

UNESCO and decades of marine science

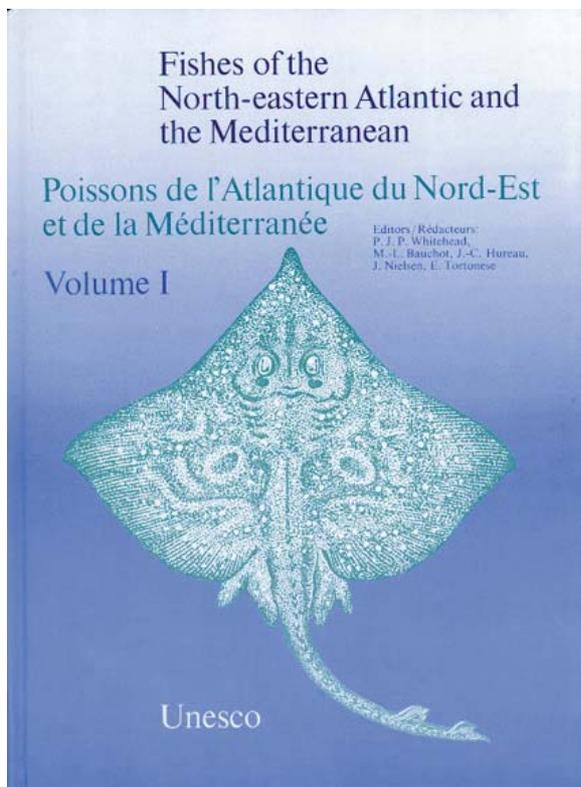
Selim Morcos,
28204 Kenton Lane, Santa Clarita, California 91350, USA

Alexei Suzyumov,
UNESCO, 75732 Paris, France

Gary Wright
UNESCO Publishing, 75732 Paris, France

NOTE: This article, submitted to the Newsletter by S. Morcos, A. Suzyumov and G. Wright, is based on a longer one prepared by these same authors in collaboration with Dale Krause, Marc Steyaert and Dirk Troost. The expanded text has been submitted for inclusion in a substantial publication on 'sixty years of science at UNESCO: 1945-2005' (provisional title), scheduled for production later this year in celebration of the Organization's 60th anniversary. When available, the book will be announced on UNESCO Publishing's website (<http://publishing.unesco.org/>). The following presentation evokes some of the main contributions of UNESCO, through its Division of Marine Sciences, to capacity building in developing countries, as well as to coastal research and oceanographic methodology and standards; many of these achievements have been largely unsung in today's historical accounts. The above-named colleagues were staff members of the (former) Division of Marine Sciences. An electronic copy of the original full article (in draft form) can be obtained by special request (contact: selimmorx@aol.com).

The Editor



Throughout the last 40 years or more and as part of its multi-faceted services to the international community, UNESCO has continually pursued an ambitious policy of providing professional materials intended for practical use by scientists. One outstanding example of its successful marine-related publications was the adjacent exhaustive ichthyological guide (*FNAM*, 3 volumes, over 1500 pages; 1984-86), part of a series sponsored by the Division of Marine Sciences. It was followed by the 3-volume *Checklist of the Fishes of the Eastern Tropical Atlantic (CLOFETA)*, 1990).

The authors acknowledge with thanks the technical assistance provided by Micheline Turner and Michael Tran (UNESCO) in the preparation of this paper.

Introduction

For almost a quarter century (1971-1995), the Division of Marine Sciences and its successor unit (MRI, see further on) functioned as another marine science arm of UNESCO, complementing the work of the Organization's Intergovernmental Oceanographic Commission (IOC). The IOC's programmes, amply covered by the Commission's website (<http://www.ioc.unesco.org/>) and extensive documentation (available from IOC [see IOC website on how to obtain] and in libraries and documentation centres around the world), are probably familiar to many of our readers, but some of you may not know of the Division's erstwhile existence and mandate. This introduction deals with the foundation of IOC and the Office of Oceanography (which later gave birth to the Division of Marine Sciences) within UNESCO and sets the stage for the historical evolution of the relations between them.

