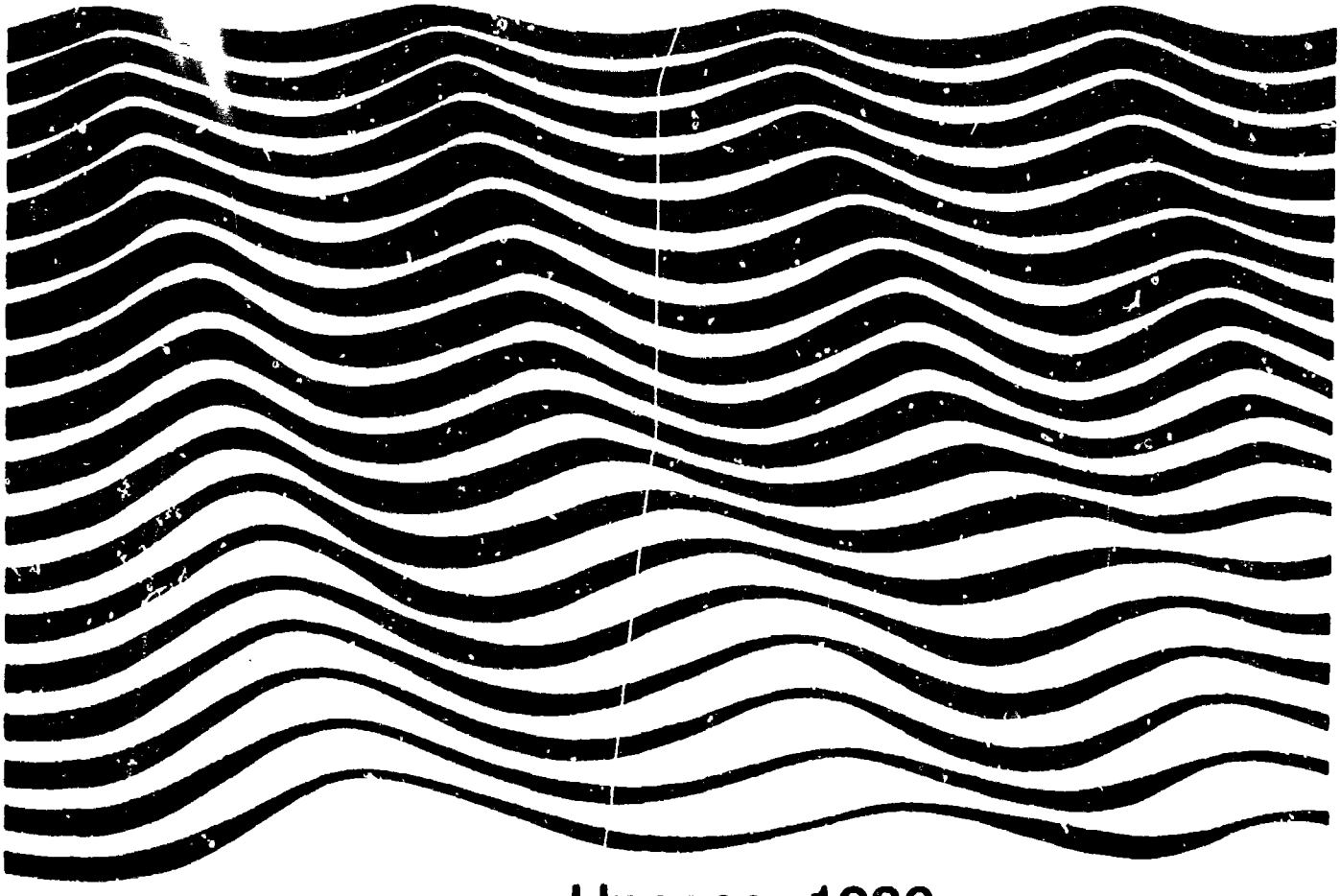
Unesco reports
in marine science

39

Development of marine sciences in Arab Universities

Meeting of Experts
held at the Marine Science Station
Aqaba, Jordan

1-5 December 1985



Unesco, 1986

UNESCO REPORTS IN MARINE SCIENCE

No.		Year
1	Marine ecosystem modelling in the Eastern Mediterranean Report of a Unesco workshop held in Alexandria, Egypt, December 1974 English only	1977
2	Marine ecosystem modelling in the Mediterranean Report of the Second Unesco Workshop on Marine Ecosystem Modelling English only	1977
4	Syllabus for training marine technicians Report of an IOC/Unesco workshop held in Miami, Florida, 22-26 May 1978 Available in English, French, Russian and Spanish	1979
5	Marine science syllabus for secondary schools Report of an IOC workshop held at United World College of the Atlantic, United Kingdom, 5-9 June 1978 Available in Arabic, English, French, Russian and Spanish	1979
6	Organization of marine biological reference collections in the Mediterranean Arab countries Expert meeting held in Tunis, 20-23 September 1978 Available in Arabic, English and French	1979
7	Coastal ecosystems of the southern Mediterranean: lagoons, deltas and salt marshes Report of a meeting of experts, Tunis, 25-27 September 1978 Available in Arabic, English and French	1979
8	The mangrove ecosystem: Human uses and management implications Report of a Unesco regional seminar held in Dacca, Bangladesh, December 1978 English only	1979
9	The mangrove ecosystem: scientific aspects and human impact Report of the seminar organized by Unesco at Cali, Colombia, 27 November-1 December 1978 Available in English and Spanish	1979
10	Development of marine science and technology in Africa Working Group of Experts sponsored by ECA and Unesco, Addis Ababa, 5-9 May 1980 Available in English and French	1980
11	Programa de Plancton para el Pacífico Oriental Informe final del Seminario-Taller realizado en el Instituto del Mar del Perú, El Callao, Perú, 8-11 de septiembre de 1980 Spanish only	1981
12	Geología y geoquímica del margen continental del Atlántico Sudoccidental, Informe final del Taller de Trabajo organizado por la Unesco en Montevideo, Uruguay, 2-4 de diciembre de 1980 Spanish only	1981
14	Marine science and technology in Africa: present state and future development Synthesis of Unesco/ECA survey missions to African coastal states, 1980 Available in English and French	1981
15	Fishery science teaching at the university level Report of a Unesco/FAO workshop on university curricula in fishery science, Paris, May 1980 Available in Arabic, English, French, Russian and Spanish	1981
16	Marine and coastal processes in the Pacific: ecological aspects of coastal zone management Report of a Unesco seminar held at Motupore Island Research Centre, University of Papua New Guinea, 14-17 July 1980 English only	1981
17	The coastal ecosystems of West Africa: coastal lagoons, estuaries and mangroves A workshop report, Dakar, 11-15 June 1979 Available in English and French	1981
18	Coral reef management in Asia and the Pacific: some research and training priorities Report of a Unesco workshop held in Manila, Philippines 21-22 May 1981 English only	1982
19	Marcas rojas en el Plancton del Pacífico Oriental Informe del Segundo Taller del Programa de Plancton del Pacífico Oriental, Instituto del Mar, Callao, Perú 19-20 de noviembre de 1981 Spanish only	1982
20	Quantitative analysis and simulation of Mediterranean coastal ecosystems: The Gulf of Naples, a case study Report of a workshop on ecosystem modelling Ischia, Naples, Italy, 28 March to 10 April 1981 Organized by the United Nations, Educational, Scientific and Cultural Organization (Unesco) and the Stazione Zoologica, Naples English only	1983
21	Comparing coral reef survey methods A regional Unesco/UNEP workshop, Phuket Marine Biological Centre, Thailand, December 1982 English only	1983
22	Guidelines for marine biological reference collections Prepared in response to a recommendation by a meeting of experts from the Mediterranean Arab countries Available in English, French and Arabic	1983
23	Coral reefs, seagrass beds and mangroves: their interaction in the coastal zones of the Caribbean Report of a workshop held at West Indies Laboratory, St. Croix, U.S. Virgin Islands, May, 1982 English only	1983
24	Coastal ecosystems of Latin America and the Caribbean The objectives, priorities and activities of Unesco's COMAR project for the Latin America and Caribbean region Caracas, Venezuela, 15-19 November 1982 Available in English and Spanish	1983
25	Ocean engineering teaching at the university level Recommended guidelines from the Unesco/IOC/ECOR workshop on advanced university curricula in ocean engineering and related fields, Paris, October 1982 Available in English, French, Spanish, Russian, Arabic and Chinese	1983
26	Global survey and analysis of post-graduate curricula in ocean engineering English only	1984
27	Productivity and processes in island marine ecosystems. Recommendations and scientific papers from the Unesco/IOC sessions on marine science co-operation in the Pacific, at the XVth Pacific Science Congress, Dunedin, New Zealand, February 1983 English only	1984
28	Oceanographic modelling of the Kuwait Action Plan (KAP) Region. Report of simposium/workshop; University of Petroleum and Minerals, Dhahran, Kingdom of Saudi Arabia 15-18 October 1983 English only	1984
29	Eutrophication in coastal marine areas and lagoons: a case study of 'Lac de Tunis' Report prepared by Dr M. Kelly and Dr M. Naguib English only	1984
30	Physical oceanography of the Eastern Mediterranean: an overview and research plan Report of a workshop held in Lerici, La Spezia (Italy), September 1983 English only	1984
31	MABAHISS/John Murray 50th anniversary: Marine science of the North West Indian Ocean and adjacent waters Report of a symposium on the occasion of the 50th anniversary of the MABAHISS/ John Murray Expedition (1933/34), University of Alexandria, Egypt, 3 to 7 September 1983 English only	1985
32	L'estuaire et la mangrove du Sine Saloum Résultats d'un Atelier régional Unesco-COMAR tenu à Dakar (Sénégal) du 28 février au 5 mars 1983 French only	1985
33	Coral taxonomy Results and recommendations of a regional Unesco (COMAR)/UNEP Workshop with advanced training Phuket Marine Biological Centre Thailand, 10-26 February 1984 English only	1985
34	Bibliography on costal lagoons and salt marshes along the Southern Mediterranean coast (Algeria, Egypt, Libya, Morocco, Tunisia) Available in Arabic, English and French	1985

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PREFACE

Unesco Reports in Marine Science are designed to serve specific programme needs and to report on developments in projects conducted by the Unesco Division of Marine Sciences, including those involving collaboration between the Division and the Intergovernmental Oceanographic Commission, particularly in the field of training, education, and mutual assistance in the marine sciences.

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75700 Paris
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Abstract

An expert meeting, attended mainly by faculty members and researchers in the marine sciences in Arab universities, was convened in Aqaba, Jordan, 1-5 December 1985. The participants discussed the objectives of teaching and research in the marine sciences and the present situation in this field in Arab universities. They studied the existing educational systems at undergraduate level as well as postgraduate studies and related research. The principal obstacles facing development and co-operation in this field were pointed out. The recommendation of the meeting is given in Annex I. A working paper presented by Unesco to the meeting and entitled 'Marine Sciences in the Arab Universities' is given as Annex V.

RESUME

Une réunion d'experts, à laquelle ont assisté principalement des professeurs et des chercheurs d'universités arabes spécialisés dans les sciences de la mer, a été organisée à Aqaba (Jordanie) du 1er au 5 décembre 1985. Elle a donné lieu à un échange de vues sur les objectifs de l'enseignement et de la recherche dans ce domaine et sur la situation actuelle des universités arabes à cet égard. Les participants ont examiné les systèmes d'enseignement existants dans le premier cycle ainsi que les études menées dans les cycles suivants et les recherches qui y sont liées. Les principaux obstacles qui s'opposent au développement et à la coopération dans ce domaine ont été mis en évidence. La recommandation adoptée au cours de la réunion figure à l'annexe I. Un document de travail présenté par l'Unesco et intitulé "Marine Sciences in Arab Universities" fait l'objet de l'annexe V.

RESUMEN ANALITICO

Del 1° al 5 de diciembre de 1985 tuvo lugar en Akaba (Jordania) una reunión de expertos en la que participaron sobre todo profesores e investigadores especializados en ciencias del mar de las universidades árabes. Los participantes examinaron los objetivos de la enseñanza y la investigación de su disciplina y la situación actual en las universidades árabes. Consideraron los sistemas educativos vigentes en el tercer ciclo, los estudios de postgrado y la investigación. Se hicieron notar los principales obstáculos con que tropiezan el progreso y la cooperación en la materia. En el Anexo I figura la recomendación aprobada en la reunión. El documento de trabajo presentado por la Unesco, "Las ciencias del mar en las universidades árabes", figura en el Anexo V.

ВЫДЕРЖКА

В Акабе, Иордания, 1-5 декабря 1985 г. было созвано совещание экспертов, на котором присутствовали главным образом представители факультетов и научные работники в области морских наук арабских университетов. Участники обсудили цели преподавательской и исследовательской деятельности в морских науках и нынешнее положение в этой области в арабских университетах. Они рассмотрели существующие системы образования на университетском уровне, а также послеуниверситетские исследования и соответствующую научную деятельность. Были указаны основные препятствия развитию и сотрудничеству в этой области. Рекомендация совещания приводится в Приложении I. В Приложении V содержится рабочий документ, представленный ЮНЕСКО на это совещание и озаглавленный "Морские науки в арабских университетах".

ملخص

عقد اجتماع لخبراء علوم البحار من أعضاء هيئات التدريس والبحوث في الجامعات العربية في محطة علوم البحار بالعقبة بالأردن من ١ - ٥ ديسمبر/كانون الأول ١٩٨٥ . ودرس المجتمعون أهداف البحث والتدريس في علوم البحار والأوضاع الحالية لعلوم البحار في الجامعات العربية ثم ناقشوا الأنظمة الدراسية القائمة في المرحلة الجامعية الأولى ومرحلة الدراسات العليا بعد الدرجة الجامعية الأولى وما يتصل بها من بحوث يقوم بها طلبة الدراسات العليا وهيئات البحوث الجامعية . كذلك درس المجتمعون المشاكل الرئيسية التي تعوق التطوير والتعاون في هذا المجال وأصدروا مجموعة من التوصيات (ملحق رقم ١) . وقد استعان الاجتماع بورقة عمل مقدمة من منظمة اليونسكو عن "علوم البحار في الجامعات العربية" توجد بأكملها في ملحق رقم ٥ .

摘　　要

1985年12月1—5日在约旦亚喀巴举行了一次专家会议，出席会议的主要有阿拉伯各大学海洋科学方面的教学人员和研究人员。与会者讨论了海洋科学教学与研究的目标以及阿拉伯各大学该领域的现状。他们研究了现有本科生一级的教育制度以及研究生学习和有关研究，指出了这一领域的发展与合作所面临的主要障碍。会议的建议见附件I。教科文组织向会议提交的题为“阿拉伯各大学的海洋科学”的工作文件见附件V。

TABLE OF CONTENTS

I. OPENING

1. Arab universities have shown great interest in marine sciences since the 1970s. As a result, the number of universities whose programmes included curricula and courses in these sciences have increased. Some of them established specific divisions or departments to teach these disciplines while others did not go beyond teaching them within the curricula of their traditional basic science departments.

