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Athens, 10 - 13 April 1984

Mediterranean action plan

Long-Term Programme on Pollution Monitoring and Research in the Mediterranean Sea (MED POL - PHASE II)

PROJECT ON JELLY-FISH IN THE MEDITERRANEAN SEA

(Report of a Consultation on a jelly-fish project in the Mediterranean Sea, Athens 6 - 7 February 1984)

C O N T E N T S

1. 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 was formulated to UNEP for action in the framework of MED POL - PHASE II.

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 - related aspects and jelly-fish combatting procedures.

A 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. Sixty-four scientists attended and twenty-seven papers were presented. Biological and environmental conditions related to the occurrence of jelly-fish swarms were analysed and their impact on human activities, mostly fisheries, human health and recreation, were reviewed and discussed.

As a result of the Workshop and after the matter was reviewed by the Second Meeting of the Working Group on Scientific and Technical Co-operation (UNEP/WG.91/12), a number of actions are being implemented (see document UNEP/WG.103/1):

- National Co-ordinators for MED POL were asked to initiate immediate action in the framework of national monitoring programmes, extending the monitoring activities to cover qualitative and quantitative observations of jelly-fish;

- Submission of research proposals in the framework of MED POL research activities has been encouraged through the agreed channels. The following topics were suggested:

  a) Factors affecting population dynamics of jelly-fish;

  b) Biology, ecology, physiology, biochemistry, etc., of jelly-fish for the understanding of the observed distribution;

  c) Hydrodynamics of coastal and open-sea areas controlling the transport of jelly-fish swarms; and,

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

- Development of a more comprehensive programme which will make full use of all ongoing related activities in the Mediterranean Basin.

The present document (to be considered an an operational document for the implementation of a Mediterranean Project) was prepared at a Consultation Meeting of Mediterranean scientists convened in Athens from 6 to 7 February 1984. Six experts were invited in close consultation with the MED POL National Co-ordinators of those countries where national activities related to jelly-fish were already ongoing (see list of participants as Annex I). Other National Co-ordinators expressed interest in the programme but informed that they had not initiated any related activity. During the course of the consultation, in addition to the preparation of the present document, the methodology related to the implementation of the project described in document "Monitoring of Swarming by Schyphomedusae", UNEP, 1983, was also taken into account and reviewed. The present operational document is submitted to the Extraordinary Meeting of the Contracting Parties for its consideration.

2. Objective of the project

The overall objective of the project is to assess the importance of jelly-fish blooms in the Mediterranean, their impact on human activities (fisheries, human health, recreation) and their causes with an aim to envisage means of combatting jelly-fish or reducing their effects on those activities.

Immediate objectives to be reached through the project activities are:

- to gather data and evaluate all possible information on the occurrence and biology of jelly-fish in the Mediterranean;
- to establish possible correlations between the occurrence of jelly-fish swarms and their biology and/or environmental conditions;
- to assess the impact on human health and activities, particularly tourism and fisheries;
- to study methods to predict, control or combat jelly-fish blooms as well as to prevent or to alleviate the effects of their poisoning on man.

3. Work programme

The following work programme is to be used as a guideline for the preparation of project proposals to be submitted (see section 4.) by national institutions, on the basis of ongoing national activities, in the framework of the present project.

3.1. Areas of investigation:

The project should start in selected areas of the Mediterranean where the appearance of jelly-fish has been of concern during the last years. In particular, the Adriatic, the Aegean, the Central Mediterranean have been initially selected as areas where intensive monitoring and research studies are being carried out.

It is however assumed that the whole Mediterranean will be covered with observations and research on the occurrence of jelly-fish in coastal and open waters to be carried out by institutions participating in the MED POL programme.

3.2. Observations and studies to be carried out

Intensive observations and research will be carried out in the selected areas. In particular:

- Occurrence of jelly-fish in swarms or as individuals detected in the areas selected should be monitored by all means available (fishermen, coastguards, ferry-boats, health inspectors, police, etc.) and reported to designated national institutions. Forms for data reporting should be prepared at national level, on the basis of those proposed in document "Monitoring of Swarming by Schyphomedusae", UNEP 1983. In connection with the collection of data and observations of swarms and individuals, any correlation to contingent environmental conditions should be carefully noted. Historical data should also be searched.