Marine sciences have been included in UNESCO's programmes since the early years just after the Organization's founding in 1945; at first this was mainly in the form of training courses and fellowships to specialists¹. Several recipients subsequently became leaders in their own countries, thus setting the stage to the ensuing phase of international cooperation. An outstanding example was the Russian Konstantin Fedorov (1927-1988), who later became the second IOC Secretary.

The Intergovernmental Oceanographic Commission (IOC) was established within UNESCO and became operational in 1961. This was accompanied by the creation of the Office of Oceanography (OCE) to serve in part as: (a) the Secretariat for the Commission and (b) to consolidate and carry out UNESCO's marine science programme. The Director of the Office was also the Secretary of the Commission. The rapid expansion of IOC (it increased to 67 Member States in 1967) and the great demand on UNESCO's programme, to respond to the needs of the developing countries and the scientific community in general, put disproportionate pressure on the staff of the Office of Oceanography. This and the desire to give IOC a special role within the UN System as the Secretariat for the Inter-Secretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO) led to the decision in 1971 to reorganize, as separate entities, the IOC Secretariat and UNESCO Office of Oceanography. The latter was subsequently renamed the Division of Marine Sciences (keeping its original acronym of OCE). These two separate units of UNESCO, with different functions, existed side by side for 20 years until the Division was merged with the IOC Secretariat; the combination was then referred to as the Office of the IOC and (other) Marine-science Related Issues (IOC/MRI) in 1991. In the autumn of 1995, the UNESCO General Conference decided to discontinue MRI, leaving the IOC Secretariat to carry on as the sole marine science arm of the Organization.

Division of Marine Sciences

Programme mission and approach

The Division of Marine Sciences, located in the Organization's Headquarters, operated in conjunction with other Paris units and services as well as with UNESCO regional (or field) offices in various countries. Presented briefly herein are the strategic approach, mission and some of the major achievements of the OCE programme, from 1971 to 1991, and its successor MRI

¹ Directory of UNESCO Fellows, 1948-1968, UNESCO [not dated], Paris.

(until the end of 1995). The Division based its work on science – on the one hand, natural sciences, and on the other, social sciences – in its strategic approach toward the desired marine science development.

The mission of the UNESCO marine science programme was mainly to: (1) help the less-favoured countries develop their marine science capabilities, (2) cooperate with the international scientific community to develop universally accepted research criteria, methods and standards, and later (3) to concentrate, for both these areas, on coastal programmes. Everything done over the years since 1972 employed the experimental approach, either explicitly or implicitly, from which has come an understanding of how development and scientific cooperation can function hand in hand. For example, each marine science development project was, by definition, an applied experiment in social science. There were several significant steps in the evolution of the programme over the period since 1972.

Immediately after the separation of the two units (IOC and OCE), there were discussions with the Scientific Committee on Oceanic Research (SCOR, member of ICSU) about what might be the approach of the Division. In 1974, SCOR produced a working paper on the basis of an extensive enquiry on the ‘Promotion of Marine Sciences in Developing Countries’ that formed one of the bases for the programme’s strategy in the following years.²

In 1980, as part of UNESCO's response to the 1979 UN Conference on Science and Technology for Development (Vienna), the marine science programme was re-organized with a visible concentration on coastal scientific problems under the coastal marine project COMAR (Major Inter-regional Project on Research and Training leading to the Integrated Management of Coastal Systems). At the same time, a decentralization of activities occurred giving rise to the strong cooperation between the Division and the UNESCO Regional Offices for Science and Technology (following their strengthening with marine science specialists during the 1980s) – namely in Cairo, Jakarta, Montevideo, Nairobi and Venice.