Due to the noticeable diversity of the educational systems adopted and and the degrees offered by these universities, the Division of Marine Sciences, Unesco, considered that it was time to give marine scientists in Arab universities an opportunity to meet in order to review and assess these varied experiences and hence to agree upon proposals and recommendations aiming at developing marine science teaching in Arab universities.

In November 1983, the Unesco General Conference adopted, under the Programme and Budget for 1984-1985, a proposal to convene a meeting of experts on the development of marine sciences in Arab universities. This meeting was held at the Marine Science Station in Aqaba, Jordan (University of Jordan and Yarmouk University), 1-5 December 1985.

2. The opening session started at 10 a.m. on 1 December 1985 with an address by Dr M. Wahba, Director of the Aqaba Marine Science Station. He welcomed the participants and expressed his joy that the meeting was the first official one to be held at the station since it was completed in 1981. He thanked Unesco for its response to the invitation to hold that regional meeting in that new institute and invited the representative of Unesco to address the meeting.

3. The representative of Unesco, Dr Selim Morcos, began his address by welcoming the meeting and congratulating the University of Jordan and the Yarmouk University for their successful efforts in establishing the Aqaba Marine Science Station. He also conveyed to the participants, the greetings of Mr Amadou-Mahtar M'Bow, Director-General of Unesco, and his best wishes for a successful meeting. He hoped that the meeting would be a starting point for more constructive regional co-operation in marine sciences in the Arab region.

4. The representative of Unesco pointed out that Unesco gave great attention to upgrading performance in university education and scientific research in general, particularly in marine sciences. That attention resulted in the convening in 1973 of a workshop on marine science teaching at the university level, which unanimously concluded that marine science education should ideally start after the first level of university education. A detailed study of the types of curricula and courses required was also submitted.

5. Another workshop on fishery science teaching at the university level followed in 1980, and the teaching of ocean engineering at the university level was the subject of yet another workshop in 1983. Earlier, two workshops were held in 1978 in co-operation between the Intergovernmental Oceanographic Commission and the Unesco Marine Sciences Division. They dealt with the training of marine technicians and marine science syllabus for secondary schools respectively.

6. More than ten years after the organization of the first workshop in 1973, it seemed to Unesco that it was time to review its recommendations on the basis of a realistic evaluation of the systems of university education in marine sciences. With that objective in mind, Unesco commissioned the Open

University of the United Kingdom to prepare a questionnaire on marine science teaching at first degree level, which was distributed to universities all over the world, including Arab universities.

7. Since each geographical region had certain common characteristics, the Arab region was chosen to be the first where a realistic and factual evaluation would take place. Thus, the Unesco General Conference decided at its twenty-first session in 1983, to hold a meeting of experts on the development of marine sciences in Arab universities, namely the Aqaba meeting.

Other regional meetings would follow in Africa and Latin America in preparation for an international meeting to be organized by Unesco late in 1989. The fact that the Aqaba meeting was the first in that series indicated the great importance attached to it.

8. Dr Morcos added that, in preparation for that meeting, the Unesco Marine Sciences Division formulated a questionnaire on postgraduate studies and the situation of marine sciences in the organizational structure of each university. The replies to that questionnaire and that of the Open University were evaluated by a working group that met at the University of Alexandria from 24 to 27 June 1985 and prepared the working paper submitted to the meeting.

9. Dr M. Hemdan, Dean of the Faculty of Science, University of Jordan, then delivered a speech in which he welcomed the participants and conveyed to them the greetings of Dr Abdel Salam Al-Magali, President of the University of Jordan, who for unforeseen reasons of work could not attend the inaugural session. He emphasized Jordan's interest in marine sciences. In 1974 the University of Jordan began establishing a marine station in Aqaba from which a number of specialists graduated to become researchers and teachers in that scientific institute. The station remained affiliated to the University of Jordan till 1981, when the University of Jordan and Al-Yarmouk University concluded an agreement under which the station became an independent administrative unit, run by a special board composed of professors and deans of both universities. Despite that modest start, that scientific institute was able to award 11 masters degrees in various disciplines related to marine sciences. Dr Hemdan concluded by wishing the meeting success and expressing his great appreciation to Unesco for holding that expert meeting to the benefit of Arab universities.

II. ADMINISTRATIVE ARRANGEMENTS

10. The meeting was attended by 37 members of the teaching and research staff from 28 Arab universities and institutes engaged in marine science education and/or research (Annex II). The opening session was attended by Dr Mohamed Hemdan, Dean of the Faculty of Science, University of Jordan, representing Dr Abdel Salam Al-Magali, President of the University of Jordan. Dr Mohamed Nabih Akel, Assistant Secretary-General of the Arab Universities Union also attending the opening meeting.

11. The representative of Unesco presented the draft agenda which was adopted by the meeting without any amendments (Annex III).

12. The meeting unanimously elected the following officers:

Dr Mohamed Wahba, Chairman		
Dr Y. Gideiri, Vice-Chairman		
Dr Y. Lalami, Vice-Chairman		
Dr A. Abu Hilal	)	
Dr Hassan Helmi Kharouf	)	
Dr S. Lakkis	)	Rapporteurs
Dr Abdel Ghani Khalil	)	

13. Dr M. Wahba chaired the session and invited the Unesco representative, Dr Selim Morcos, to take the floor. He presented the list of documents for the meeting (Annex IV) and made a detailed presentation of the draft agenda and explained that in addition to the contents of the proposed working paper (Annex V), he had asked a number of colleagues present to prepare presentations on the main themes of the meeting as follows:

Objectives of marine science teaching and research in Arab universities: Dr Yousef Abu Gideiri and Dr N. Dowidar;

Present situation of marine sciences in Arab universities: Dr Ahmad Abu Hilal and Dr Yousef Lalami;

Educational systems at undergraduate level in Arab universities: Dr N. Dowidar and Dr Abdel Gawad Lamrini;

Postgraduate studies and research in Arab universities: Dr Yousef Halim, Dr Fredj Kartas and Dr Ahmad El Rifai Bayoumi.

III. OBJECTIVES OF MARINE SCIENCE TEACHING AND RESEARCH IN ARAB UNIVERSITIES

14. Observations drawn from the working paper

According to the working paper submitted to the meeting, marine sciences should be taught against the general background of national goals and the country's actual requirements. Such goals are not necessarily identical for all Arab countries. The results of the questionnaire show the absence of a clear philosophy behind introducing marine science teaching in some Arab universities. Nevertheless, it may be said that there are common interests in marine science studies related to the following objectives:

exploitation and development of marine resources;

investigation of the growing environmental problems caused by modernization;

integration of ecology curricula in the basic sciences;

promotion of knowledge and awareness concerning the marine environment and its protection.

15. Dr Y. Abu Gideiri then introduced the theme concerning the objectives of marine sciences in Arab universities. He said that it was natural that there would be differences between the objectives of one university and another as there were differing interests in marine science studies and their applications in the Arab countries. The priorities given to objectives depended on

the degree of insistence on linking university teaching programmes to the development of the society. They were also affected by the personal viewpoints of people in charge of such programmes at universities. Dr Abu Gideiri identified three main objectives: general knowledge about the sea, the exploitation of living and non-living marine resources and the preservation of the marine environment. He called for promoting a better knowledge of the marine environment and better awarness of the need to preserve it and underlined the necessity of linking courses and research to national development projects. More attention should be given to applied studies such as marine engineering and the promotion of joint research projects at the national level as well as at the Arab regional level.

16. Dr N. Dowidar then spoke on the objectives of marine science teaching in Arab universities. He explained that although all Arab countries overlooked vast marine areas and most of them had large bodies of fresh and potable water, the specific and overall objectives of marine science teaching at the university level were not clear to a great number of those countries. The speaker pointed out that marine science teaching at university level had three main objectives: scientific objectives that may be summarized in the training of specialists, and cultural objectives, namely promoting awareness and better knowledge of the role of marine science in the national economy. In addition, there were national and strategic objectives such as contributing to the realization of food security and acquiring the information that may be required by the navy for national defence.

The speaker indicated the importance of planning when introducing marine science teaching in universities, so as to link it to an actual assessment of the country's specific natural resources and persistent environmental problems, such as pollution and shore erosion. In the light of those considerations, the volume of necessary investments as well as the size of the marine science educational structure could be determined.

The ideal arrangement, as pointed out by the speaker, is to establish within the university a special department or institute comprising the various specializations. However, there are less difficult alternatives for developing countries that lack the necessary educational expertise. It may also be useful, within the integration among neighbouring Arab countries or between different universities within one country, to have the various areas of specialization distributed among them.

17. The participants then engaged in a discussion that brought to light the following ideas:

17.1 Environmental problems and their importance vary from one country to another. Hence, the priorities and objectives covered by a national plan of action could also differ, taking into consideration the need for appropriate solutions to environmental problems. The marine science disciplines to be studies should be determined in such a manner as to link students to the environment surrounding them.

17.2 Since marine science research is usually concerned with applied aspects, it is desirable to provide the student with target-oriented training without overlooking the basic importance of academic training.

17.3 The ever-increasing movement of ships in Arab seas, particularly oil tankers, leads to continuous pollution of Arab coasts and waters. Attention should, therefore, be given to marine science research for assessing pollution hazards and combating them.

17.4 There is a need to train national scientific personnel capable of identifying marine environmental problems and taking the necessary remedial action.

17.5 Information and data on marine science research carried out in the Arab region should be collected so as to form the basis for the preparation of an integrated plan of action to complete investigations for identifying national resources, their locations and possibilities of economical exploitation.

IV. PRESENT SITUATION OF MARINE SCIENCES IN ARAB UNIVERSITIES

18. General features of marine science teaching in Arab universities as revealed by the Open University survey

18.1 Marine science teaching is less widespread in universities of the Arab region than in universities of other regions: 47 per cent as against 59 per cent in Europe, 70-75 per cent in the Americas and 92 per cent in Australia and New Zealand.

18.2 The data collected indicate that marine sciences have been introduced into the curricula of an increasing number of Arab universities. There are also indications that some Arab countries have long-term plans to include marine sciences at the undergraduate level (e.g. Kuwait, Tunisia), or for expansion in this respect (such as Egypt).

18.3 Historically, marine science teaching in Arab universities started only in the 1970s with the exception of the University of Alexandria which offered degrees in marine sciences since the establishment of its marine science department in 1948. The survey also reveals that some Arab universities introduced marine sciences in their curricula even though they did not have the necessary facilities for such teaching.

18.4 It is also clear that most of the universities interested in marine sciences in the Arab region introduced these studies at the undergraduate level (55 per cent) while 35 per cent introduced them at the postgraduate level. The rest teach them in the form of diploma courses at the first university level as shown in the following table.

It is also to be noted that the following table summarizes the replies of Arab universities which took part in the questionnaire, and does not represent all Arab universities and institutes interested in marine sciences. This is due to the fact that a number of institutions did not answer the questionnaire or to difficulties in postal communication.

For example, in Tunisia, l'Ecole Nationale d'Ingenieurs, Sfax, was the only institute that replied to the questionnaire as shown in the following table. However, some marine science courses are offered at the University of Tunis and the Institut National Agronomique de Tunisie.

Arab universities and institutes
participating in the Open University survey

	Country	Total	A	B	C	D
1.	Kuwait	1				1
2.	Qatar	1	1			
3.	Saudi Arabia	2	1			1
4.	United Arab Emirates	1				1
5.	Yemen Arab Republic	1	1			
6.	Lebanon	2				2
7.	Egypt	4	2		1	1
8.	Libya	1		1		
9.	Tunisia	1				1
10.	Morocco	1	1			
	Grand total	15				

N.B.

Total = the total number of universities and institutes that answered the questionnaire in each Arab country.
A = a first university degree in marine sciences.
B = a first university degree in the basic sciences including some marine sciences.
C = a postgraduate degree in marine sciences.
D = very few or no courses in marine sciences.
Grand total = total number of Arab universities covered by the survey.

19. Observations drawn from the working paper

Arab universities differ in terms of their educational structure and marine science curricula. They may be classified as follows:

19.1 At the undergraduate level

Universities offering degrees specialized in one of the four marine science disciplines, such as King Abdulaziz University; or a general marine science degree as in the case of the University of Qatar; or a general degree in marine sciences in addition to a specialized degree in physical oceanography such as the University of Alexandria.

Universities offering a degree in biological oceanography only such as the University of Sana'a and the Suez Canal University.

Universities not offering an undergraduate degree. These constitute the majority. However, most of their teaching programmes include some courses in marine sciences.

19.2 At the postgraduate level

Universities offering postgraduate degrees through a marine science faculty or department or a specific division within one of the departments of the basic sciences.

Universities offering degrees in marine sciences within the departments of basic science.

19.3 The findings of the survey indicate that the existing systems in Arab universities, which start specialization in marine sciences at an early stage, do not provide the student with an adequate knowledge of the basic sciences. It is also noted that marine science teaching programmes in most universities do not include a comprehensive introduction to marine sciences as recommended by the Unesco Workshop in 1974 (Unesco Technical Papers in Marine Science, No. 19).

20. Dr Ahmad Abu Hilal then dealt with the situation of marine sciences in Arab universities in terms of teaching and research. He pointed out that universities did not introduce marine science teaching at one and the same time. Although real interest in marine sciences and their teaching began in most universities in the 1970s, it is to be noted that Algeria established the first marine station in 1881, the University of Cairo built the Hurgada Station in 1931 and the University of Alexandria established the first marine science department in the Arab world in 1948.

Variations in the degree of interest in marine sciences were also noteworthy. A number of universities did not go beyond including them in their courses through basic science departments, particularly biology departments, sometimes as a separate division, while others established marine science departments. Some universities went further to establish a faculty of marine science comprising the four major disciplines.

Such diversity resulted in marked differences in both quantity and quality and affected the number of courses, their titles and contents in addition to the standard of certificates and the number of specialists. The common features of the situation of marine sciences at both the research and teaching levels can be summarized as follows.

Absence of specific objectives and a general plan, and the restriction of marine science teaching in many Arab universities to biological specializations only; different systems of education as some adopt the credit hours system while others apply the traditional year system; lack of textbooks and shortage of specialists and facilities, limited exchange and co-operation among Arab universities; different languages of teaching, i.e. French, English and Arabic; absence of a specialized scientific journal at the Arab world level and the limited number of research papers published by Arab scientists in world-famous journals.