- Systematic sampling of phyto- zoo- and icthyoplankton should be carried out at stations in which swarms of jelly-fish have been reported. Areas likely to be breeding grounds or where hydrographic conditions may possibly originate jelly-fish swarms should also be considered. For these observations the methodology described in the paper "Monitoring of Swarming by Scyphomedusae", UNEP 1983, should be followed.

- Meteorological and hydrodynamic studies of the selected areas should be carried out whenever feasible, and, data already existing should be analysed. This work will be carried out in collaboration with IOC. In particular, local wind and surface currents should be measured frequently, (the use of floats and/or drift cards might be of great help).

- Possible correlations between swarming and physical, biological or other environmental conditions should be further studied: behavioural tests should be carried out in the laboratories and in the field, to further understand any correlation noted. In particular, jelly-fish feeding habits and reproductive cycle, vertical and horizontal migration patterns and influence of environmental conditions on the swarming processes should be studied. Other laboratory research, such as functional, morphological and histological studies should be promoted.

- Development of models including hydrodynamic and ecological processes in particular for those areas selected should be carried out. Harmonization between field work and model development should be kept in mind at all the stages of the project implementation.

- In co-operation with FAO, preliminary studies should be carried out by national institutions in order to assess and quantify the possible damages that the blooms may have on the Mediterranean fisheries (catching, quality of fish and stocks). The results of these studies will be transmitted to FAO/GFCM for further consideration.

- In co-operation with WHO, a health-related programme should be carried out in order to provide guidelines on curative treatment and preventions (beach management, informative leaflets, etc.). Research on the properties of the jelly-fish venom and its remedy should be promoted.

3.3. Collection and processing of data

Data obtained through the project should be submitted following agreed procedures to the MED UNIT after a preliminary screening of the data made by the research centres. Further processing, quality control and evaluation of the data will be made using the computer facilities of the MED UNIT in Athens in collaboration with the relevant Co-operating Agencies, as appropriate. Assessments of the results will be submitted by the MED UNIT to the Working Group on Scientific and Technical Co-operation at its regular meetings.

4. Participants in the Project

The project implementation will be based on detailed project proposals submitted by national institutions through their respective National Co-ordinators for MED POL. UNEP in collaboration with the relevant Co-operating agencies will evaluate the proposals and eventually make specific suggestions, in particular with regard to the harmonization of the various proposals. The project will initially start with the participation of the institutes which already have ongoing activities (see Annex II). It is understood that additional research centers may be designated to participate by the National Co-ordinators during the course of the project.

5. Co-ordination

The project will be under the over-all responsibility and co-ordination of UNEP through the MED UNIT in the framework of MED POL - PHASE II research activities. FAO and WHO will be technically responsible for the implementation of the activities related to fisheries and human health, respectively. Other Co-operating Agencies (IOC, UNESCO, WMO, IAEA) may also collaborate in the technical implementation of some aspects of the project, as appropriate.

6. Training needs and technical assistance

In order to harmonize the work performed in the various laboratories, a programme of exchange of scientific visits and on-job training of different duration will be agreed. Moreover, some laboratories, such as the CIMAM (Centro Internazionale Mediterraneo Ambiente - Meduse) at the Laboratorio di Biologia Marina (Consorzio Università di Trieste/Comune/Provincia), have already expressed the wish to provide training in various aspects of field and laboratory work in connection with biological, histological, biochemical, behavioural, and other, experiments on jelly-fish. The Greek Center for the Mediterranean documentation and for unusual ecological phenomena in Athens may also provide bibliographic and other support for the project. The purchase of some specific laboratory, sampling or other equipment is also foreseen, subject to availability of funds.

7. Timetable

The project is proposed to last for an initial period of two years. Extension of the project may be proposed to Contracting Parties on the basis of the results obtained at the end of the above period.

Consultation with National Co-ordinators	February 1984
Submission of project to Contracting Parties	April 1984
Submission of research proposals to MED UNIT	April 1984
Implementation of field and laboratory work	May 1984 - November 1985
Submission of data reports	July 1984 December 1984
Submission of mid-term reports	January 1985
Meeting of scientists to review the advancement of the work	February 1985
Submission of data reports	April 1985 July 1985 December 1985
Submission of final reports	January 1986
Meeting of scientists to evaluate the results of the project	February 1986
Submission of results to Contracting Parties Meeting	April 1986
Second Workshop of jelly-fish blooms in the Mediterranean and consultation meeting to recommend control measures	June 1986

8. Budgetary considerations

In addition to the national contributions, the following assistance requirements were identified for the implementation of the programme.