Marine science for development

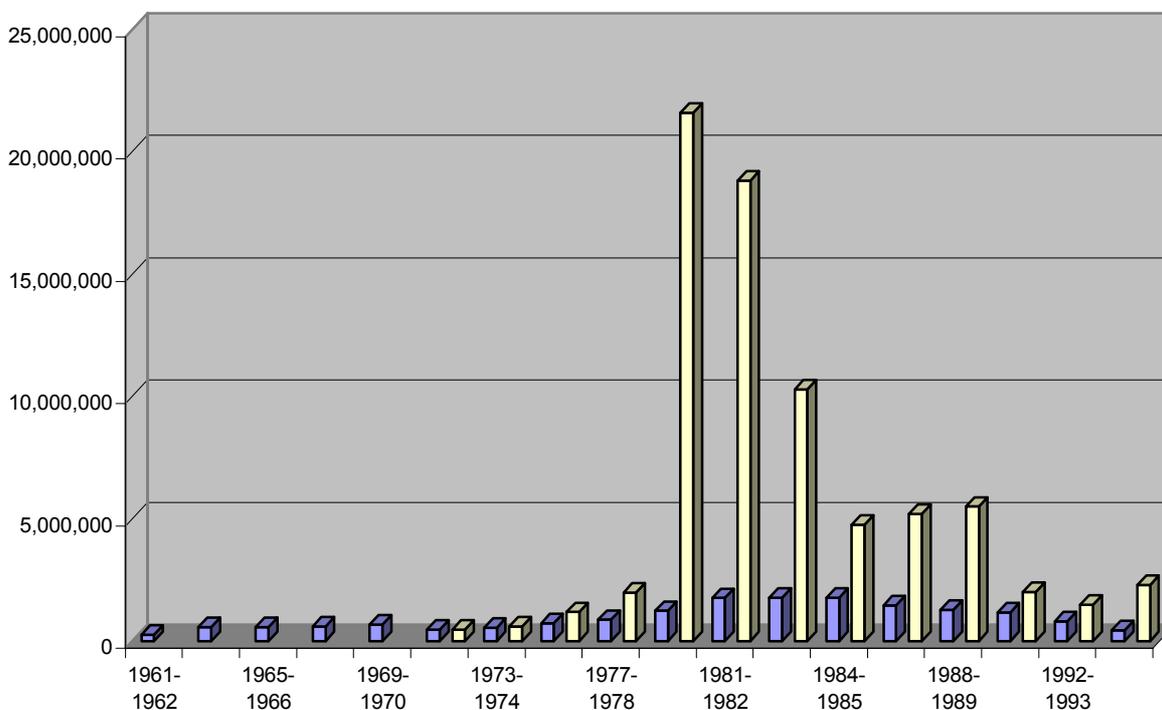
Infrastructure-building; growth and challenges

In the period 1974-1982, the Law of the Sea Conference took place – and it effectively put before governments the importance of marine science. In the Conference there was much debate (sometimes rather difficult) as well as tension amongst various groups. However, one positive aspect to emerge was that most of the developing countries decided to develop their own marine science capabilities, both through their national resources and with the help of UNESCO, which resulted in a rapid growth of UNESCO's extra-budgetary marine science development programme, reaching a peak in 1981.

A true achievement, evident by the end of the 1980s, was that most developing countries had established basic marine science capabilities, although they may have varied in size and quality. UNESCO may take some pride in having been associated with most of these developing countries in this achievement.

² Working Paper, SCOR Executive Meeting, Canberra, 29 January – 2 February 1974; ICSU; 29 pp.

Over circa three decades (from 1960 through the 1980s), the marine scientific community of the developing world and of the world as a whole became ten times larger.³ Of significance, the relative growth in the developing countries began to exceed that in the industrialized ones. By 1983 the number of marine scientists in the developing world equaled the total number for the world in 1970, just prior to the establishment of OCE.



Above graph: Resources of the Marine Science Programme (in US\$), 1961-1995.

Dark bars = regular programme funds; light bars = extra-budgetary funds. 1961-1972 – Office of Oceanography; 1973-1989 – OCE; 1990-1995 – MRI programmes.