21. Dr Y. Lalami stressed the need to link scientific research to education in the field of marine sciences. Scientific research at the national level had to be boosted within the context of projects or programmes, directly related to development priorities. For that purpose, the number of qualified personnel should be urgently increased by supporting postgraduate studies in co-ordination with production sectors, taking into consideration research programmes and priorities. Moreover, research institutes and establishments should be freed from the constraints of centralization and formalities for the

procurement of equipment and reference books had to be reduced. Libraries should be supplied with references and specialized scientific periodicals. Finally, the sectors concerned with marine life should be made aware of the problems of education and the strategic importance of university education in the field of marine sciences. The guiding concepts in this connection could be defined as follows: promoting awareness about marine sciences, standardization and co-ordination of teaching and research methodologies and equivalence of certificates, mobilization of common resources both human and material, joint planning and finally the transfer of technology. Those guiding principles were related to the modern concept of scientific research: research for education and training and research for development.

According to the speaker, unity with variation is the best means for collective efforts, as unity of thought is a pre-condition for unity of action.

22. Dr Lamrini then highlighted the fertility of the seas bordering the Arab Magrib. He mentioned university and other institutions responsible for the training of qualified manpower for the management of fisheries and the implementation of marine science research projects, particularly the 'Institut Agronomique et Veterinaire Hassan II in Rabat. In 1975 the institute established an ichthyology section offering four degrees in marine sciences at the diploma and doctorate levels. He also explained the general framework of the teaching system at the institute and summarized current research programmes, mainly directed towards the study and management of fisheries.

The speaker concluded by pointing out obstacles and problems hindering the progress of activities, namely the absence of a research vessel, the lack of educators and equipment and the small area allotted to the ichthyology section.

V. EDUCATIONAL SYSTEMS AT THE UNDERGRADUATE LEVEL IN ARAB COUNTRIES

23. Observations drawn from the working paper:

A student must have acquired sufficient knowledge of the basic sciences before applying for the study of marine sciences. It is estimated that 700 to 800 lecture hours (at the undergraduate level) will be required as recommended in Unesco Technical Papers No. 19 (1974).

A student must take an introductory instruction in marine science in the form of a multidisciplinary course of about 100-150 lecture hours before specializing in any specific marine dicipline.

Universities offering courses for specialization in one field of the marine sciences should make plans to cover the other major fields in order to train qualified manpower in the various disciplines.

The teaching of marine sciences requires a minimum of facilities which should be made available. The most important are research boats, laboratory and field equipment and basic reference manuals in marine sciences.

24. Dr N. Dowidar spoke on curricula at the undergraduate level. He said that despite the existing different systems for teaching marine science in Arab universities, there were basic considerations that ought to be borne in mind when preparing marine science curricula:

(a) Students must possess an adequate background in the basic sciences in general before specializing in one specific discipline. Experts have recommended that 700 to 800 lecture hours would be required. For that reason, some specialists are in favour of starting marine science studies at the postgraduate level.

(b) Given the multidisciplinary nature of marine sciences, students need to become adequately familiar with its various disciplines through courses ranging from 100-150 lecture hours.

(c) The areas and degrees of specialization should be related to national objectives. The prevailing systems of marine science teaching at the undergraduate level go into two different directions: one leading to a general degree in marine sciences with equal portions of instruction in the four disciplines, while the other leads to a specialized degree, i.e. B.Sc. degree in one of the four disciplines. In both cases it was recommended that study programmes comprise about 350-400 lecture hours and some 600 hours of practical and field training including an introductory course in marine sciences. The general degree might be more suitable for developing countries.

He told the meeting that the specialized degree awarded by the University of Alexandria was to be modified to offer students a general B.Sc. degree covering a basic subject such as chemistry or zoology in addition to one specific marine discipline. It was also necessary to introduce applied disciplines related to the environment and its economic activity such as fish-culture, fisheries management, pollution, protection of the environment and of shores, ocean engineering, etc. Applied disciplines should preferably be introduced at the postgraduate level.

It was important to focus on the practical laboratory and field training of students and to use modern audio-visual aids. It was also to be noted that the Arab world lacked scientific reference books on local environmental conditions. There was an urgent need for the preparation of appropriate textbooks through the joint efforts of Arab scientists.

25. Discussion of the system of education at the undergraduate level

The participants analysed and discussed the various aspects of education at the undergraduate level. Following are the principal conclusions:

25.1 Courses and degrees

It is more appropriate to offer undergraduate students marine science courses equivalent to 50 lecture hours in order to increase their understanding of basic sciences. In this case the degree obtained will be a general degree in a basic subject (such as chemistry) in addition to marine sciences.

Marine science courses could be offered within the basic science curricula of the traditional departments. Thus, it would be possible to teach chemical, physical, geological and biological oceanography in the corresponding basic departments of the faculties of science which have no special marine science department.

The teaching of basic subjects should be increased or brought into balance with marine science teaching in accordance with the actual needs and the types of experts required at the national level. These may be generalists qualified to perform certain technical functions that do not involve specific environmental activities, or specialists specifically qualified and trained to carry out scientific research at the postgraduate level.

Efforts should be directed towards producing well-trained specialists capable of serving the national environment.

Guidelines should be elaborated to indicate the courses to be offered at the undergraduate level. These could differ from courses at the postgraduate level depending on the views of the professors concerned.

Universities offering no degrees in marine sciences can teach a number of courses related to marine sciences in order to give students a better understanding of marine disciplines. It should be taken into consideration that graduates may be employed in applied activities, such as fish-culture or fisheries or as teachers at intermediate levels of education, while outstanding students could pursue specialized studies and in-depth research.

Technical institutes should be established to train technicians and skilled manpower needed for maintenance and repair of technical equipment used in the fields of marine sciences, as well as for assisting in collecting samples and data on board research vessels.

25.2 University textbooks

It is desirable that specialized Arab professors prepare university reference books in marine sciences to help teachers and students in the study of the local environment.

Each country and each university should be free to choose appropriate examples from the local environment.

The preparation of textbooks in marine sciences in Arabic and other languages should be encouraged. They must include basic information on the local environment. Arab and international organizations are urged to sponsor the publishing of such textbooks.

Attention should be given to the convocation of a meeting of specialists to consider publishing a reference manual and to seek sources of financing. In this respect the representative of Unesco stated that the Open University had been commissioned by Unesco to publish a special comprehensive volume on tropical marine sciences.

25.3 Practical and field training

At universities offering degrees in marine sciences:

a minimum of 600 hours of practical and field training should be included in the teaching programme.

At universities offering no degrees but some courses in marine sciences:

students should be given not less than two weeks of practical field training to get acquainted with the marine environment and its problems.

Postgraduate studies:

the recommendations contained in the Unesco Technical Papers No. 19 may be followed.

The possibility of offering outstanding students a limited period of shipboard training should be considered.

25.4 Exchange of professors and students

To make a recommendation on the necessity of regional co-operation including the exchange of visiting professors and students and the need to provide the necessary facilities to students from other universities on a reciprocal basis.

To prepare a list of the names and areas of specialization of all persons working in the field of marine science in the Arab world to serve as a directory of marine scientists in the Arab universities. Such a publication can be useful in making up shortages in certain areas as well as in seeking the assistance of Arab expertise to solve specific problems.

To encourage the system of visiting professors to meet shortages in specific areas.

To encourage the holding of short-term training courses with the assistance of international or regional organizations or through bilateral co-operation. Such courses should aim at training students in the most recent techniques so that they may become versed in the use of sophisticated equipment and update their knowledge from time to time.

To study the possibility of offering students short-term training in specific subjects at certain universities with financial support from international and Arab organizations.

VI. POSTGRADUATE STUDIES AND RESEARCH IN ARAB UNIVERSITIES

26. Observations drawn from the working paper

The working paper made it clear that teaching programmes and courses offered at the postgraduate level vary from one university to another. It is not required that one system be adopted in all Arab universities but it may be useful to evaluate these experiments in the light of national objectives and the scientific and practical experience gained by marine science students under these systems.

27. Dr Y. Halim presented this theme. He defined postgraduate studies and discussed their objectives and curricula and underlined the two stages

required, namely, study and research. Another important point was that students should also have a good knowledge of English, the international language of science. He then explained that specialized study should start with an introductory course in marine science prior to the stage of specialization. This must be followed by research work and submission of a thesis. It was also important to introduce courses in informatics and ecological models at the postgraduate level.

According to the speaker, scientific research in Arab universities suffered from a lack of senior research scientists, isolation and shortage of equipment and reference material. Such deficiencies resulted in unvaried and descriptive research, mostly of limited local interest.

It was desirable to expand the scientific channel system between Arab universities as well as between them and foreign universities. Attention should also be given to multidisciplinary research projects to be carried out by teams of researchers as well as to developmental studies.

28. Dr F. Kurtas then spoke about the Tunisian experience in the fields of marine science teaching and research. He explained the system of teaching marine sciences at the Faculty of Science and the National Institute for Agricultural Sciences at Tunis. The speaker then focused on the research work carried out in the various fields of marine sciences in all the institutions concerned and underlined the importance of research activities and dissertations. He concluded by listing certain shortcomings such as the absence of a modern well-equipped research vessel, a data bank and workshops to repair scientific equipment. In addition, there was a lack of some specializations such as physical oceanography.

29. Another topic concerned employment opportunities for postgraduates in marine sciences and the role of national universities in providing institutes of applied research with scientists specialized in the various marine disciplines. In this connection, Dr Ahmad El-Rifai Bayoumi spoke about the Marine Science and Fisheries Institute in Egypt, indicating that it was the largest institute offering job opportunities to postgraduates in marine sciences. Relations between the institute and universities began in 1928 when the Faculty of Science of the Egyptian University considered building a laboratory in Hurghada on the Red Sea Coast, actually built in 1931 and later affiliated to the Institute. The speaker then explained the organizational structure of the Institute, with its three branches: Alexandria, the Red Sea and the internal waters. He gave detailed information on the areas of specialization, the numbers of scientists and their occupations. Dr Bayoumi then demonstrated the findings of a survey covering 116 scientists and the universities from which they obtained their degrees at the various levels leading to the Ph.D. The findings of that survey are presented in Tables 1, 2, 3 and 4 which show that most of the first degrees and masters degrees were obtained from the University of Alexandria, followed by the Universities of Cairo, Ain Shams and Al-Azhar. As for Ph.D degrees, most were obtained from foreign universities followed by the University of Alexandria and Cairo University.

Table 1 - Research professors

Table 2 - Assistant research professors

Table 3 - Researchers

Table 4 - Assistant lecturers

Table 1

Research professors at the Institute

University	First degree	M.Sc.	Ph.D.	Remarks
Cairo	7	5	1	
Alexandria	3	4	3	
Ain Shams	-	-	-	
Other Egyptian universities	-	-	-	
Foreign universities	-	-	6	
Total	10	9	10	9 men 1 woman

Table 2

Assistant research professors at the Institute

University	First degree	M.Sc.	Ph.D.	Remarks
Cairo	4	4	3	
Alexandria	15	12	2	
Ain Shams	1	-	-	
Foreign universities	-	4	15	
Total	20	18	20	17 men 3 women

Table 3

Researchers at the Institute

University	First degree	M.Sc.	Ph.D.	Remarks
Cairo	4	5	3	
Alexandria	30	26	9	
Ain Shams	2	1	-	
Assiut	2	1	-	
Al-Azhar	3	2	2	
Foreign universities	1	-	28	
Total	42	35	42	34 men 8 women

Table 4

Assistant lecturers at the Institute

University	First degree	M.Sc.	Remarks
Cairo	4	6	
Alexandria	36	33	
Ain Shams	2	3	
Assiut	1	-	
Al-Azhar	-	-	
Tanta	1	-	
Foreign universities	-	2	
Total	44	44	31 men 13 women

30. Development of postgraduate studies and research

The discussion centred around the following points:

30.1 Objectives of postgraduate studies: The participants stressed the need to train postgraduate students and get them used to self-reliance in acquiring information through libraries, reading, investigation and deduction and the preparation of scientific essays.

30.2 Situation of postgraduate studies in Arab universities

The participants made reference to the diversity of postgraduate study systems in universities due to different traditions and systems as well as to certain historical reasons. Some Arab universities had specific departments or divisions to teach marine sciences and offered postgraduate studies. Other universities offered undergraduate studies only, with postgraduate studies still under consideration. Higher institutes in the Arab Maghrib were interested in programmes aimed at qualifying students for work in applied marine sciences.

30.3 Systems of postgraduate education

The discussion revealed a preference for a system of study and research at the masters degree level. Such a system combines courses and research work to be included in a thesis. Due to its many advantages, that system has become the one most widely used in Arab universities. Another system, still adopted by some Arab universities, allows for masters degrees through a thesis only, without offering any courses. They are only assigned research work and required to submit a thesis to a committee of examiners.

30.4 Prerequisites of postgraduate registration

The discussion dealt with subjects a student should have covered at the undergraduate level, and whether some marine science disciplines should have been studied. They agreed that a student with a B.Sc. in basic sciences could apply for a masters degree in marine science, provided that he take such courses in general oceanography as might be deemed necessary by the university. Within that context, the participants recommended the following:

a student holding a first degree should spend an adequate qualifying period before conducting specialized research work to obtain postgraduate degrees in marine science;

marine science courses should not constitute less than 24 credit hours during postgraduate studies, thus realizing the main objective of teaching students the basic concepts of the marine environment.

30.5 Postgraduate research and joint supervision

The participants discussed the subjects of research work undertaken by postgraduate students. Many of them were in favour of research projects covering various aspects each assigned to one student within the framework of an integrated team supervised by a group of professors. However, some participants expressed reservations due to the insufficient number of students and professors to form a multidisciplinary team. It was, therefore, decided to leave the matter to the science departments of Arab universities.

The participants also discussed joint supervision by Arab and foreign universities. Many of them also favoured joint supervision by Arab university professors.

VII. MAIN PROBLEMS FACING MARINE SCIENCES IN ARAB UNIVERSITIES AND SUGGESTED SOLUTIONS

31. Observations drawn from the working paper

The working paper indicated several constraints that hindered marine science studies and research in Arab univesities. They could be summarized as follows:

the shortage of specialists in physical, chemical and geological oceanography;

the lack of specialists in the most needed applied diciplines related to environmental and economic problems;

the acute shortage of technical assistants and technicians capable of undertaking the operation and maintenance of scientific and oceanographic equipment and providing assistance on research vessels;

the absence of a plan to employ marine science graduates in Arab universities;

lack of close contacts between universities on the one hand, and governmental and non-governmental institutions concerned with marine sciences on the other;

the use of different instruction and research languages in Arab universities, some teach in Arabic while others use English or French, thus limiting to a certain extent scientific exchanges between Arab universities;

marked deficiency of marine science libraries and data exchange systems;

lack of facilities, especially research ships and laboratory equipment.

32. Discussion concerning the main difficulties

The discussion centred around a number of aspects:

32.1 The acquisition of references and abstracts

The participants unanimously noted the importance of libraries and access to sources of information which they summarized as follows:

(a) Publications about the Arab region by the Arabs themselves. These include:

scientific publications of research work carried out in Arab universities and scientific institutions;

master and doctorate theses approved by Arab and foreign universities.