	MTF		
	1984	1985	1986
Equipment	55,000	25,000	-
Fellowships	20,000	25,000	10,000
Meetings	-	10,000	45,000
Other (shiptime, insurance, bibliographies, reports, information leaflets)	25,000	15,000	-
TOTAL	100,000	75,000	55,000

9. References

UNEP 1983	Monitoring of Swarming by Schyphomedusae
UNEP 1983	Changes in the distribution of the population of Pelagia noctiluca in the Mediterranean
UNEP 1983	Bibliography on Blooms of Jelly-fish and related organisms
UNEP/WG.103/1	Report of Workshop on Jelly-fish blooms in the Mediterranean
UNEP/WG.91/12	Report of the Second Meeting of the Working Group for Scientific and Technical Co-operation for MED POL

A N N E X I

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A N N E X II

PRESENT LEVEL OF ACTIVITIES RELATED TO JELLY-FISH IN THE MEDITERRANEAN SEA

This Annex was prepared by the experts participating at the Consultation Meeting on a jelly-fish programme in the Mediterranean Sea (Athens, 6 - 7 February 1984). It provides some information on the level of activities at present being carried out in Greece, Italy, Malta and Yugoslavia on the subject of jelly-fish and also outlines some future plans envisaged at national level.

A. NATIONAL ACTIVITIES ON JELLY-FISH IN GREECE

I. Monitoring Programme by IOKAE (Athens)

Programme on the Ecology and Biology of the Jelly-fish in Greek Waters

During 1981 - 1982 jelly-fish blooms have occurred in Greek waters which had an effect on human activities and developed serial of problems to the public. In a governmental meeting, which took place in August 1982 at the Institute, it was decided that IOKAE will take action upon the subject. A group of five marine biologists, one chemical oceanographer and one physical oceanographer developed a programme on jelly-fish with special interest on the biology of medusae and the correlation of jelly-fish blooms with physical and chemical parameters as well as with biological samples.

1. Programme

a. Oceanographic cruises

The programme initiated during May 1983. It was based on monthly cruises in Saronikos Gulf, since the group of scientists was too small to cover the Greek coastal area (15,000 km). Saronikos Gulf, due to its neighbouring with industrial areas, has also distinct eutrophic areas (e.g. Elefsis Bay), a factor which could be linked with the presence of medusae. Nine stations within the inner, the western and the outer Saronikos Gulf were chosen for sampling according to their hydrography (see the attached map). The following measurements were made: salinity, sea-water temperature, underwater illumination, chlorophyll-a, nutrients and surface currents. The biological samples which were taken were phytoplankton, zooplankton and medusae. The sampling for medusae was carried out by using a special plankton net (MOLLER, 1980), in order to evaluate the occurrence of jelly-fish in Saronikos Gulf. The data from these cruises are being processed.

b. Laboratory work

Preliminary experiments have been made in the laboratory, especially using different temperature and illumination. These experiments will continue in 1984.

c. Co-operation with other Authorities

From June 1983, the occurrence of jelly-fish has been reported from 67 port authorities around Greece (see the attached map), with a special questionnaire which has been provided by the Institute.

Contacts have been also made with the Department of Tourism and the Hellenic Hydrographic Service in order to evaluate any correlation between sea-water temperature and occurrence of the jelly-fish during the years 1980, 1981, 1982 (information taken from the Ministry of Commerical Marine).

d. Future aspects

The programme will continue on 1984 with a possibility of adding some stations of relatively unpolluted areas where jelly-fish have been reported recently. Such possible areas are the Cyclades in the central Aegean Sea, and/or south Evoikos Gulf.

II. Research Activities in Hydaulics Laboratory, School of Technology, Aristotle University, (Thessaloniki)

1. Modelling the coastal transport of jelly-fish

The hydrodynamic conditions of the movement of jelly-fish near the coast are studied. In particular, the influence of the winds and the surface water currents on the coastal transport of jelly-fish are analysed.

