-fish biology, health research and jelly-fish combatting procedures. The Workshop on Jelly-fish blooms in the Mediterranean was organized by the MED UNIT in Athens from 31 October to 4 November 1983, as part of the MED POL - PHASE II activities, in co-operation with WHO and FAO. The following is the summary of the Workshop, the proceedings being under preparation.

Attendance

A call for papers was circulated by the MED UNIT to a large number of scientists in and outside the Mediterranean region. As a result, sixty-four experts from Mediterranean countries, the Federal Republic of Germany, Belgium and U.S.A. as well as representatives of FAO and WHO attended the Workshop (see Annex I). Twenty-seven papers were presented (see Annex II).

Opening

H.E. the Ministry of Physical Planning, Housing and the Environment, Mr. A. Tritsis and the Co-ordinator of the Mediterranean Action Plan, Mr. Aldo Manos opened the Workshop. The Meeting was also addressed by H.E. the Minister of Physical Planning of Yugoslavia, Mr. Kovacevic as President of the Bureau of the Contracting Parties to the Barcelona Convention for the Protection of the Mediterranean Sea.

Organization of the work

The Workshop was divided into six sessions and a moderator was appointed for each of them, as follows:

SESSION I a : Moderator : L. ROTTINI-SANDRINI
OCCURRENCE OF JELLY-FISH BLOOMS IN THE MEDITERRANEAN

SESSION I b : Moderator : H. MOLLER
IMPACT OF JELLY-FISH BLOOMS ON HUMAN ACTIVITIES

SESSION I c : Moderator : Z. MARETIC
IMPACT OF JELLY-FISH BLOOMS ON HUMAN HEALTH AND RECREATION

SESSION II a : Moderator : V. AXIAK
ASSESSMENT OF BIOLOGICAL CONDITIONS LEADING TO JELLY-FISH BLOOMS

SESSION II b : Moderator : J. GANOULIS
ASSESSMENT OF ENVIRONMENTAL CONDITIONS LEADING TO JELLY-FISH BLOOMS

SESSION III : Moderator : D.G. CARGO
METHODS TO CONTROL AND COMBAT BLOOMS OF JELLY-FISH

Each session was followed by a short discussion. At the end of the Workshop a round table discussion synthesized the major topics raised during the Workshop and adopted the conclusions and recommendations reported in the two following sections.

Conclusions

Blooms of medusae are not of recent origin in the Mediterranean, neither are they limited to this sea. In fact reports of blooms of jelly-fish date back as far as the early 19th century. Moreover they have been reported in several areas of the oceans.

Population fluctuations of medusae may very well be determined by seasonal rhythmic changes in the local environmental conditions, such as sea-water temperature.

Factors leading to the recent blooms of Pelagia noctiluca are not so easy to identify - mainly due to the apparent irregularity and complexity of the patterns of occurrences of such blooms. Another reason may be the lack of precise data on occurrences of past blooms and on the associated environmental parameters prevalent at the time of these blooms.

To explain this phenomenon, perhaps we should look at it at the global scale. Long-term global climatic fluctuations may lead to occasional changes in the dynamics of water masses which alter local environmental conditions, eventually increasing availability of food, or modifying the nature of foodwebs within the pelagic community, favouring an increase in the numbers of medusae. The possible role of environmental stress resulting from such uncommon conditions in inducing an increase in the fecundity of medusae was mentioned.

Present state of knowledge on the occurrence of this phenomenon in the various Mediterranean areas does not permit the establishment of a relationship with the levels of pollution in coastal areas, although it may be suspected.

Investigations under controlled laboratory conditions, including studies on the survival, predation, fecundity, feeding, and behaviour of the relevant species of medusae under different environmental conditions and studies on exposure to stresses such as pollutants, assist in answering at least some of the aforementioned questions.

The development of new lines of investigation - such as trace elements contents and lipid composition of medusae and of their usual predators and preys may clarify and perhaps quantify the foodwebs involved. Similar biochemical investigations on medusae from polluted and unpolluted zones may also shed new light on the question of correlation of blooms and pollution.

Severe impacts of jelly-fish blooms on human activities, were reported, mainly in relation to the hinderance of fishing by clogging nets and stinging fishermen, clogging of power plant intake system and indirect impact on fisheries by affecting fish stocks by predation. Most of this information comes from north-east Atlantic waters, probably due to a relatively large amount of activities in this area. Nevertheless, one report proved that similar problems also exist in some areas of the Mediterranean.

Studies on the epidemiology, clinics, prevention and treatment of stings made by Pelagia noctiluca show that an average case is not serious and represents more a nuisance than a health hazard.

However, one can say that Pelagia noctiluca can present a significant problem for human health and recreation due to its frequent, but unpredictable, occurrence in some areas during some periods of time, especially because of psychological reasons.