1981-83 was (exceptionally) a 3-year budgetary period in UNESCO. For the sake of comparison, it has been transformed here into two artificial biennia: 1981-82 and 1982-83. Reminder: the above figures do not reflect IOC budgets.

A primary strategy was to use UNESCO's action as a catalyst to generate large extra-budgetary projects and national commitments. The funds came from outside sources such as the United Nations Development Programme (UNDP), development banks and the member countries

³ De Shazo, Y.M., and D.C. Krause, 1984. Marine scientists in the world: UNESCO, Paris, MARINF/53, 16 pp.

Note: the growth in the respective scientific community was also reflected in the *International Directory of Marine Scientists*, third edition, published in 1983 by UNESCO in cooperation with the UN, IOC and FAO. After the third edition (fairly exhaustive and well used throughout the world), no other global directories as such were published, at least not in printed form - although various directories by region or other groupings were compiled and made available. To be noted, in this respect: in 1997 the IOC launched GLODIR, the *Global Directory of Marine (and Freshwater) Professionals*, a database (later renamed OceanExperts) containing information on individuals involved in all aspects of marine or freshwater research and management.

themselves. As shown in the preceding graph, the marine science extra-budgetary programme manifested high growth during the 1970s – from US\$480,000 with only a few projects in 1971/72, to US\$21,600,000 with 23 projects in 1979/80. By comparison, the regular budget of OCE grew from US\$491,000 for 1971/72 up to US\$2,426,000 for 1981/83. The extra-budgetary funds exceeded the regular programme budget by more than seventeen-fold in the 1979/80 biennium. Due to the global financial crisis and the withdrawal of the USA in 1984 – followed in 1985 by the UK and Singapore – funding declined. More innovative approaches, mainly through networking and cooperation, were undertaken by OCE and MRI to respond to the needier developing countries and small islands.

OCE strategy

Good science in a regional approach

Tried and tested through experience, UNESCO's approach to marine science development was based on the building up of three kinds of capability: human resources, scientific infrastructure and research programmes. If any one of these three components were missing, the whole development effort would fail.

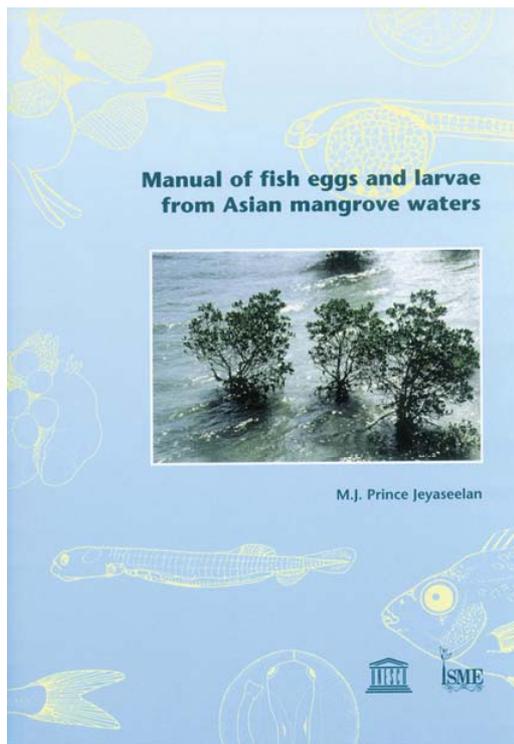
POEM – the Eastern Mediterranean

An exemplary achievement of the UNESCO marine science programme was the investigation of the Physical Oceanography of the Eastern Mediterranean (POEM), developed in the region in 1983 through the collaboration of the very scientists who wanted to conduct the research, and who in due course were responsible for carrying out the activities. At that time, thanks to some ongoing UNESCO/UNDP projects in several countries of the region, and a favourable environment of cooperation with overseas institutions, the national marine science capabilities had reached a satisfactory level of development. The ground was well prepared for fruitful cooperation. Carried out over almost ten years, POEM included planning workshops, multi-ship coordinated surveys, inter-calibration exercises, data validation and research workshops. The results, mainly concerning the formation of intermediate and deep waters and the dynamics of water circulation, were published in scholarly journals and led to a much-improved understanding of the Eastern Mediterranean, which was less known scientifically than the Western Basin.