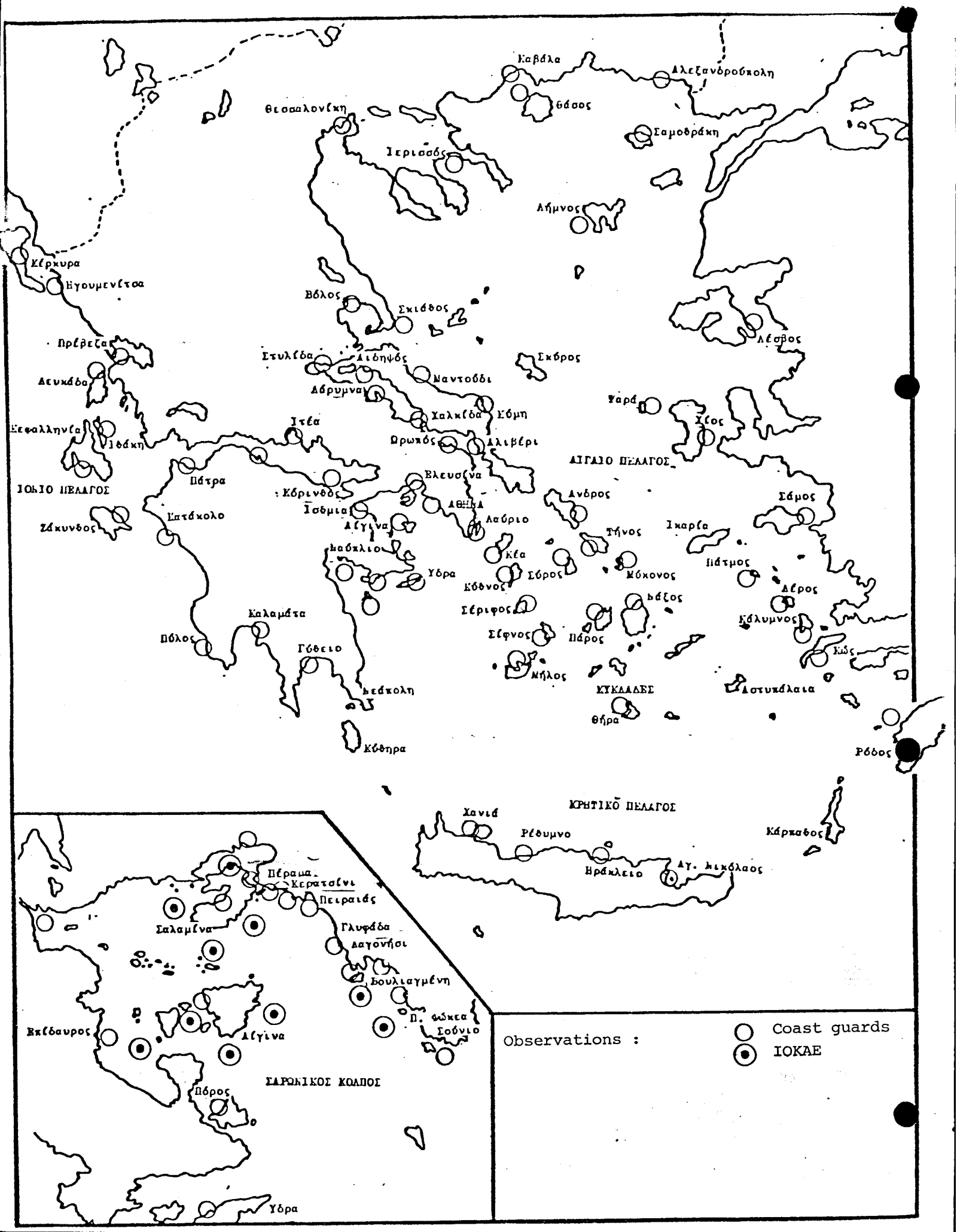
The research is conducted on a small regional scale, like a specific bay or a beach and the final objective is to simulate, from the engineering point of view, the efficiency of a proposed method to control blooms of jelly-fish.

Models in 2 and 3 dimensions are already operational and the preliminary obtained results are very promising.

2. Monitoring of jelly-fish in the North Aegean Sea

A small research boat of 14 m length is now available in the University of Thessaloniki and a multi-disciplinary group of scientists (physicists, chemists, biologists and medical officers) is formed for studying the appearance of jelly-fish in coastal areas of Northern Aegean having touristic interests.