As is the case with other animal venoms, such as those from hymenopterae (bees and wasps), intoxication by Pelagia noctiluca stinging depends on the condition and sensitivity of the victim, as well as on that of the animal itself.

Severe cases have been encountered mostly when the most sensitive parts of the body, such as eyes are affected. Other serious cases may also appear when the victim suffers many stings at once, for instance, if falling into a swarm of medusae; sensitive victims may collapse though such cases are rare.

As concerns the environmental factors, which may bring about medusae blooms, we should distinguish on the one hand, the physical factors (currents, temperature, salinity), and on the other, the quality of the waters (waste waters, eutrophication).

Observations on the appearance of Pelagia noctiluca swarms have often shown a link between wind and the transport of these planktonic organisms. Therefore, sea currents due to winds or other causes appear to be responsible, mainly for the horizontal transport of medusae. The use of mathematical models for the transport of medusae by currents may give encouraging results.

Temperature seems to play an important role on the reproduction of Pelagia noctiluca by limiting its proliferation to the low winter temperatures.

No quantitative correlation between salinity and the concentration of Pelagia noctiluca has been reported. Further, many questions remain unanswered as to the relationship between water pollution and the growth of jelly-fish.

As to the methods to control or combat jelly-fish blooms, although it appears that practical and proved measures have not yet been successfully developed, a number of actions could be suggested in this direction.

The design of barriers (single or in combination) to protect sensitive industrial water usage locations, and aesthetically acceptable, efficient protection for swimming beaches against the intrusion of noxious jelly-fish could be developed by engineers in close collaboration with specialists in hydrodynamics, as well as biologists.

Further, it may be possible to develop means of reducing the numbers of medusae or their effects on man. These might include: habitat modification by the use of the behaviour of medusae to their own disadvantage, reduction of pollution levels which might be responsible for their proliferation, and establishment of models for predicting their occurrence on a seasonal or short-term local basis. This will require a wide range of biological, hydrographic and other studies.

Recommendations

After analysing the various aspects of jelly-fish blooming, its impact and means to control it, the following recommendations obtained the consensus of the participants:

1. A Mediterranean-wide programme for monitoring the occurrence of jelly-fish, especially Pelagia noctiluca should be established using the infrastructure of the Long-term Programme for Pollution Monitoring and Research in the Mediterranean (MED POL - PHASE II), both in coastal and open-sea areas.

   Such a programme should also determine environmental conditions relevant to the swarming of jelly-fish and pay special attention to space and time variability, as well as to medium and long-term trends at the regional level, and to the extent possible, the global level.

2. An assessment should be made of the actual social and economic impact of the occurrence of jelly-fish blooms on fishing and tourism around the Mediterranean.

3. Research should be conducted on a number of topics:

   - Biology of this organisms and population dynamics.

   - Ecology, physiology biochemistry and other, the study of which may assist in the understanding of the observed distributions.

   - Hydrodynamics of coastal and open-sea areas controlling the transport of jelly-fish swarms.

   - Influence of pollution on the biology and food availability of the jelly-fish.

   - Characterization of jelly-fish poisoning and preventive and curative treatments.

4. Preventive measures should be taken, such as health education, beach management, elaboration of numerical models, mostly hydrodynamical, covering specific areas, possibly contributing to the development of criteria for general coastal area management.

A N N E X I

LIST OF PAPERS

SESSION I a : OCCURRENCE OF JELLY-FISH BLOOMS IN THE MEDITERRANEAN

MODERATOR : L. ROTTINI-SANDRINI

AUTHORS	TITLE
A. Benovic	APPEARANCE OF JELLY-FISH Pelagia noctiluca IN THE ADRIATIC SEA DURING THE SUMMER SEASON OF 1983
N. Dowidar	MEDUSAE OF THE EGYPTIAN MEDITERRANEAN WATERS
S. Lakkis et R. Zeidane*	LES HYDROMEDUSES DANS LES EAUX NERITIQUES LIBANAISES : OBSERVATIONS FAUNISTIQUES ET ECOLOGIQUES
P. Bernard	NOTE SUR L'INVASION DE LA MEDUSE Pelagia noctiluca SUR LA RIVIERA FRANCAISE DURANT L'ETE 1982
F. Bingel*	ON THE OCCURRENCE OF JELLY-FISH IN THE EASTERN MEDITERRANEAN COAST OF TURKEY
G. Piccinetti Manfrin et C. Piccinetti	DISTRIBUTION DE Pelagia noctiluca EN MEDITERRANEE DANS L'ETE 1983