Mangroves of Asia and the Pacific

As another example of its marine science strategy, UNESCO approached SCOR for advice on the mangrove ecosystem, and then took that advice to build up a large regional networking programme for research and training on such ecosystems in Asia and the Pacific, which systems stretched from Pakistan to Fiji. The UNDP provided financial assistance (US\$2,800,000) to the mangrove programme, and it was later recognized that this was one of the best regional projects with which the UNDP had ever been associated. In 1990, the mangrove project evolved into the International Society for Mangrove Ecosystems (ISME)⁴, based in Okinawa, as a grass-roots initiative fostered by UNESCO and Japan. This NGO eventually carried on the types of work spawned and implemented by UNESCO, thus insuring continuity.

⁴ ISME has a consultative status with the United Nations Economic and Social Council (ECOSOC)



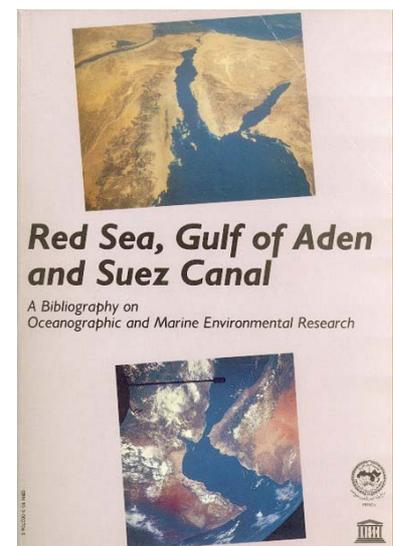
The above manual (1998) was one of the many results of the Asian mangrove efforts of UNESCO and ISME. See mangrove-related paragraph on preceding page.



Through the Organization's Coastal Marine Programme for Africa, the Division assisted scientists and the local populations. Examples: ichthyoplankton investigations (*upper photo: S. Diop*) and mangrove reforestation (*A. Diame*).

Arab States' oceanographic institutions

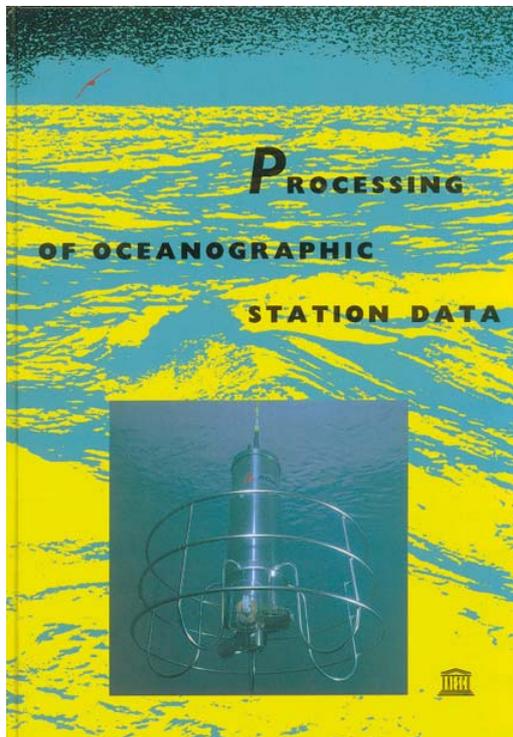
In the Arab States, the regional approach of the marine science programme concentrated on the development of national capabilities, e.g. the establishment of several laboratories and university departments, as well as research vessels, involving ten countries and using (in the 1980s) US\$13,000,000 of extra-budgetary funding from the Arab region. UNESCO can be credited with the fact that these national projects and the initial technical support of the Organization's marine science programme contributed to the creation of two active sub-regional organizations: (i) the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA, based in Jeddah) and (ii) the Regional Organization for the Protection of the Marine Environment (ROPME, based in Kuwait). In 1990 UNESCO and PERSGA published an extensive multidisciplinary bibliography on research in the respective marine areas (see right).