(b) Publications about the Arab region by Arab and foreign scientists, especially in international scientific journals. They stressed the need to collect such data in order to facilitate access to them whenever needed. In this respect the following was suggested:

to publish a list of all persons engaged in the field of marine sciences in the Arab region;

to publish a compilation of the abstracts of academic theses submitted in the Arab region;

to compile abstracts of all scientific publications with the assistance of data centres;

to seek the assistance of the Arab Marine Science Society, still under formation, in collecting the above-mentioned data. Financial support should be sought from Unesco, ALECSO and other organizations to publish the compiled information;

to urge Unesco to complete its bibliography of the different marine ecosystems of the Arab countries following the examples of 'The Red Sea and the Gulf of Aden Bibliography' in co-operation with the Red Sea and Gulf of Aden Environment Programme (PERSGA) and ALECSO and the 'Southern Mediterranean Lagoons Bibliography'.

32.2 Research vessels

The participants summarized that a small- or medium-sized ship should be made available for the training of students.

Regarding Arab research vessels, the participants recommended that neighbouring centres should share one ship in order to reduce the high costs of operating such ships. They also underlined the need to utilize foreign research vessels operating in the Arab region by taking part in research work held on board and participating in the elaboration of results whenever possible.

32.3 Funds to finance marine science research

In view of the importance of marine research in the development of the marine environment and its beneficial effect on the region's economy in the long run, the participants called upon Arab universities, government authorities and non-governmental organizations to allocate sufficient funds to marine research.

32.4 Shortage of specialized personnel

The participants stressed that the absence of clear planning might lead to a lack of the necessary qualified manpower. It was therefore necessary to draw up a comprehensive strategy of action in each centre and to overcome the shortage of qualified manpower through co-operation with other Arab centres which had the needed specializations, the exchange of expertise and sending postgraduate students for specialized training at these centres.

32.5 Employment opportunities for graduates

Graduates should be provided with some applied experience to enable them to take part in the implementation of national development plans. Such experience should cover pollution control, rational exploitation of marine resources, etc., besides academic experience.

The participants also stressed the need to establish links between university centres and prospective employers through joint committees as well as other means of communication and co-operation.

32.6 Equipment and access to data

The participants discussed the need to train local technicians in the operation and maintenance of equipment used at marine science centres. Operation of these devices should be restricted to qualified technicians in order to avoid breakdowns and to facilitate repair work and maintenance.

With regard to marine data, Arab scientists were urged to provide national, regional and international data centres with the data available to them in order to enrich the world's scientific heritage and help foreign scientists learn about the contributions of Arab scientists to marine sciences.

The participants also encouraged Arab scientists to draw on the resources of the above-mentioned data centres in their studies.

32.7 The participants considered the suggestions submitted by experts from the Arab Maghrib countries (Libyan Arab Jamahiriya, Tunisia, Algeria and Morocco) regarding the difficulties encountered in training specialists and conducting scientific research in marine sciences and their desire to foster co-operation among these countries in all spheres, particularly the field of marine science.

The suggestions included the exchange of students, the organization of training courses on specific environmental problems, the exchange of research scientists and professors, the organization of periodic conferences and workshops and avoiding duplication of scientific research programmes. The above-mentioned countries also suggested the establishment of an Arab documentation centre in the fields of marine science, an oceanographic data centre and an Arab centre for reference collections. They stressed the need to utilize ARABSAT in marine research and to continue to use more than one language in scientific research for the time being. Furthermore, major joint projects need to be planned, following the example of 'The International Indian Ocean Expedition'.

VIII. PROPOSAL FOR THE FORMATION OF A UNION OF ARAB MARINE SCIENTISTS

The participants had the opportunity and time to discuss a proposal for the formation of a union or a non-governmental society of Arab scientists in marine sciencee and related applied activities.

Consultations in this connection took place outside the meeting in a positive manner that augured well for the creation of such a non-governmental marine science society.

IX. RECOMMENDATIONS

The meeting spent a great deal of time discussing recommendations submitted by the participants. Finally, specific recommendations were formulated and unanimously adopted by the participants. The text of these recommendations is contained in Annex I.

X. ADOPTION OF THE SUMMARY REPORT

The meeting adopted the draft summary report and requested the Unesco Secretariat to make the necessary editorial corrections and improvements in the final version.

XI. CLOSURE

The Chairman of the meeting Dr Mohamed Wahba thanked the participants for their constructive spirit, and paid tribute to those who served as rapporteurs for the meeting. He finally thanked Unesco for giving the opportunity to the Aqaba Marine Science Station of Jordan for hosting this meeting.

Dr S. Morcos expressed his appreciation on behalf of Unesco, and the participants for the host institution for providing all the facilities required for the meeting and for making their stay in Aqaba both pleasant and profitable. He finally thanked the participants for their enthusiasm and co-operation in bringing the meeting to a successful end.

The Chairman closed the meeting at 1 p.m. on 5 December 1985.

ANNEX I

RECOMMENDATIONS

Undergraduate studies:

1. The participants recommend the following with regard to marine science teaching in Arab universities:

1.1 Marine science teaching should ideally start at the postgraduate level (i.e. when the student has obtained a B.Sc. or a 'Licence' in one of the basic sciences).

1.2 At universities not offering a degree in marine sciences, the courses offered at the first university level should include courses in marine sciences (chemical, biological, geological and geophysical oceanography) within the programmes of the corresponding basic science departments. Such courses should constitute at least 10 per cent of total credit hours.

1.3 At faculties offering a 'Licence' or B.Sc. degree in general oceanography or in one specific discipline of marine sciences, total hours devoted to marine science should not be less than 350 lecture hours in addition to practical and field studies. Such courses should include an introduction to marine sciences in the various disciplines for a minimum of 100 lecture hours.

2. Textbooks:

2.1 Arab scientists should be encouraged to write textbooks and reference manuals in the various fields of marine sciences in Arabic or in a foreign language. Such publications should include information relating to the marine environment in the Arab world.

2.2 The participants recommend that Unesco and ALECSO should support the preparation of an Arabic reference manual on principles of marine science with selected examples from the Arab environment.

3. Training:

3.1 Maximum attention should be given to practical (field and laboratory) training of students. Such training should take place in marine stations and centres concerned with subjects actually taught at the university.

3.2 Regional training courses should be encouraged in marine science subjects where there is a lack of scientific or praftical experience in Arab States.

4. Exchange of experience:

The exchange of marine science students, lecturers (visiting professors) and researchers should be encouraged among Arab universities and institutes.

Annex I

Graduate studies:

5. The participants are of the opinion that the main objective of graduate courses in marine science is to train specialists who would:

1. carry out scientific research;

2. direct and guide teaching and research activities;

3. provide advice on controlling and solving environmental problems;

4. take part in projects aimed at the management, development and protection of marine resources.

6. The participants believe that a system combining study and research would be the best at the postgraduate level. It is recommended that Arab universities should adopt such a system and make it possible for students with a first university degree in the basic sciences to specialize in marine sciences, provided that they take courses which qualify them for specialization.

7. The participants recommend that Arab universities should offer graduate students 350-400 lecture hours in marine sciences, including an introductory course in marine science and specialized study of one of the four basic marine science disciplines (i.e. physical, chemical, geological and biological oceanography).

8. The participants urge Arab universities interested in marine sciences to supplement their teaching staff by recruiting marine scientists capable of teaching in the various disciplines in order that their students may take the necessary courses in all subjects.

9. It is recommended that marine scientists should take action to improve the standards of research work carried out by graduate students. Adequate attention should be given to basic research and subspecialities. The links between academic and applied research should be taken into consideration within a balanced strategy.

10. The multidisciplinary nature of marine sciences and related research may require collaboration among several specializations so that research work may be both deep and comprehensive. In order to reach integrated results, the participants urged marine researchers in Arab universities to promote team work through the formation of research teams comprising different disciplines. It is, therefore, recommended that, whenever possible, joint programmes should be carried out with the participation of marine science specialists in faculties which do not include marine science departments.

11. It is recommended that Arab universities should adopt the principle of 'joint supervision' of graduate students by professors from Arab and/or foreign universities and research institutes. Such a system will be beneficial to both students and research standards. It also facilitates the exchange of experience and promotes co-operation among universities and scientific institutes.

12. The meeting recommends that universities should encourage graduate students to acquire proficiency in foreign languages, particularly English, in addition to Arabic, so that they may consult foreign sources and interact with them.

13. It is recommended that marine science institutes, centres, stations and departments should identify the fields in which marine science graduates may be employed. Co-ordination should be established with prospective employers through the creation of joint committees comprising representatives of employers as well as marine science educational institutions in order to agree on teaching, training and practice programmes that would qualify marine science students to participate in implementing national development plans.

14. The participants recommend that Arab universities and institutes should provide the necessary equipment and laboratories for conducting scientific research. It is also necessary to secure spare parts and maintenance. Emphasis should be placed on the training of national technicians to operate and maintain such equipment. To keep equipment in good condition, only qualified technicians should be allowed to operate them.

15. The participants call upon the competent authorities in the Arab States to create marine science national commissions which would draw up overall strategies for the promotion of marine science teaching and research.

Regional and international co-operation and scientific exchange:

16. The participants call upon Arab universities to co-operate in the different fields of marine science and to conclude bilateral and regional agreements for scientific and technical co-operation. It is also recommended that Unesco, ALECSO, the General Federation of Arab Universities and Arab Scientific Research Councils actively assist in making such co-operation a reality.

17. It is recommended that Arab marine scientists should support the creation of an Arab non-governmental marine sciences society composed of marine scientists in the Arab countries and abroad under the name of 'The Arab Marine Science Society' and to support its objectives of promoting marine science research and applications, developing marine science teaching and compiling a directory of marine science specialists.

The participants call upon Arab and international scientific organizations, societies and unions to give material and moral support to the new society.

18. The meeting urges Arab universities, institutes, stations and research centres:

(a) to prepare lists of the titles of successfully defended M.Sc. and Ph.D. theses in marine sciences and to update such lists regularly;

(b) to prepare abstracts of research papers in marine sciences published by each university, institute, station or centre individually.

It is also recommended that Unesco should co-operate with ALECSO and UNEP with a view to:

(a) compiling and publishing lists of the titles of successfully defended M.Sc. and Ph.D. theses in marine sciences;

(b) compiling and publishing lists of the names, fields of specialization, addresses and fields of interest of marine science researchers in Arab universities, institutes, centres and scientific stations;

(c) providing financial support for publishing the marine science research abstracts to be prepared by the Arab Marine Science Society once the society is formally founded.

19. The participants urge Arab universities and institutes:

(a) to seek to complete basic marine science disciplines in chemical, biological, geological and physical oceanography so that activities of Arab marine science institutes, departments, stations and centres may be based on a full understanding of the interdisciplinary nature of marine sciences;

(b) to encourage sending graduate students to Arab universities which have the necessary training facilities in their fields of specialization;

(c) to give priority to Arab scientists and specialists when filling vacancies in the teaching and research staff of Arab universities in the various disciplines.

20. It is recommended that universities and institutes in the Arab world should take the following measures:

(a) to provide an adequate number of boats for scientific research in their coastal and offshore zones;

(b) to co-operate with neighbouring institutes in using research vessels available to any of them to conduct scientific research in their territorial waters or carry out joint research projects within their common regional waters;

(c) to seek to use international research vessels operating in Arab marine zones for the purpose of research and training.

21. The participants urge Arab researchers to benefit from national, Arab and international marine data centres and to provide such centres with the data available to them.

22. The participants recommend that Arab universities should seek the assistance of Unesco, ALECSO, UNEP and other competent organizations with a view to supplementing their marine data bases with auxiliary information and data on meteorology, fishery statistics, etc., which are of great importance to marine researchers, and that universities should make the necessary data readily accessible to research scientists.

23. The participants believe that it is of the utmost importance to hold Arab marine science conferences on a periodic basis in order that Arab marine

scientists may come together, present the outcome of their research work and discuss matters relating to scientific research and its evolution in the Arab world. They recommend to Unesco to sponsor the first such conference within two years in co-operation with FAO, UNEP, ALECSO, the Federation of Arab Universities, the Federation of Arab Scientific Research Councils and other interested regional and international organizations. The participants call upon universities and marine science and fishery institutes and centres to make their facilities available for this purpose. They also call upon those engaged in the various disciplines of marine sciences to contribute to the success of this effort.

24. The participants recommend to Unesco:

(a) to sponsor and support the idea of creating an Arab regional network of institutions concerned with marine sciences, along the lines of ANSTI (African Network of Scientific and Technological Institutions), since such a network would have a very important role to play in serving the marine environment, protecting it from pollution, supporting fishery-related research and promoting the technical training of Arab marine scientists, researchers and technicians;

(b) to request UNDP to include this project in the list of priority projects to be financed by the UNDP regional programme for the Arab States which will be initiated in 1987.

25. The participants urge the governments of their respective countries to sponsor the vital project referred to in paragraph (a) of the preceding recommendation and to give it priority among those to be financed during the next cycle of the UNDP regional programme for the Arab States, as it will be instrumental in advancing marine sciences in their countries.

Annex II
الملحق ٢

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والتكنولوجيا ١٠١ ش القصر العينى
- القاهرة.