* Paper not presented

SESSION I b : IMPACT OF JELLY-FISH BLOOMS ON HUMAN ACTIVITIES

MODERATOR : H. MOLLER

AUTHORS	TITLE
L. Rottini-Sandrini, M. Avian, N. Franchi and A. Troian	DOMMAGE A LA PECHE EN CORRELATION A LA PRESENCE DE GRANDE QUANTITE DE MEDUSES
H. Möller	EFFECTS OF JELLY-FISH PREDATION ON FISHES

SESSION I c : IMPACT OF JELLY-FISH BLOOMS ON HUMAN HEALTH AND RECREATION

MODERATOR : Z. MARETIC

AUTHORS	TITLE
Th. C. Theoharides	MAST CELL SECRETION : BASIS FOR JELLY-FISH POISONING AND PROSPECTS FOR RELIEF
R. Della Loggia	NOUVELLES TECHNIQUES POUR LES ESSAIS DES ACTIVITES BIOLOGIQUES DANS L'IDENTIFICATION ET LA SEPARATION DES PRINCIPES DERMATOTOXIQUES DES MEDUSES
Z. Maretic	THE BLOOM OF JELLY-FISH Pelagia noctiluca ALONG THE COASTS OF PULA AND ISTRIA 1977-1983, WITH SPECIAL REFERENCE TO EPIDEMIOLOGY, CLINICS AND TREATMENT
A. Malej and A. Vukovic	SOME DATA ON THE OCCURRENCE AND BIOLOGY OF THE SCYPHOMEDUSA Pelagia noctiluca IN THE GULF OF TRIESTE, AND ITS IMPACT ON HUMAN ACTIVITIES
C. Scarpa	ON SKIN INJURIES PROVOKED BY COELENTERATA AND ECHINODERMATA
M. Aubert	PROLIFERATION DES MEDUSES ET RISQUES SANITAIRES

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MODERATOR : V. AXIAK

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V. Axiak	EFFECT OF DECREASING LIGHT INTENSITY ON THE UMBRELLA PULSATIONS OF Pelagia noctiluca (FORSKAL)
D. G. Cargo	SOME LABORATORY CULTURE METHODS FOR THE DIFFERENT LIFE STAGES OF SCYPHOZOAN JELLY-FISH
S. K. Mastronicolis and I. C. Nakhel	OCCURRENCE OF THE PHOSPHONOCOMPOUNDS IN THE MEDUSA Pelagia noctiluca AND THEIR POSSIBLE RELATION WITH THE BLOOMS OF JELLY-FISH
R. Vaissière	COMMENTAIRES SUR QUELQUES TRAVAUX RELATIFS A LA REPRODUCTION DES MEDUSES ACALEPHES
S. Tomic, J. Makjanic, I. Orlic and V. Valkovic	ANALYSIS OF TRACE ELEMENTS IN JELLY-FISH BY X-RAY FLUORESCENCE
T. Vucetic	SOME CAUSES OF THE BLOOMS AND UNUSUAL DISTRIBUTION OF THE JELLY-FISH Pelagia noctiluca IN THE MEDITERRANEAN (ADRIATIC)

SESSION II b : ASSESSMENT OF ENVIRONMENTAL CONDITIONS LEADING TO JELLY-FISH BLOOMS

MODERATOR : J. GANOULIS

AUTHORS	TITLE
J. Ganoulis	COASTAL TRANSPORT OF JELLY-FISH BLOOMS DUE TO THE WIND ACTION
F. Stravisi	OCEANOGRAPHICAL - METEOROLOGICAL PARAMETERS AND DRIFT OF PLANKTONIC ORGANISMS (prov.)
T. Legovic and A. Benovic	TRANSPORT OF Pelagia noctiluca SWARM IN THE ADRIATIC SEA
F.P. Wilkerson and R. C. Dugdale	POSSIBLE CONNECTIONS BETWEEN SEWAGE EFFLUENT, NITROGEN LEVELS AND JELLY-FISH BLOOMS

SESSION III METHODS TO CONTROL AND COMBAT BLOOMS OF JELLY-FISH

MODERATOR : D.G. CARGO

AUTHORS	TITLE
B. Verner	JELLY-FISH FLOATATION BY MEANS OF BUBBLE BARRIER TO PREVENT BLOCKAGE OF A COOLING WATER SUPPLY AND A PROPOSAL FOR A SEMIMECHANICAL BARRIER TO PROTECT BATHING BEACHES FROM JELLY-FISH
H. Möller	SOME SPECULATIONS ON POSSIBILITIES OF CONTROLLING JELLY-FISH SWARMS

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R E F E R E N C E S

UNEP 1983 — Monitoring of Swarming by Schyphomedusae

UNEP 1983 — Changes in the distribution of the population of Pelagia noctiluca in the Mediterranean (in preparation)