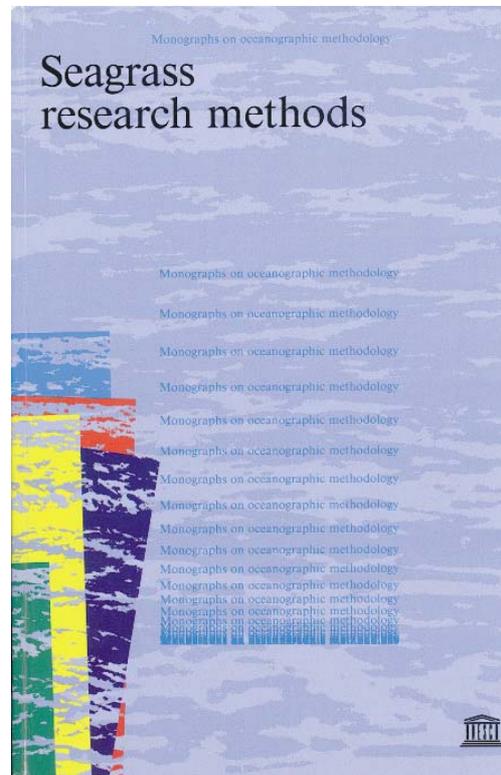
International marine research

International Oceanographic Tables

One of the major components of UNESCO's programme was to support the needs of the scientific communities in their efforts to develop joint methodologies and standards that insured common approaches to global scientific problems. Most of these activities were carried out in cooperation with the NGOs concerned – such as SCOR, IAPSO and IABO; the results were published by UNESCO. One of the early examples was the need for a universal standard and a method to measure salinity of seawater to replace the *Hydrographic Tables* (1901) and Knudsen's method, which became outdated by the more accurate measurement of electrical conductivity of seawater. In 1961 the UNESCO/ICES/SCOR/IAPSO Joint Panel on Oceanographic Tables and Standards (JPOTS) was established and UNESCO (through OCE) coordinated the work of the Panel on behalf of the sponsoring organizations.



The above manual (1991), based on the JPOTS findings, gives practical guidelines for computing the basic physical oceanographic parameters from raw data obtained from measurements at sea.



This 1990 publication, no. 9 in the monograph series, typically presented the guidance and advice of a SCOR working group. (See monographs, following page.)

The results of the Panel marked the fruition of research work carried out by many distinguished institutions and scientists. The Panel adopted a new definition of salinity – the Practical Salinity Scale (1979) – that also ensured the continued usefulness of salinity data collected since the beginning of the 20th century. A new International Equation of State of Seawater (1980) replaced

the traditional equations that described the density of seawater as a function of temperature, salinity and pressure (depth). The culmination of this effort was the publication by UNESCO of two volumes of the International Oceanographic Tables in 1985 and 1987. The JPOTS findings were finally consolidated in a textbook manual (see the previous page), all of which were produced during the 25 years of the Panel's existence⁵.

Monographs, Technical Papers and Reports

A landmark reference series – UNESCO's Monographs on Oceanographic Methodology – was launched in 1966 with the publication of *Determination of photosynthetic pigments in sea-water*. The publication of the series followed a recommendation of SCOR to UNESCO in 1963. In this highly successful collection (proven to be 'best sellers' among the UNESCO scientific books), which was largely an OCE activity (from the latter's creation until the series was taken over in 1996 by the IOC), a total of eleven volumes were eventually published, providing guidelines and information for researchers – mainly in aspects of biological oceanography. The series is ongoing (the name to be shortened to 'Oceanographic Methodology'). An OCE-produced example (No. 9) is shown on the previous page.