ت : العمل ٥٥٦٧٨٥/٥٥١٣٨١
المنزل ٣٤٦١٦٥٦

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المنزل ٦٦٧٨٣١

(بيولوجيا الاسماك-استزراع مائى)

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(بيئة بحرية - هائمات بحرية)

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(بيئة بحر المتوسط)

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وزارة الثروة السمكية ص .ب ١٢٤٢
- عدن - جمهورية اليمن
الديمقراطية الشعبية

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(كيمياء بحرية)

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ص . ب ٨٣٢ - الاسكندرية - مصر

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دمشق - سوريـــــا

ت : العمل ٢٢٨٤٧٤ بدالة ٤١٤
المنزل ٥٨٦٩٦٦١

(Marine biology - molluscs)

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(Benthic ecology - taxonomy of polychaeta)

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(Ecology of macrobenthic invertebrates)

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٢٩١٠٤٤ (المركز - يوم الثلاثاء)
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المنزل ٤٥٩٢٥٣

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المنزل ٩٤٠١٢١/٩٤٠٥٨٠

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المنزل ٧٩٩٣٠٠

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المنزل ٧٤٩٥٢

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المنزل ٤٢ ٥٠ ٣٩ ٧٧
تلكس : ٢٠٤٤٦١ باريس

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٥١٢٧٤٧/٥١١١٨٩
المنزل ٣٨٨٩٣

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(Marine environment- physical, chemical and biological)

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ت : العمل ٣١٥١٤٤/٥

(بيولوجيا بحرية)

ANNEX III

AGENDA

1. Opening
2. Administrative arrangements
   - 2.1 Adoption of the agenda
   - 2.2 Designation of Chairman, Vice-Chairman and Rapporteur
   - 2.3 Conduct of the session, timetable and presentation of document
3. Objectives of marine science teaching and research in Arab universities
4. Present situation of marine sciences in Arab universities
5. Educational systems at undergraduate level in Arab universities
6. Postgraduate studies and research in Arab universities
7. Main problems facing marine sciences in Arab universities and measures to upgrade teaching and research
8. Proposal for the formation of a union of Arab marine scientists
9. Recommendations
10. Adoption of the summary report
11. Closure

ANNEX IV

LIST OF DOCUMENTS

Document code	Title
WORKING DOCUMENTS	
SC/OCE/XII 85/1	Agenda
SC/OCE/XII 85/1	Timetable
SC/OCE/XII 85/2	Annotated agenda
SC/OCE/XII 85/3	Summary report
SC/OCE/XII 85/4	List of documents
SC/OCE/XII 85/5	List of participants
SC/OCE/XII 85/6	Working paper on marine sciences in Arab universities
INFORMATION DOCUMENTS	
Unesco Technical Papers No. 19	Marine science teaching at the university level. Report of Unesco workshop on university curricula. 1974 (Ar, E)
Unesco Reports No. 15	Fishery science teaching at the university level. Report of Unesco/FAO workshop on university curricula in fishery science, Paris, May 1980. 1981 (Ar, E, F)
Unesco Reports No. 25	Ocean engineering teaching at the university level. Recommended guidelines from Unesco/IOC/ECOR workshop on advanced university curricula in ocean engineering and related fields, Paris, October 1982. 1983 (Ar, E, F)
Unesco Reports No. 4	Syllabus for training marine technicians. Report of IOC/Unesco workshop, Miami, Florida, 22-26 May 1978. 1979 (E, F)
Unesco Reports No. 5	Marine science syllabus for secondary schools. Report of IOC workshop held at United World College of the Atlantic, United Kingdom, 5-9 June 1978. 1979 (E, F)

Annex IV

Document code	Title
Unesco Technical Papers No. 25	Marine science programme for the Red Sea. Recommendations of a workshop sponsored by Unesco and the Deutsche Forschungs-gemeinschaft. 1976 (E)
Unesco Technical Papers No. 26	Marine sciences in the Gulf area. Report of Unesco consultative meeting. 1976 (Ar, E)
Unesco Reports No. 28	Oceanographic modelling of the Kuwait Action Plan (KAP) region. Report of symposium/workshop, University of Petroleum and Marine, Dhahran, Saudi Arabia, 15-18 October 1983. 1984 (E)
Unesco Reports No. 31	Marine science of the north-west Indian Ocean and adjacent waters. Report of symposium on the occasion of the fiftieth anniversary of the Mabahiss/ John Murray Expedition (1933/1934), University of Alexandria, Egypt, 3-7 September 1983. 1983 (E)
Unesco Reports No. 7	Coastal ecosystems of the southern Mediterranean: lagoons, deltas and salt marshes. Report of meeting of experts, Tunis, 25-27 September 1978. 1979 (Ar, E, F)
Unesco Reports No. 6	Organization of marine biological reference collections in the Mediterranean Arab countries. Expert meeting held in Tunis, 20-23 September 1978. 1979 (Ar, E, F)
Unesco Reports No. 22	Guidelines for marine biological reference collections. Prepared in response to recommendation by a meeting of experts from the Mediterranean Arab countries. 1983 (Ar, E, F)

OTHER DOCUMENTS

Draft recommendations of a seminar of heads of departments and programmes of marine sciences in the Arab universities. ALECSO and Association of Arab Universities, Jeddah, 4-8 January 1979 (in Arabic only)

Brochure on African Network of Scientific and Technological Institutions (ANSTI) (E, F)

ANNEX V

MARINE SCIENCES IN ARAB UNIVERSITIES

Working paper submitted to the meeting of experts on Development of Marine Sciences in Arab Universities

Aqaba, Jordan (1-5 December 1985)

Every effort has been made to ensure the correctness of information in this document. The information included in this document was updated and revised during the meeting in Aqaba, Jordan, December 1985.

United Nations Educational,
Scientific and Cultural Organization

1985

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APPENDICES

INTRODUCTION

This working paper was prepared by a preparatory committee which met at the University of Alexandria from 24 to 27 June 1985, with the participation of staff members from Arab universities, specialized in marine sciences (Appendix I.B).

The information contained in this paper is derived in the first place from the replies received by Unesco to two questionnaires:

The first questionnaire dealt with marine science programmes at the first university level. It was prepared by the Survey Research Department of the Open University, United Kingdom, and the Division of Marine Sciences, Unesco, and distributed throughout the world to universities involved in the teaching of marine sciences at the first university level.

The second questionnaire was prepared by the Division of marine sciences, Unesco, and was later finalized by a working group of staff members of Arab universities, which met during the Congress and Plenary Assembly of the International Commission for the Scientific Exploration of the Mediterranean Sea, held at Lucerne, Switzerland, in October 1984. The purpose of that questionnaire was to obtain information on marine science teaching programmes in Arab universities both at the undergraduate and postgraduate and research levels.

In addition to the questionnaires, supplementary information was obtained from various sources, mainly through direct communication with faculty members.

Appendix II contains a detailed list of universities and institutes involved in the teaching of marine sciences in the Arab States.

Within each category of teaching, universities and institutes are classified geographically from east to west and from north to south as follows:

(a) universities of the Gulf region;

(b) universities of the Red Sea and the Gulf of Aden;

(c) universities of the eastern Mediterranean;

(d) universities of the Mahgrib region.

It is to be noted that no replies were received from a number of universities. Any additional information that might be received in the future will be included in a separate annex.

From an analysis of the information obtained through the questionnaires and other sources on marine science teaching in Arab universities, it appears that Arab universities involved in the teaching of marine sciences can be classified into three major categories (Annex II) as follows:

I. Universities offering degrees in marine sciences at the undergraduate level.

Annex V

II. Universities offering no degrees but some courses in marine sciences.

III. Institutes offering applied degrees in the management of marine resources, their curricula including some courses in marine sciences.

I. UNIVERSITIES OFFERING DEGREES IN MARINE SCIENCES AT UNDERGRADUATE LEVEL

1. UNIVERSITY OF QATAR (Doha, Qatar)

Historical review

The teaching of marine science courses started with the foundation of the university in 1977 as part of the curricula of the Zoology Department. In 1979, a department of oceanography was created within the Faculty of Science.

Title of first degree

A B.Sc. in Oceanography is offered, either as a major (65-70 credit hours in marine sciences) or as a minor (25-30 credit hours) as follows:

Marine science as major	Marine science as minor
B.Sc. in Oceanography + Zoology	B.Sc in Zoology + Oceanography
B.Sc. in Oceanography + Geology	B.Sc. in Geology + Oceanography
B.Sc. in Oceanography + Chemistry	B.Sc. in Chemistry + Oceanography
B.Sc. in Oceanography + Physics	B.Sc. in Physics + Oceanography

Students are oriented to the marine science disciplines corresponding to their basic science training. It is to be noted that the levels of marine science learning in the various disciplines are not quite equivalent.

General system of education

The credit hours system is applied and 144 credit hours are required for graduation.

Teaching language

The teaching language is Arabic.

Purpose of marine science teaching

To train specialists in the various marine sciences with a view to contributing to the development of living and non-living resources of the marine environment, overcoming pollution problems, protection of the environment and meeting the country's needs for specialists in marine science disciplines.

Basic science prerequisites

Up to 60 credit hours in chemistry, physics, mathematics and statistics, biology and geology.

Percentage of each marine discipline to total marine sciences

Credits vary depending on the basic sciences taught as minors.

Annex V

Proportion of marine sciences to all credits

Approximately 48 per cent of marine science is chosen as a major and 33 per cent as a minor.

Number of faculty members

The faculty consists of some ten professors and lecturers, all foreigners:

two for physical oceanography;

two for chemical oceanography;

two for geological and geophysical oceanography;

three for biological oceanography.

Available facilities

1. There is a well-equipped research vessel (Mukhtabar Al-Bihar), specially built for the university in 1981 under the supervision of Unesco.

2. No marine station is available. However, the department has some well-equipped laboratories.

3. The Faculty of Science library is fairly well provided with marine science publications.

4. The university publishes an annual review 'The University of Qatar Review' which includes some articles in various marine science disciplines.

Number of graduates

Twelve graduates.

Research projects

In addition to the national plan for surveying territorial waters of the State of Qatar, monitoring all forms of marine pollution and the management and development of marine resources, the Oceanography Department takes part in a special survey programme carried out by ROMPE (The Regional Organization for the Protection of the Marine Environment).

Postgraduate studies

No graduate studies for M.Sc. or Ph.D. degrees are offered in marine sciences.

2. KING ABDULAZIZ UNIVERSITY (Jeddah, Kingdom of Saudi Arabia)

Historical review

Marine science teaching at the university was initiated in 1974 with the creation of a department of oceanography within the Faculty of Science. In 1978, the department was developed into a separate institute comprising four departments devoted to the major marine science disciplines, i.e. biological, physical, chemical and geological oceanography. In 1981, the institute was renamed the Faculty of Marine Science with the same four departments.

Title of the first degree

The faculty offers the following B.Sc. degrees:

(a) B.Sc. in Physical Oceanography;

(b) B.Sc. in Chemical Oceanography;

(c) B.Sc. in Geological Oceanography;

(d) B.Sc. in Biological Oceanography.

General system of education

The system adopted for teaching and evaluation is that of credit hours over two main semesters. A third summer semester may be organized. For graduation, 129 hours of successful study are required.

Teaching language

Arabic is the official teaching language. However, English may be used in some cases.

Purpose of marine science teaching

The basic marine science programme of the faculty is designed to give students a comprehensive background in the various marine science disciplines with specialized knowledge of one of the major disciplines. It also aims at training qualified personnel to serve the objectives and development plans of Saudi Arabia in fields of activity related to the marine environment, its development and protection, and to provide oceanographic data to the various sectors.

Basic science prerequisites

Fifty-seven credit hours in mathematics, statistics, physics, chemistry, geology and biology are required. Relative credits depend on the department of specialization in marine sciences.

Percentage of each marine discipline to total marine science credits

The main field of specialization constitutes some 50 per cent of total marine science credits. The remaining credit hours are rather evenly allocated to other marine science disciplines.

Annex V

Proportion of marine science to all credits

About 40 per cent.

Number of faculty members

The faculty consists of about 24 professors and lecturers as follows:

for physical oceanography: three, all foreigners;

for chemical oceanography: five, including one national;

for geological oceanography: four, including one national;

for biological oceanography: 12, including seven nationals.

Available facilities

1. A fairly equipped research vessel and a number of small boats for operation in the coastal zone are available.

2. There is a marine station with well-equipped laboratories and accommodation for 12 researchers. It is also equipped with a museum and indoor and outdoor aquaria.

3. The faculty has a specialized marine science library, well-provided with periodicals and books.

4. An annual scientific bulletin 'Bulletin of the Faculty of Marine Science' is published in English and exchanged with different universities and marine research institutions.

Number of graduates

More than 100 students have graduated since the creation of the department.

Current research projects

Apart from the faculty's plan for the investigation of the coastal environment of the Jeddah area and its surroundings, there is a number of joint research projects. The most important are:

(a) an ecological study of the coral reefs in co-operation with the University of Nice, France;

(b) a survey of fishery resources in the Red Sea Saudi waters, currently from Jeddah to Jizan. The sector extending from Yanbou to Jeddah has already been covered. This research project is carried out in co-operation with the Ministry of Agriculture and Water Resources.

Postgraduate studies

B.Sc. graduates in the basic science are offered a one-year diploma in physical, chemical, geological or biological oceanography.

The university also offers M.Sc. degrees (courses and research) in the four major disciplines (physical, chemical, geological and biological oceanography) to graduates holding a B.Sc. in Oceanography or a diploma in the above-mentioned disciplines. The by-laws of the university allow for registration for Ph.D. degrees in marine science disciplines. So far, two M.Sc. degrees in biological oceanography have been awarded.

3. UNIVERSITY OF SANA'A (Sana'a, Yemen Arab Republic)

Historical review

The teaching of marine science was initiated in 1976 within the Department of Biology (Oceanography Section).

Title of first degree

A B.Sc. in Biological Oceanography is offered by the university.

General system of education

The general system is that of credit hours. One-hundred-and-thirty-two credits are required for graduation.

Teaching lanauge

The teaching language is English.

Purpose of marine science teaching

The teaching of marine science aims at providing the students with a background about the marine environment and the various fields of oceanography and training specialists to serve the objectives of government plans.

Basic science prerequisites

About 50 credit hours are required.

Percentage of each marine discipline to total marine sciences

Biological oceanography: 54 per cent

Chemical oceanography: 12 per cent

Geological oceanography: 10 per cent

Physical oceanography: 6 per cent.

The remaining credits are allocated to general subjects related to marine sciences.

Proportion of marine sciences to all credits

Approximately 36 per cent.

Annex V

Number of faculty members

There are two staff members only in the oceanography section, one in biological oceanography and the other in chemical oceanography. Both are foreigners.

Available facilities

The university has no marine station or research vessels at present. The existing library is fairly provided. No journals or scientific publications specialized in marine sciences are published by the university.

Number of graduates

Approximately 12 students have graduated from the section since 1980.

Current research projects

As a result of insufficient facilities, no research projects are included in the faculty's plan.

Postgraduate studies

No postgraduate studies are available at the university in the field of marine sciences.

4. SUEZ CANAL UNIVERSITY (Ismailia, Egypt)

Historical review

The university was founded in 1976. Marine sciences are taught in the marine biology section of the Department of Biology. Teaching started in 1982.

Title of first degree

A B.Sc. in Biological Oceanography is offered by the university.

General system of education

As in all Egyptian universities, the general system of education is the traditional four-years system.

Teaching language

English.

Purpose of marine science teaching

The purpose of marine science teaching is to train specialists in biological oceanography for the investigation of the marine environment and the management of marine resources.

Basic science prerequisites

Two-and-a-half years of studies in basic science are prerequisited, particularly in biology.

Percentage of each marine discipline to total marine sciences

Marine biology: 50 per cent

Fisheries: 25 per cent

Marine geology: 10 per cent

Marine chemistry: 10 per cent

Other subjects (marine physics and survey): 5 per cent.

Number of faculty members

There are three staff members specialized in marine algae, intertidal fauna and fish biology respectively.

Available facilities

1. No research vessel is available at presnt.

2. There are two marine stations, one at Sharm El-Sheikh and the other on the Bitter Lakes.

3. There is no specialized library in marine sciences.

4. The university has no scientific publication specialized in marine sciences.

Number of graduates

Fifteen students have graduated in marine biology.

Postgraduate studies

Although registration for M.Sc. and Ph.D. degrees in marine sciences is allowed by the by-laws of the university, no candidates applied until 1984. Seven students applied for M.Sc. degrees in marine biology (courses and research) in the academic year 1985/1986. A B.Sc. in Biological Oceanography is required. An M.Sc. in Marine Sciences is a prerequisite for registration for Ph.D. degrees.