The Bay of Toroneos (Kassandra) in the region of Chalkidiki has been selected as a specific areas of monitoring and investigation, through the National Activities of MED POL - PHASE II programme.


Καβάλα
Αλεξανδρούπολη
Θάσος
Θεσσαλονίκη
Σαμοθράκη
Ιεριτσός
Λήμνος
Κέρκυρα
Ηγουμενίτσα
Βόλος
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Ψαρά
Χαλκίδα
Εύβοια
Κεφαλληνία
Ιτέα
Χίος
Ιθάκη
Ωρωπός
Αλιβέρι
ΑΙΓΑΙΟ ΠΕΛΑΓΟΣ
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ΙΟΝΙΟ ΠΕΛΑΓΟΣ
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Τήνος
Μεθλιον
Κέα
Πάτμος
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ΚΥΚΛΑΔΕΣ
Αστυπάλαια
Μονεμβασία
Θήρα
Ρόδος
Κύθηρα
ΚΡΗΤΙΚΟ ΠΕΛΑΓΟΣ
Χανιά
Κάρπαθος
Ρέθυμνο
Ηράκλειο
Αγ. Νικόλαος
Πέραμα
Κερατσίνι
Πειραιάς
Σαλαμίνα
Γλυφάδα
Αγκίστρι
Βουλιαγμένη
Π. Φώκαια
Σούνιο
Ελευσίνα
Αίγινα
ΣΑΡΩΝΙΚΟΣ ΚΟΛΠΟΣ
Πόρος
Υδρα
Observations :
Coast guards
IOKAE

B. PRESENT LEVEL OF ACTIVITIES RELATED TO JELLY-FISH IN ITALY

I. Section of Zoology of the Department of Biology. University of Trieste
Professor L. Rottini-Sandrini

1. Monitoring of presence of Pelagia noctiluca and/or other species of jelly-fish in a fixed station in Northern Adriatic (Marano Lagunare) in collaboration with the local co-operation of fisherman.

2. Quantification of damages by jelly-fish to fishery. In collaboration with the co-operatives of fishermen of Marano Lagunare, an analysis of available data is being done at the section of Zoology.

II. Centre of electronic microscopy of the University of Trieste

At present, studies are being carried out on the identification of a "marker" of fecundity (POB - paraovular body) of the egg of Pelagia noctiluca as well as on its role in the processes of maturation and vitellogenesis of the ovary of Pelagia.

III. Istituto Talassografico-CNR, Trieste, (Dr. Stravisi)

The correlation between the meteorological and hydrographical parameters and the swarms of jelly-fish of the last fifty years is being studied.

IV. Laboratory of Marine Biology and Fishery, Fano (University of Bologna)
(Professor C. Piccinetti)

1. The population's dynamics is being studied with the application of the most recent statistical analyses.

2. Quantitative analysis of Pelagia noctiluca is being made as a result of the fishing campaigns carried out during 1983 in the Adriatic and the Central Mediterranean

Future plans

I. Section of Zoology of the Department of Biology. Univ. Trieste

1. Analysis of the intestine and stomach content of fish caught in areas of jelly-fish swarming.

2. Analysis of the intestine content of jelly-fish at all stages of development.

II. Laboratory of Marine Biology, Trieste (Dr. P. Bressan)

1. Culture of Pelagia noctiluca specimens in experimental tanks: behavioural tests in presence of controlled amounts of selected pollutants.

2. Tests of neuromuscolar response of Pelagia to the presence of selected pollutants.

III. Istituto Talssografico - CNR, Trieste

Studies on the connection between meteorological and hydrographical conditions and swarming of jelly-fish.

IV. Institute of pharmacology of Trieste University

1. Statistical analysis of hospitalizations resulting from stings of jelly-fish.

2. Study on clinics and treatments of patients stung by jelly-fish.

3. Education and information on health risks by jelly-fish.

V. Laboratory of Marine Biology and Fishery - Fano (University of Bologna)

1. Monitoring of jelly-fish in the Adriatic to be accomplished during the three seasonal fishing campaings promoted by the Ministry of Mercantile Marine and quantitative analysis of the data by the use of mathematical models.

2. Seasonal monitoring of the damages to tourism in the region Emilia Romagna (if possible, in collaboration with local touristic and medical authorities).

C. MONITORING OF JELLY-FISH IN MALTA

The Malta Government recently set up a committee to deal specifically with jelly-fish blooms. The University of Malta, the Department of Health and Environment, the Department of Tourism and the Maritime Section of the Task Force are represented on this committee.