5. UNIVERSITY OF ALEXANDRIA (Alexandria, Egypt)

Historical review

The Oceanography Department was founded in 1948 within the Faculty of Science. Marine science teaching was restricted to postgraduate students who studied for two years to obtain a diploma in oceanography. The department admitted students holding a B.Sc. in one of the basic sciences. Diploma-holders were allowed to register for an M.Sc. then for a Ph.D. Later, the duration of diploma courses was reduced to one year.

In 1966, oceanography was introduced at the first degree level to train specialists in biological oceanography. Students have successfully completed

two years of study in biology and chemistry were admitted to the Oceanography Department. In 1971, the B.Sc. in Biological Oceanography was replaced by a B.Sc. in General Oceanography. It became necessary to offer third- and fourth-year students equal courses in three marine science disciplines, namely chemical oceanography, geological oceanography and biological oceanography, in addition to the fundamentals of physical oceanography. In the same year, a new B.Sc. in Physical Oceanography was offered to students having completed two years of study in mathematics and physics.

Title of first degree

The University of Alexandria offers two degrees; a B.Sc. in General Oceanography and a B.Sc. in Physical Oceanography.

General system of education

The traditional system is applied in teaching and evaluation. Students graduate after four years of successful study.

Teaching language

The teaching language is English.

Purpose of marine science teaching

The study programme aims basically at training qualified personnel in the various disciplines in order to help attain the country's objectives in the fields of marine studies and control of marine environmental problems. It is also designed to provide the research and production sectors with specialists and consultants in the various fields of marine science.

Basic science prerequities

These are equivalent to two-and-a-half years of study or 64 credit hours.

Percentage of each marine discipline to total marine sciences

General oceanography

Biological oceanography: 19 per cent

Fish and fishery biology: 12 per cent

Marine geology: 19 per cent

Marine chemistry: 12.5 per cent

Physical oceanography and marine meteorology: 12.5 per cent

Other subjects (mariculture, fish processing, fish nets and pollution): 12.5 per cent

Two-week field training: 12.5 per cent.

Physical oceanography

Physical and dynamic oceanography: 44 per cent

Marine meteorology, survey and geophysics: 25 per cent

Chemical oceanography: 6 per cent

Geological oceanography: 6 per cent

Biological oceanography: 6 per cent

Two-week field training: 13 per cent.

Proportion of marine science to all credits

Forty-five per cent.

Number of faculty members

Sixteen staff members covering the various fields of marine science (doctorate level) as follows:

six for biological oceanography;

four for chemical oceanography;

four for physical oceanography;

two for geological oceanography.

The department also comprises 16 assistant lecturers and demonstrators as follows:

eight assistant lecturers (M.Sc. level);

eight demonstrators (B.Sc. level).

Available facilities

1. The department does not own a research vessel at present.

2. There is a marine station well-equipped with laboratories at Anfoushy.

3. The marine science library is part of the Faculty of Science library.

4. The faculty publishes a non-periodical journal including some articles related to marine sciences.

Number of graduates

Since 1964, some 340 specialists have graduated at the B.Sc. level.

Annex V

Research projects

In addition to the research activities carried out by the department and covering Egyptian coastal waters and lagoons, joint research projects are undertaken in co-operation with the United States of America, Unesco and UNDP.

Postgraduate studies

(a) Postgraduate diplomas

A higher diploma is offered in the four major marine disciplines, i.e. physical, chemical, geological and biological oceanography, to holders of B.Sc. degrees in the corresponding basic sciences: mathematics, physics, chemistry, geology, botany and zoology.

(b) Masters degrees

Masters degrees combining courses and research are offered in the above-mentioned major disciplines to graduates holding a B.Sc. in Oceanography or a higher diploma in physical, chemical, geological or biological oceanography.

The department has so far awarded the following M.Sc. degrees in marine sciences:

16 M.Sc. degrees in physical oceanography

21 M.Sc. degrees in chemical oceanography

8 M.Sc. degrees in geological oceanography

78 M.Sc. degrees in biological oceanography (including 25 degrees in fish biology)

123

(c) Ph.D. degrees in marine sciences

Holders of M.Sc. degrees in the above-mentioned marine science disciplines are admitted. The department has so far awarded the following Ph.D. degrees:

3 Ph.D. degrees in physical oceanography

4 Ph.D. degrees in chemical oceanography

3 Ph.D. degrees in geological oceanography

14 Ph.D. degrees in biological oceanography

24

II. UNIVERSITIES OFFERING NO DEGREES BUT SOME COURSES IN MARINE SCIENCES

1. BASRAH UNIVERSITY (Al-Basrah, Iraq)

Basrah University is one of the oldest universities in the Gulf region. The teaching of marine science courses started in 1973 in the Department of Biology of the Faculty of Science and the Department of Fisheries and Marine Resources of the Faculty of Agriculture.

In 1976 a Marine Science Centre, administered directly by the Presidency of Basrah University, was created. The centre is supported by Unesco within the framework of a project financed by the Government of Iraq. With the creation of the centre, study missions were sent to universities in Europe for the training of nationals in different fields of specialization.

Title of first degree

Basrah University offers a B.Sc. in Biology.

Teaching language

Arabic.

Number of faculty members specialized in marine sciences

Marine biology: 3

Marine geology: 2

Marine physics: 1

Marine chemistry: 3

Fisheries: 3

Marine zoology: 4

Marine fish: 6

General system of education

Credit hours.

Available facilities

1. An equipped 31-metre fishing boat and a number of boats.

2. A marine station on the estuary as well as various laboratories, specialized in marine sciences in some faculties.

3. A specialized scientific journal: the Iraqi Marine Science Journal.

Current research projects

A research project is under way in co-operation with Unesco (Marine Sciences Division). Other projects are carried out with ROPME (Regional Organization for the Protection of the Marine Environment) under the Kuwait Action

Plan. There are also some joint projects with the Kuwait Scientific Research Intitute and the Oceanography Department of the University of Qatar.

Postgraduate studies

Basrah University offers an M.Sc. degree in basic science. Some M.Sc. degrees in biological oceanography and marine fish were awarded. The Marine Science Centre receives a number of postgraduate students registered at the Faculty of Science for M.Sc. degrees in marine sciences.

2. KUWAIT UNIVERSITY (Kuwait)

The university was founded in 1966. The Faculty of Science comprises seven departments including zoology, geology and botany and microbiology. Education in these departments focuses on the local environment. The study of marine sciences is limited to the three departments. However, these courses are optional unlike the other basic sciences.

In 1973 there were plans to create an independent department of marine sciences. A committee was set up for this purpose in 1978 but circumstances were not favourable. Education remained the same in these departments at the Faculty of Science. However, there are plans to found a Faculty of Marine Studies in Kuwait which have received the agreement of the Kuwait House of Representatives two years ago.

General system of education

Credit hours.

Teaching language

Basically English.

Marine science courses taught in the basic science departments

1. Department of Botany and Microbiology: marine biology, marine flora, physiology of algae.

2. Department of Zoology: introduction to marine sciences, marine biology, marine environment, fish physiology.

3. Department of Geology: marine geology.

Proportion of marine sciences to all credits

The proportion is insignificant compared to other basic sciences particularly as marine science courses are optional.

Number of faculty members interested in marine sciences

Chemistry: 2

Geology: 4

Biology: 6

Physics: none at present.

Available facilities

No research vessel, marine stations or specialized marine laboratories are available. However, there is a laboratory at the Kuwait Institute for Scientific Research which can be used. Most of its staff members have been sent on missions abroad to obtain scientific degrees. There is no specialized scientific library and no specialized scientific journal.

Current research projects

Some research projects are carried out in co-operation with the Kuwait Institute for Scientific Research, and with regional and international programmes.

Postgraduate studies

Kuwait University offers M.Sc. degrees in basic sciences.

3. UNIVERSITY OF AL-AYN (Al-Ayn, United Arab Emirates)

The University of Al-Ayn is one of the universities recently founded in the Gulf region. It was established in 1977.

A B.Sc. in basic science is offered by the university.

Teaching language

Arabic and English.

Number of faculty members

Only one staff member of the Biology Department is specialized in marine science.

Marine science courses

An introductory course in marine biology is given to B.Sc. students in the Department of Biology. There are no facilities for research at present. However, there is a laboratory for fish-culture in the Fougueira Emirate.

Postgraduate studies

No postgraduate studies are offered at present.

4. YARMOUK UNIVERSITY (Irbid, Jordan)

5. UNIVERSITY OF JORDAN (Amman, Jordan)

The University of Jordan and Yarmouk University are interested in marine sciences with the purpose of scientific research, the collection of basic information about the environment of the Gulf of Aqaba and the levels of pollution in the Gulf as well as graduating specialists in marine sciences.

Annex V

Marine science teaching started at first at the University of Jordan with the creation in 1974 of the Aqaba Marine Station then affiliated to the Department of Biological Sciences of the Faculty of Science.

In 1978 the Yarmouk University established a separate Marine Science Centre in Aqaba.

In 1981 the two universities agreed to have one station. The already completed station affiliated to the University of Jordan was chosen. Marine sciences are thus supervised by both universities. The research staff at the station are originally staff members of both universities but they conduct research on a full-time basis. The marine station is run by the two universities alternately.

Both universities offer B.Sc. degrees in specific disciplines.

General system of education

Credit hours.

Teaching language

English.

Number of faculty members

Teaching staff specialized in marine science:

University of Jordan:

marine biology: 1

marine chemistry: 1

Yarmouk University: three nationals

marine biology: 2

fish biology: 1

Marine Science Station: three (two nationals)

fisheries: 1

marine biology: 1

biology (physiology): 1

Available facilities

Research vessel: not available but there are four motor boats 3 to 9 metres long with engines ranging from 20 to 220 h.p.

Marine station: the station at Aqaba has:

1. an aquarium;

2. laboratories for chemistry, biology and ichthyology;

3. a diving centre with a trainer;

4. accommodation for students and staff.

The library is fairly well provided. There is no specialized scientific journal.

Postgraduate studies

Both universities offer M.Sc. degrees in biology, chemistry and geology at the Faculty of Science. Research projects may deal with one of the above-mentioned marine disciplines.

6. UNIVERSITY OF KHARTOUM (Khartoum, Sudan)

There is no Marine Science Department and there are no plans to introduce this discipline in the University of Khartoum. There are plans, however, to establish a university in the eastern region including a Marine Science Faculty to be located at Port Sudan. It is to be noted that the Dengnab Research Station was founded in 1905 to carry out research on the Red Sea shells.

The university offers a B.Sc. in biology.

Teaching language

Mainly English.

General system of education

Traditional.

Marine science courses

Marine biology courses are included in the syllabus of the Department of Zoology. However, these courses constitute only 8 per cent of the basic sciences.

Available facilities

Research vessel: a boat equipped for coastal research.

Marine station: there is a marine laboratory for 40 students affiliated to the Zoology Department at Suakin. The laboratory is used for practical training of university students. There is also an Institute of Oceanography at Port Sudan affiliated to the National Research Council. Co-operation and co-ordination also exist between the university and the institute that can take about ten researchers. Another training facility is the shell station at Dengnab at the north of Port Sudan.

Library: there is a limited library in Suakin but the one at the Institute in Port Sudan is more in use. There is also a central library in Khartoum.

Scientific publication: the Sudan Science Magazine includes a part on marine science.

Current research projects

1. A joint project is carried out in co-operation with the ALECSO programme on the environment of the Red Sea and the Gulf of Aden based in Jeddah.

2. Collection and analysis of basic marine data in co-ordination with the Suakin station and the Marine Science Institute. This project is financed by the Red Sea Environment Programme.

3. There is an ALECSO-financed project for the mariculture of shrimps in the Red Sea.

7. THE NATIONAL UNIVERSITY OF LEBANON (Beirut, Lebanon)

The university was established in the 1950s and the teaching of marine sciences was introduced in 1972. Some courses in marine biology are included in the syllabus of the Biology Department. There are no plans to change the present marine science teaching system.

Teaching language

French, sometimes English in the Faculty of Science.

An introductory course in marine biology is given which represents 5 per cent of all basic sciences.

There are two staff members in marine biology.

General system of education

It combines both the traditional system and that of credit hours.

Available facilities

Research vessel: a 12-metre boat 'Seta III' is available.

Marine station: a station belonging to the National Council for Scientific Research is located at Jounieh north of Beirut.

Library: There is a non-specialized library at the university. The Jounieh station library is more in use.

Scientific publication: there is a non-specialized publication including a section on marine sciences.

Current research projects

There is a research project for the survey of the coastal zone. Another project is carried out within the framework of the Mediterranean Action Plan, UNEP, FAO and the National Council for Scientific Research.

Postgraduate studies

There are no postgraduate studies at present.

8. THE AMERICAN UNIVERSITY (Beirut, Lebanon)

Marine science teaching was initiated in this private university in 1970. Only an introductory course in marine biology is included in the syllabus of the Department of Biology. There are no plans at present to introduce other courses in marine sciences.

General system of education

Credit hours.

Teaching language

English.

Marine science courses

These are given in marine biology.

Available facilities

Research vessel: not available.

Marine station: not available.

Library: not available.

Publication: not available.

Current research projects

None.

Postgraduate studies

There are no postgraduate studies in marine sciences.

9. THE UNIVERSITY OF DAMASCUS (Damascus, Syrian Arab Republic)

Some marine science courses are given in the Departments of Zoology, Botany, Geology and Chemistry of the Faculty of Science. The university offers a 'licence' and an M.Sc. in Science. This applies to the other Syrian universities (the University of Aleppo, the October University and Al-Baa'th University).

Annex V

The Supreme Council for Science has established a centre at Latakia. It was completed at the end of 1981. A number of students were sent abroad to specialize in various marine science disciplines. The centre is open to research scientists from the four Syrian universities.

General system of education

Syrian universities follow the semester system.

Teaching language

Arabic.

Number of faculty members

University of Damascus: marine biology: 4

October University: marine biology: 1

: marine geology: 1

University of Aleppo: marine biology: 1

Marine Research Centre: marine biology: 2

Available facilities

Research vessel: none, even though the required equipment has been imported and is waiting for the completion of a locally built vessel. There are two fibre glass motor boats.

The Marine Research Centre in Latakia has laboratories for research in marine biology, marine chemistry, marine physics, marine geology and marine microbiology. It also has accommodation for research workers.

Scientific library: marine science reference material is available in the library of the Faculties of Science in the four universities as well as the library of the Supreme Council for Science. A new library is expected to be established at the Marine Research Centre.

There are no specialized journals. General reviews are published by the Universities of Damascus and Aleppo.

Postgraduate studies

Syrian universities offer a diploma in graduate studies as well as an M.Sc. degree within the Departments of Zoology, Botany, Chemistry and Geology of the Faculties of Science. Research subjects may be in any of the fields of marine science corresponding to the above disciplines.

10. THE UNIVERSITY OF CAIRO (Giza, Egypt)

The teaching of marine science was initiated in 1945 by the Zoology Department. Cairo University was the first Arab university to establish a marine station, the Marine Biological Station at Hurghada on the Red Sea, in

1931, which was affiliated to the Zoology Department of the Faculty of Science. The station was later affiliated to the Academy of Science and Technology.

General system of education

Traditional.

Teaching language

English.

Marine science courses

A course in marine ecology, representing 3 per cent of the basic science curricula.

Number of faculty members

There are five staff members specialized in marine biology.

Available facilities

There are no marine science facilities at present.

Postgraduate studies

The university offers an M.Sc. degree in Basic Science (courses and research) as well as a Ph.D. in basic science disciplines.

11. THE UNIVERSITY OF AIN SHAMS (Cairo, Egpt)

Marine sciences have been taught in the Department of Zoology since it was established in 1950. There are no plans for expansion.

General system of education

Traditional.

Teaching language

English.

Marine science courses

These include a course on fresh water and marine ecology representing 10 per cent of basic science curricula.

Number of faculty members

Five members are specialized in marine biology.

Available facilities

There are no specific facilities for marine science research other than those available for basic science.

Annex V

Postgraduate studies

The university offers M.Sc. and Ph.D. degrees in basic sciences.

12. THE UNIVERSITY OF AL-AZHAR (Cairo, Egypt)

The Faculty of Science at Al-Azhar University was established in 1970. Some limited teaching in marine biology is given in the Zoology Department.

General system of education

Traditional.

Teaching language

English.

Marine science courses

Some courses are given in biological oceanography, fisheries and ichthyology, marine geology, pollution and fish-culture.

Number of faculty members

Two specialized in ichthyology, Zoology Department.

One specialized in mollusca at the Zoology Department.

One specialized in physiology of algae, Botany Department.

Two specialized in marine geology, Geology Department.

Available facilities

There are research laboratories basically concerned with the taxonomy of marine fauna collected from the Red Sea and Egptian lakes. The university has no modern equipment to meet the requirements of teaching and research in marine sciences.

Postgraduate studies

The university offers M.Sc. and Ph.D. degrees in basic science (courses and research). Four students have been awarded M.Sc. and Ph.D. degrees in subjects related to marine ecology.

Current research projects

The Zoology Department participates in a number of projects sponsored by the Academy of Science and Technology. It also takes part in an exchange project between Egyptian and American universities.

13. AL-FATEH UNIVERSITY (Tripoli, Libyan Arab Jamahiriya)

The university was established in 1971. Some courses in marine science are given in both the Botany and Zoology Departments. The two departments were

fused into one department in 1984. There are plans to create an independent section for marine biology within the Biology Department.

General system of education

Credit hours. One-hundred-and-thirty credit hours are required for graduation.

Teaching language

English.

Marine science courses

The courses given include ichthyology, fish-culture, marine ecology and marine pollution. They represent 10 per cent of basic sciences. The purpose of teaching such subjects is to provide fish farms, the fishing sector and the institutions concerned with pollution control with qualified staff.

Fourteen faculty members are specialized in marine science. All disciplines are represented except for physical oceanography.

Available facilities

Research vessel: there are two vessels.

Marine station: a well-equipped station was specially built at Tajoura near Tripoli.

Library: there is a small unfinished library.

Publication: there is a non-specialized scientific publication.

Current research projects

Research programmes are carried out in co-operation with Unesco and the University of Glasgow.

Postgraduate studies

No postgraduate degrees are offered.

14. UNIVERSITY OF TUNIS (Tunisia)

Historical review

Marine science teaching was initiated at the Faculty of Science in 1968 with the introduction of a 'troisième cycle' in marine biology within the Biology Department of the Faculty of Science.

Titles of degrees

The faculty offers:

(a) 'Diplôme d'études approfondies';

(b) 'Doctorat de specialité (3me cycle)';

(c) 'Doctorat d'Etat' in natural sciences (in marine biology or marine geology).

General system of education

Students with a 'licence' in natural history (i.e. biology or geology) are admitted to postgraduate studies in biological or geological oceanography.

The university offers diplomas after which graduates prepare theses on the Tunisian environment in French or other foreign universities.

Following an examination of their files, some students who have graduated from the Faculty of Science, the National Institute for Agricultural and Veterinary Sciences and the Faculty of Veterinary Medicine and other institutions are allowed to pursue higher studies in marine sciences. Students are offered theoretical courses (150 hours) and applied courses (85 hours) to obtain an 'Attestation d'études approfondies'. After one more year of research work, the student prepares a thesis and defends it before a committee of examiners to obtain a 'Diplôme d'études approfondies'. Successful students then register for a 'Doctorat de specialité (de 3me cycle)' which requires research work for two years followed by a thesis.

Teaching language

French.

Faculty members

Nationals and French visiting professors.

Marine science research in Tunisia

Researchers in marine science belong to several faculties and institutes interested in lagoons and the continental shelf. Research activities deal with: plankton, benthos, ichthyology, parasitology, crustacea, mollusca, helminthology, algae, etc. They also cover hydrology, organic, chemical and microbiological pollution, fisheries and fishing technology, fish-culture, geology, geochemistry and sedimentology.

Institutes engaged in intensive research include:

The National Scientific and Technical Institute of Oceanography and Fisheries, Salambo;

The National Agricultural Institute, Tunis;

The Faculty of Science, Tunis;

Marine Science Centre of the National Scientific and Technical Institute;

The National School of Engineering, Sfax;

The National School for Teacher Training;

The Pasteur Institute;

The Faculty of Pharmacy, Monastir.

Ecole Nationale d'Ingénieurs, Sfax

The school was founded in 1975. No marine science studies are offered at present.

A project aimed at introducing the teaching of marine science and technology, particularly fishery technology and mariculture is under consideration.

Three faculty members are specialized in the following marine sciences: biology, parasitology and physiology.

15. HOUARI BOUMEDIENNE UNIVERSITY OF SCIENCE AND TECHNOLOGY (Algiers, Algeria)

Marine science courses are offered by the Institute of Biology, the Marine Science Institute and the Coastal Zone Department of the University.

The following degrees in marine science are offered:

1. 'Diplôme d'Enseignement Superieur d'Oceanologie (DES)' in biological oceanography: four years;

2. Marine Resources Engineer - population dynamics: five years;

3. Specialized technologist: 2½ years;

4. M.Sc. (for diploma graduates): three years;

5. 'Doctorat d'Etat': duration not fixed.

Marine science disciplines

Biological and geological oceanography and marine fisheries.

Historical review

Marine science teaching was introduced in the University of Algiers in 1965 with the creation of a diploma in biological oceanography. Graduates joined the university staff as researchers and teachers.

In 1973 a new marine science teaching system was introduced at the undergraduate level. Graduates were offered a 'diplôme d'enseignement superieur'. The new system proved ineffective since students preferred other fields such as medicine and engineering.

In 1980 postgraduate studies in marine science were reinstated at the Houari Boumedienne University. Students with first university degree (higher diploma in zoology or botany) were admitted to study for 2½ years.

This system was replaced in 1982 by a first degree entitled 'diplome d'enseignement superieur' for students having successfully completed their secondary education.

16. MOHAMMAD V UNIVERSITY (Rabat, Morocco)

The university has for a long time been interested in introducing marine sciences in its teaching and research programmes. In fact, it hosted the TEMA conference in the early 1970s.

Although some members of the teaching staff are actively involved in marine geology and to a lesser extent in marine biology, the Faculty of Science has not so far developed a strong basis for the introduction of a marine science programme.

III. INSTITUTES OFFERING APPLIED DEGREES IN THE MANAGEMENT OF MARINE RESOURCES, THEIR CURRICULA INCLUDING SOME COURSES IN MARINE SCIENCES

This category comprises three institutes all located in countries of the Arab Maghrib:

1. National Institute of Agricultural Sciences: Ministry of Agriculture, Tunis.

2. Institute of Marine Sciences and Management of Coastal Resources, Ministry of Higher Education, Algiers.

3. Hassan II Intitute of Agricultural and Veterinary Sciences, Ministry of Agriculture, Rabat.

1. NATIONAL INSTITUTE OF AGRICULTURAL SCIENCES, 'INAT' (Tunis, Tunisia)

The institute was established in 1893. The Marine Resources Section was created in 1973.

Title of first degree

Diploma of Works Engineering in Marine Resources.

Teaching language

French.

General system of education

In line with the traditional French three-level system:

Two years of basic science followed by two years of marine resources studies. At the end of the fourth year, the student submits a dissertation. Outstanding students are usually sent on study missions, most in France or to the Faculty of Science in Tunis to obtain 'Doctorate de 3me cycle' or equivalent degrees.

The basic sciences include physics, mathematics, chemistry and biology.

Percentage of marine science to basic science

Not specified.

Proportion of each marine science discipline to total marine sciences

Third year		Fourth year	
Plankton	10%	Fishery ecology	70%
Benthos	10%	Fishery technology	70%
Marine micro-organisms	5%	Mariculture	70%
Ship engineering	7%	Resource development	70%
Economics + statistics	30%	Fishery economics	70%
Meteorology	8%	Technology	70%
Language	3%	Marine fauna pathology	5%
Other subjects	37%	Pollution	5%
		Law of the sea	10%
		Mathematics and computer science	10%

Annex V

Number of faculty members

Five Tunisians and four foreigners.

Number of students

Fifteen.

Available facilities

No vessel is available. However, there is a rubber boat. Two marine stations and field equipment are available. There is an instructional library but the institute needs more equipment and staff.

Postgraduate studies

Courses are given at the institute but research and theses are carried out abroad.

2. INSTITUTE OF MARINE SCIENCES AND MANAGEMENT OF COASTAL RESOURCES (Algiers, Algeria)

The institute was established in 1974 to replace the marine station of Algiers, founded in 1881.

Titles of degrees

1. Higher Technical Diploma: two years for secondary school graduates. It was created in 1983.

2. Engineer specialized in marine resources: two years of basic science followed by three years for specialization. It was created in 1985.

3. Postgraduate studies in oceanography for holders of a first degree in science. It was created in 1984.

4. Diploma of advanced studies: four years for secondary school graduates. It was introduced in 1982.

Teaching language

French.

System of education

Six-week modules. Eight modules are required per academic year.

Main courses for higher technical diploma

Mathematics and statistics, chemistry, physics, geology, biology, informatics, general oceanography and marine ecosystems.

Marine science courses

Fisheries, marine ecology, zoogeography, biochemistry, bacteriology, applied marine sciences, marine botany and zoology, law of the sea and economics.

Proportion of marine sciences

Sixty per cent.

Postgraduate studies

Marine science courses represent 70 per cent. They include: physical and chemical oceanography, marine geology, ecology, marine biology, lagoons, mariculture and computer science.

Number of faculty members

Ten Algerians and five foreigners.

Number of students at present

1. Higher technical diploma: 20.

2. Engineering: not yet started.

3. Postgraduate studies: 6.

Available facilities

A 23-metre research vessel (Mohammad Saddiq Ben Yahia); two boats and one rubber boat; two stations; well-provided library, well-equipped laboratories (not fully utilized).

There is a lack of qualified staff in physical and chemical oceanography. The available facilities are not fully utilized.

3. HASSAN II INSTITUTE OF AGRICULTURAL AND VETERINARY SCIENCES (Rabat, Morocco)

The institute was founded in 1975 and marine resources studies were introduced in the same year.

Titles of degrees

- Diploma of Applied Engineering with a major in marine resources, created in 1975.

- Diploma of Agricultural Engineering with a major in marine resources, created in 1975.

- Veterinary with a major in marine resources, introduced in 1976.

- Doctor in Agricultural Sciences, specialized in marine resources, created in 1975.

Annex V

Teaching language

French.

System of education

Along the lines of the French traditional system.

1. Two years in basic science followed by two years of specialized study in marine resources for diploma students.

2. Four years in basic agricultural and veterinary sciences followed by two years of postgraduate studies to obtain a doctorate degree in marine resources.

Basic courses

First and second years:

General biology	10%	Physics	6%
Botany	6%	Mathematics and statistics	16%
Zoology	8%	Geology	5%
Physical chemistry	12%	Ecology	5%
Physiology	5%	Inorganic and analytical chemistry	12%
Organic chemistry	15%		

Percentage of each marine discipline

Third year:

Marine biology	16%	Physical oceanography	12%
Fisheries and fish biology	12%	Mariculture, pollution and fishery technology	18%
Marine geology	6%	Economics	12%
Marine chemistry	12%	Training	--

Fourth year:

Not specified.

Number of faculty members

Not specified.

Number of graduates in 1984

Diploma of applied engineering in marine resources: 21

Diploma of agricultural engineering in marine resources: 5

Veterinary in marine resources: nil

Doctorate in agricultural sciences specialized in marine resources: 4.

Available facilities

Adequately equipped laboratories, two stations in Waldiya and Taghazoute. More staff and equipment are still needed.

Postgraduate studies

Not available.

ANALYSIS AND CONCLUSIONS

As a result of socio-economic and strategic developments in modern times, more and more attention is given to the various disciplines of the marine sciences with the aim of exploring the living and non-living resources of the marine environment. There is no doubt, however, that the rational exploration of these resources calls for intensive and systematic studies and, therefore, requires well-trained and qualified manpower to serve in the institutions involved in marine research and the economic exploitation of marine resources.

During the last ten years, Arab universities have shown growing interest in marine science studies. Although the Algiers marine station was founded as far back as 1881 and marine science teaching was introduced at Cairo University with the creation of the Hurghada marine station in 1931, then at Alexandria University with the inauguration of its Oceanography Department in 1948, most Arab universities did not include marine sciences in their instructional and research programmes until the early 1970s. From that period on, marine science departments and stations have been established in a growing number of universities in the Arab States such as Al-Basrah University in 1973, Al-Fateh University in 1971, the Fishery Department of the Institute of Agricultural Sciences at Tunis in 1973, the University of Jordan in 1974, King Abdulaziz University in 1975, the Marine Resources Department of the Hassan II Institute for Agricultural and Veterinary Sciences at Rabat in 1975, the University of Qatar in 1976, Sana'a University in 1976, Al-Yarmouk University in 1978 and the Suez Canal University in 1983. Moreover, the majority of other Arab universities offer some courses in marine sciences within their teaching programmes though they do not have specific marine science departments or stations.

While it might be easy to quantify this development in terms of numbers of universities, faculty members, researchers and students involved in marine science, it is rather difficult to assess the qualitative progress of marine science teaching and ascertain whether such quantitative expansion has been accompanied by improvements in scholarly standards, and the scientific, laboratory and field equipment needed for the training of qualified marine science personnel.