This committee at once realized the importance of a monitoring programme in dealing with this problem and therefore set out to organise one, making full use of the limited existing local resources. This monitoring programme will follow methodologies and procedures as indicated in UNEP's publication 'Monitoring of Swarming by Scyphomedusae'.

Monitoring Programme

1. Past occurrences of blooms

Unfortunately no records of past occurrences of Jelly-fish blooms have been identified as yet. The methodical search for such reports in all newspapers issued locally during the last 50 - 80 years is an immense task which is not feasable at present.

Contacts with local fishermen have been established in an effort to identify the years during which past blooms are said to have occurred.

2. Reports of sightings by non-scientific observers

Coastal hotel establishments are to be invited by the committee to participate in this monitoring programme by reporting sightings of jelly-fish in water or stranded on the shoreline, on specially prepared forms.

The Department of Tourism has a section for beach cleaning and its personnel are likewise to report such jelly-fish sightings.

Personnel of patrolling crafts of the Maritime Section of the Task Force are to continue reporting sightings of jelly-fish in coastal and offshore waters. They have been doing so for the past two years and thus have already provided a substantial amount of data.

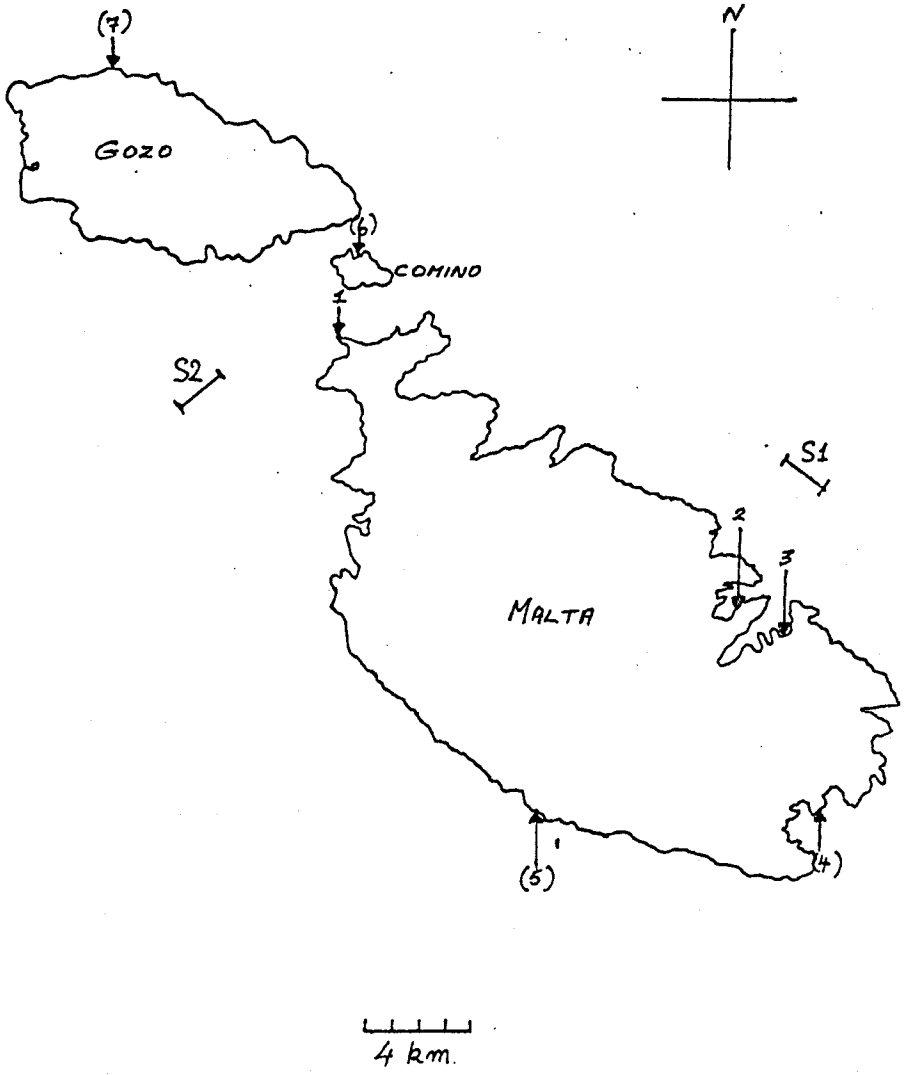
3. Standard surveys from fixed coastal stations

Three coastal stations have now been identified at which jelly-fish population studies are to be carried out daily (see map). It is hoped that at least three more stations on the South coast of Malta, at Comino and at Gozo will be set up in the near future.