It is to be noted that a first attempt to evaluate marine science teaching in Arab universities was undertaken at the Seminar of Heads of Departments and Progremmes of Marine Sciences in Arab Universities held in Jeddah, Saudi Arabia, 11-14 January 1978.

Objectives of marine science teaching in Arab universities

There is no doubt that marine science education should be introduced in some form or another at the pre-university level with a view to disseminating knowledge and promoting environmental awareness among the rising generations. Nevertheless, university education should be placed within the context of an overall guiding concept aimed at realizing national objectives. Considering the multidisciplinary nature of marine sciences, it is imperative that teaching in Arab universities be guided by such a clear philosophy with the aim of meeting the real needs of the country.

However, to identify the objectives of marine science teaching in Arab universities is not an easy task. Objectives are linked to specific considerations that vary from one country to another and even from one university to another within the same country, as borne out by an analysis of the survey

data. It is evident that there is no clear concept behind the introduction of marine science teaching in some Arab universities. Moreover, the overall and specific objectives of marine science teaching are not clearly defined in the case of many universities.

Nevertheless, it may argued that the interest shown by many Arab universities in introducing marine science teaching at the undergraduate or postgraduate levels reflects the existence of a number of common concerns in respect of marine science teaching and research. These can be summarized as follows:

(a) to exploit and develop marine resources;

(b) to study the growing number of environmental problems caused by modernization;

(c) to offer students the ecology courses related to the basic sciences;

(d) to disseminate general knowledge and promote awareness at the university level regarding the marine environment and the need to preserve and protect marine resources.

Prerequisites

In brief, the study of marine sciences aims at acquiring a better understanding of the various ecosystems in the hydrosphere by studying the biological, geological, chemical and physical processes and their interactions leading to natural equilibrium. Such a study will obviously lead to a rational exploitation and development of marine natural resources. Marine science education at the university level should, therefore, concentrate on a holistic and integrated concept of marine science and provide the student with basic multidisciplinary knowledge in addition to specialized study of one specific discipline.

It is to be noted that the study of marine sciences necessitates an adequate knowledge of the basic sciences (biology, chemistry, geology, mathematics, physics, etc.). Obviously, specialities will vary from one country to another depending on their overall and their specific objectives. At present, it may be desirable for some Arab countries to prepare 'general practitioners' trained equally in the various marine science disciplines and to leave specialized training to postgraduate studies qualifying for specialized diplomas, Masters or Doctorate degrees.

Other universities may sense a pressing need for early specialization in one marine discipline or another at the first degree level.

Still other universities may feel that marine science education should start after the first university level when the student has been given sufficient training in one of the basic sciences at the Faculty of Science to be able to pursue marine science studies successfully. In fact, this was the view expressed by the Unesco Workshop on Marine Science Teaching at the University Level (see Unesco Technical Papers in Marine Science, No. 19, 1974).

Educational system for marine science teaching and research in Arab universities

The form of an educational system is closely related to the objectives sought as well as to the type of graduate to be trained at the first degree level. It may also reflect the degree of attention given by the country to this field of study and the level of scientific development attained in that field.

Arab countries have adopted different approaches in this respect such as:

A. At the undergraduate level

1. Establishing a marine science faculty composed of different marine science departments as in the case of King Abdulaziz University in Saudi Arabia.

2. Establishing a marine science department within the faculty of science as in the case of the University of Alexandria and the University of Qatar.

3. Establishing a marine science section within the biological sciences department as in the case of the University of Sana'a and the Suez Canal University.

4. Establishing marine science centres and stations affiliated to universities for teaching and research as in the case of the Marine Science Centre of the Al-Basrah University, the Aqaba Marine Science Station of the University of Jordan and Al-Yarmouk University, the Tadjoura Centre of Marine Biological Sciences, affiliated to Al-Fateh University in the Libyan Arab Jamahiryia, the Marine Biological Station at Suakin, affiliated to the University of Khartoum in Sudan, and the Marine Science Institute of the University of Algiers.

5. Introducing some marine science courses in the study programmes of some faculty of science departments in various degrees as in the case of Al-Basrah University, Kuwait University, Al-Ayn University, the University of Jordan, the Lebanese University, the American University in Beirut, the Universities of Damascus, Cairo, Al-Azhar, Ain-Shams, Mansourah, Al-Fateh, Khartoum, Tunis and the Houari Boumedienne and Mohammed V Universities.

B. At the postgraduate levels

Curricula and courses also vary at these levels as follows:

1. Some Arab universities offer diploma, Masters and Doctorate degrees in the various marine disciplines through a department of marine science such as the University of Alexandria.

2. Other universities offer diploma and Masters degrees in some marine disciplines through marine science faculties or sections as in the case of King Abdulaziz University and the Suez Canal University.

3. Still other universities offer Masters degrees in certain disciplines through the basic science departments of their faculties of

science, such as the Universities of Al-Basrah, Kuwait, Jordan, Yarmouk, Cairo, Ain-Shams, Al-Azhar, Khartoum, Tunis and Algiers.

While it may not be desirable to adopt a uniform system in all Arab universities, it may be useful to evaluate such experiences in the light of national objectives and the scientific and practical skills acquired by marine science graduates at each level.

Curricula and courses

Different curricula and courses are offered to marine science students by Arab universities. These may be classified as follows:

1. Universities offering a B.Sc. degree in marine sciences:

   (a) King Abdulaziz University which offers B.Sc. degrees in the four major disciplines namely, biological, chemical, geological and physical oceanography;

   (b) Alexandria University which offers a B.Sc. in physical oceanography as well as a B.Sc. in general oceanography.

   The two systems adopted are quite different in terms of the programme of study and the courses offered to obtain each degree.

2. Universities offering a B.Sc. degree in biological oceanography only, such as the University of Sana'a and the Suez Canal University. These universities also differ in their teaching systems and the courses offered which, in fact, are not similar to those given at King Abdulaziz University in the same area of specialization.

3. Universities offering a general B.Sc. degree in marine science such as the University of Qatar. While the degree offered is similar to that awarded by Alexandria University in general oceanography, curricula and courses are not similar.

4. Universities offering no B.Sc. degrees in marine science. The majority of Arab universities falls in this category. Most of them include some marine science courses in the curricula of their biology, geology or chemistry departments. In many instances, such courses are not designed to highlight marine science concepts. Rather, they aim at offering integrated basic science courses. It is noted that the marine courses offered by these universities account for 5-10 per cent only of the total basic science courses offered to undergraduates. Obviously, such percentage will not be sufficient as a basis for specialized study in the marine sciences.

Common features of marine science teaching in Arab universities

Apart from the above observations, the findings of the survey on marine science teaching in Arab universities bring to light the following main features:

1. Oceanography, being a multidisciplinary science that applies the basic sciences (physics, chemistry, biology and geology) to the study of the

oceans obviously requires a general background in the basic sciences. Experts have estimated that 700-800 lecture hours would be required for that purpose (Unesco Technical Papers in Marine Science, 1974). Experience has proved that the more knowledge a student acquires in the basic sciences, the more he is capable of assimilating marine science subjects and the more able he will be to carry out research in this field. It is to be noted that the systems currently adopted by Arab universities, which provide for early specialization in marine sciences do not offer students such an adequate background in basic sciences.

2. It is recognized that modern oceanography requires specialists in the various disciplines who are acquainted with the basic facts and trends of other disciplines. It is, therefore, necessary that the curriculum include a comprehensive programme in general oceanography (100-150 lecture hours) covering the four major disciplines (see Unesco Technical Papers in Marine Sciences, No. 19, 1974). It is evident that teaching programmes in most Arab universities do not meet this requirement.

3. With the exception of King Abdulaziz University and the University of Alexandria, it appears that most Arab universities have restricted their attention to biological marine sciences in terms of both teaching and research. Although such an approach may be logical and objective and in keeping with the general trend in developing countries, it is highly desirable that the other disciplines, namely chemical, physical and geological oceanography be introduced as early as possible, in view of their importance as a basis for a better understanding and management of marine ecosystems.

4. It is noted that marine science courses currently offered by Arab universities fail to cover some of the most needed applied disciplines, related to environmental and economic problems such as pollution and the protection of the environment, fish culture, fishery management and fishing techniques, nutrition and fish technology, desalination, ocean mining, shore protection, etc.

5. There is no integrated planning for employment of marine science graduates. Only 50 per cent of graduates from most Arab universities are employed in their fields of specialization. Since full-scale training in the marine sciences is costly and may prove uneconomical unless there is a continuous demand for graduates in one of the major marine disciplines, the teaching of marine sciences in Arab universities should be linked to a clearly defined plan for effective employment of graduates.

6. There is an acute shortage of national qualified manpower in various fields of marine science. This applies also to teaching and research staff in Arab universities and has adverse effects on the quality of teaching and the real value of the degrees awarded.

7. Different languages are used in teaching and research publications. While some Arab universities use Arabic in instruction, others use English or French. This constitutes an obstacle to scientific exchange and co-ordination between Arab universities, particularly with universities and institutions of the Arab Maghrib countries.

8. Educational systems vary. While some Arab universities apply the credit hours system, others follow the traditional yearly system. Although

both systems have advantages and disadvantages, the adoption of differing systems may hinder student mobility from one university to another.

9. There are wide differences in the titles of degrees offered by Arab universities, particularly in the Maghrib countries. Moreover, there is no equivalence of degrees.

10. There is a lack of specialized centres for the training of highly qualified technicians at the university level.

11. In many cases, there does not seem to be close communication between Arab universities involved in marine science teaching and the relevant governmental and non-governmental institutions.

12. Exchange of marine science data and research publications between Arab universities remains very limited. Few contacts exist between marine scientists in different Arab universities.

13. There is an obvious lack of scientific co-operation and integration between Arab universities in the training of students and the implementation of joint projects.

14. The facilities available to marine scientists in Arab universities are not sufficient. Deficiencies are observed in the research boats, marine laboratories and field equipment necessary for teaching and research.

15. Many Arab universities do not have comprehensive marine science libraries including basic references in the various disciplines, international scientific journals and periodicals and complilations of abstracts and scientific data.

16. Arab universities do not as yet have an introductory marine science textbook covering basic courses agreed upon by Arab marine science teachers in the four major disciplines.

17. No scienticic journal specialized in marine science research is published at the level of the Arab world.

18. Arab universities remain somewhat withdrawn from the mainstream of international marine science activities as far as involvement, effective interaction and contacts with prominent researchers abroad are concerned.

A comparative assessment of the level of scientific research in Arab universities can be made with reference to the following facts:

(a) Very few research papers are published by Arab scientists in referred journals of an international standing. Most of them submit their research to local journals or as communications to scientific conferences where acceptance is not subject to strict scientific standards. While local scientific journals should be encouraged and improved, it is also desirable that Arab scientists contribute to internationally recognized journals.

(b) The topics investigated often focus on domestic phenomena and limited zones of the coastal waters. Very few research projects deal

with regional or worldwide topics that might be of interest to marine scientists outside the countries concerned. There is no doubt that priority should be given to local problems in coastal and territorial waters. However, there is a need to relate such local and regional investigations to major marine science problems at the global level. This should be a first step towards more effective participation by Arab marine scientists in regional and international programmes.

(c) Most international activities for the advancement of marine sciences are carried out by non-governmental organizations such as:

The Scientific Committee on Oceanic Research (SCOR);

The International Association of Physical Science of the Ocean (IAPSO);

The International Association of Biological Oceanography (IABO)

which are all members of the International Council of Scientific Unions (ICSU);

The International Council of Scientific Unions (ICSU).

Very few Arab scientists have joined these associations and effective participation by Arab scientists in the working groups concerned with certain investigations at the international level remains extremely limited.

APPENDIX I.A

CONSULTATION MEETING ON DEVELOPING MARINE SCIENCES IN ARAB UNIVERSITIES

Lucerne, Switzerland, Monday, 15 October 1984

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APPENDIX I.B

MEETING OF THE PREPARATORY COMMITTEE

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APPENDIX II

THE TEACHING OF MARINE SCIENCES IN ARAB UNIVERSITIES

I. UNIVERSITIES OFFERING DEGREES IN MARINE SCIENCES AT UNDERGRADUATE LEVEL

1. University of Qatar, Doha, Qatar
2. King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia
3. University of Sana'a, Sana'a, Yemen Arab Republic
4. Suez Canal University, Ismailia, Egypt
5. University of Alexandria, Alexandria, Egypt

II. UNIVERSITIES OFFERING NO DEGREES BUT SOME COURSES IN MARINE SCIENCES

1. Basrah University, Al-Basrah, Iraq
2. Kuwait University, Kuwait
3. University of Al-Ayn, Al-Ayn, United Arab Emirates
4. Yarmouk University, Irbid, Jordan
5. University of Jordan, Amman, Jordan
6. University of Khartoum, Khartoum, Sudan
7. The National University of Lebanon, Beirut, Lebanon
8. The American University, Beirut, Lebanon
9. The University of Damascus, Damascus, Syrian Arab Republic*
10. The University of Cairo, Giza, Egypt
11. The University of Ain Shams, Cairo, Egypt
12. The University of Al-Azhar, Cairo, Egypt
13. Al-Fateh University, Tripoli, Libyan Arab Jamahiriya
14. University of Tunis, Tunis, Tunisia
15. Houari Boumedienne University of Science and Technology, Algiers, Algeria*
16. Mohammad V University, Rabat, Morocco

* Universities from which no reply was received to the questionnaires.

Annex V

III. INSTITUTES OFFERING APPLIED DEGREES IN THE MANAGEMENT OF MARINE RESOURCES, THEIR CURRICULA INCLUDING SOME COURSES IN MARINE SCIENCES

1. National Institute of Agricultural Sciences, Tunis, Tunisia

2. Institute of Marine Sciences and Management of Coastal Resources, Algiers, Algeria

3. Hassan II Institute of Agricultural and Veterinary Sciences, Morocco

UNESCO REPORTS IN MARINE SCIENCE

No.		Year
35	Physical oceanography of the Eastern Mediterranean (POEM): A Research Programme. Reports of the Organizing Committee Meeting, Paris, August 1984, and the Scientific Workshop, Lucerne, October 1984 English only	1985
36	Méthodologie d'étude des lagunes côtières. Résultats d'un atelier régional réuni à Abidjan du 6 au 11 mai 1985 French only	1986
37	Principles of Geological Mapping of Marine Sediments (with special reference to the African continental margin) Available in English and Russian	1986
38	Marine Sciences in CMEA countries Programme and results of co-operation Available in English and Russian	1986

UNESCO REPORTS IN MARINE SCIENCE

Title of numbers which are out of stock

No.		Year
3	Benthic ecology and sedimentation of the south Atlantic continental platform Report of the seminar organized by Unesco in Montevideo, Uruguay, 9-12 May 1978	1979
13	Seminario Latinoamericano sobre Enseñanza de la Oceanografía Informe final del Seminario organizado por la Unesco en São Paulo, Brasil, 17-20 de noviembre de 1978	1981