4. Plankton surveys

Monthly plankton surface hauls for adults of jelly-fish as well as for ephyrae are to be carried out at two offshore stations (see map).

Salinity, sea-water temperatures, nutrient levels (nitrates and phosphates) as well as chlorophyll contents are to be monitored as well at these stations.



Jelly Fish Monitoring Programme

Coastal Stations for Population Studies:

1. Marfa
2. M'Xett
3. Kalkara
4. B'Bugia
5. Wied iz-Zurrieq
6. Kemmuna (Comino)
7. Ghawdex (Gozo)

Stations for Plankton Surveys:

S1. Comino Channel
S2. Off Grand Harbour

D. PRESENT LEVEL OF ACTIVITIES IN YUGOSLAVIA IN CONNECTION TO JELLY-FISH BLOOMS

Activity of institutions is listed by geographical order from North to South

I. Marine Biological Laboratory, Piran

1. Monitoring

Survey of *Pelagia n.* appearance in the North Adriatic due to fishermen registration.

2. Research

Biology of *Pelagia n.* (feeding, reproduction) in the North Adriatic.

3. Future activity

The laboratory plans to continue monitoring and research with additional studies on :

- biochemical composition and metabolic rates of *Pelagia noctiluca*,
- presence, isolation and characterization of toxic substances in *Pelagia noctiluca.*

II. Medical Center, Pula, with Center for Marine Research, Rovinj

1. Inquiry

Preparation of epidemiological inquiry.

2. Health education

Preparation is made for short courses in biology of jelly-fish and treatment of stinged persons.

3. Research

Investigations of skin structure changes - experiments on guinea-pig.

Structure of venomous apparatus of *Pelagia noctiluca.*

II. Center for Marine Research, Zagreb, Institute "R. Boskovic"

1. Monitoring

Observations of jelly-fish by scuba divers in the area of Middle Adriatic (Kornati Archipelago) from summer 1983 onwards.

2. Research

Modelling residual circulation in Northern Adriatic, and wind induced currents in Rijeka Bay as a basis for jelly-fish transport. Transport of jelly-fish in southern Adriatic. Modelling ecological interactions involved in jelly-fish blooms.

3. Future activity

Identification of monitoring of jelly-fish blooms using scuba divers along the eastern coast of the Adriatic Sea. Modelling transport and ecological interactions between jelly-fish and its prey.

IV. Institute for Oceanography and Fisheries, Split

1. Monitoring

Survey of appearance of Pelagia n. in the Middle Adriatic coastal area (near Split) and on the profile Split - Gargano.

2. Research

Comparative study of unusual appearance of Pelagia n. and change of the environmental factors.

3. Future activity

Italian - Yugoslav open sea survey (Fano - Split, laboratories).

Survey of exchange of water masses between Adriatic and Ionian sea and possible jelly-fish transport.

V. Biological Institute, Dubrovnik

1. Monitoring

Observations of appearance of jelly-fish due to southern wind (survey at three locations near Dubrovnik).

2. Preparation of the inquiry

Inquiry has been prepared for jelly-fish appearance by fishermen and coastal guards and Marine and Tourist Authorities along the eastern Adriatic coast (in the behalf of the Committee of Environmental Protection of the S.R. Croatia, Zagreb).

Comments : The inquiry will serve to document appearance distribution of jelly-fish in coastal area.

3. Future activity

Field and laboratory studies of distribution feedng and sensitivity to changes of ecological factors.

VI. Medical Center, Dubrovnik

1. Inquiry

Preparation of epidemiological inquiry for the coast of south Adriatic.

2. Future activity

Monitoring of health problems in persons coming to south Adriatic beaches and affected by jelly-fish.

VII. Institute for Marine Biology and Oceanography, Kotor

1. Monitoring

Seasonal monitroing of hydrographic and biological data from near coast of Monte Negro.

2. Future activity

Monitoring of appearance of jelly-fish in the coast of Monte Negro.