Well known for over three decades in the international marine science community were two document series entitled: (i) *UNESCO Technical Papers in Marine Science* and (ii) *UNESCO Reports in Marine Science*. The Technical Papers, totalling 67 volumes issued from 1965 up to 1994, informed the scientific community of recent advances in oceanographic research and on recommended research programmes and methods. They were mainly published as documents produced jointly with scientific NGOs, such as SCOR. The Reports series (69 volumes in total issued from 1977 to 1996) served specific programme needs and reported on developments in projects conducted in the context of UNESCO's marine science-related activities.

Marine science education and training

Curricula development

As a support for capacity building and in response to wishes expressed by the scientific community and IOC meetings, a workshop on teaching marine sciences at the university level was convened in UNESCO in 1973, where university curricula in the main disciplines of oceanography were developed and recommended. This workshop was followed by a series of other workshops such as for training marine technicians, for use in secondary schools and universities (courses in fishery sciences, ocean engineering etc.). This was followed by the preparation and distribution (in six languages – Arabic, Chinese, English, French, Russian and Spanish) of the forward-looking study: *Year 2000 Challenges for Marine Science Training and Education Worldwide*.

After the merger of IOC and OCE (into IOC/MRI) at the end of 1990, two major training

⁵ Morcos, S., Poisson, A. and Mamayev, O. (1990). Joint Panel on Oceanographic Tables and Standards: 25 years of achievements under the umbrella of international organizations. In *Ocean Sciences: Their history and Relation to Man*, Proceedings of ICHO IV, Hamburg, Germany, 1987; eds W. Lenz and M. Deacon, *Deutsche Hydrographische Zeitschrift*, Hamburg, Ergänzungsheft, Reihe B, Nr. 22, 344-356.

initiatives were launched: (1) the Floating University (see below), and (2) the Global Faculty (which developed and exploited a computer-based set of training modules in remote sensing in the marine sciences and in coastal management).



Through the Division, UNESCO also cooperated in the development, production and distribution of many varied computer-based training and reference materials.

Floating University

Between 1991 and 1996, the Division carried out, jointly with Russia and with other countries, an international multi-disciplinary ship-based programme that combined training and cutting-edge research in marine geology and geophysics. Many important discoveries related to processes of interaction between the geosphere and biosphere in the deep ocean were made, mostly at the European and North African continental margins. A few hundred students from around the world were trained. In 1995 the programme – thanks to its valuable achievements in capacity building, research and its contribution to enhancement of the culture of peace – was recognized as a UNESCO contribution to the celebration of the 50th anniversary of the United Nations. The ‘Training-through-Research’ (TTR) programme (as it is called now) is still active; UNESCO’s participation is now coordinated through the IOC. Pictured in the following illustration (next page) are the Russian R/V *Gelendzhik*, one of the main ships on which cruises were conducted in several sea areas, and several training activities. In addition to the scientific learning achieved, these were occasions for multi-cultural exchanges, as another part of UNESCO’s ‘raison d’être’.

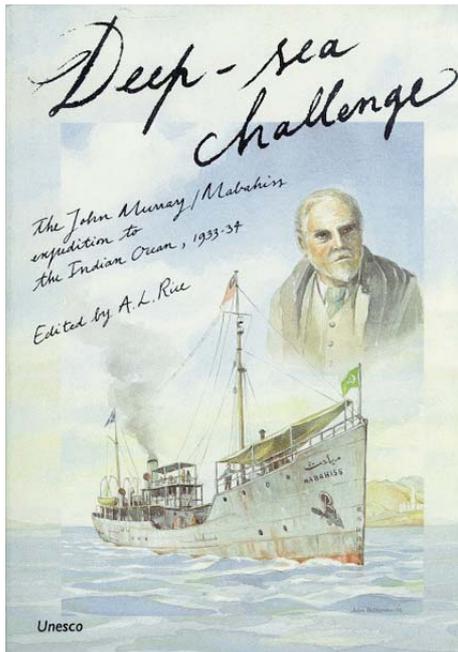


R/V *Gelendzhik* and images of TTR activities.
Photos courtesy of A. Suzyumov

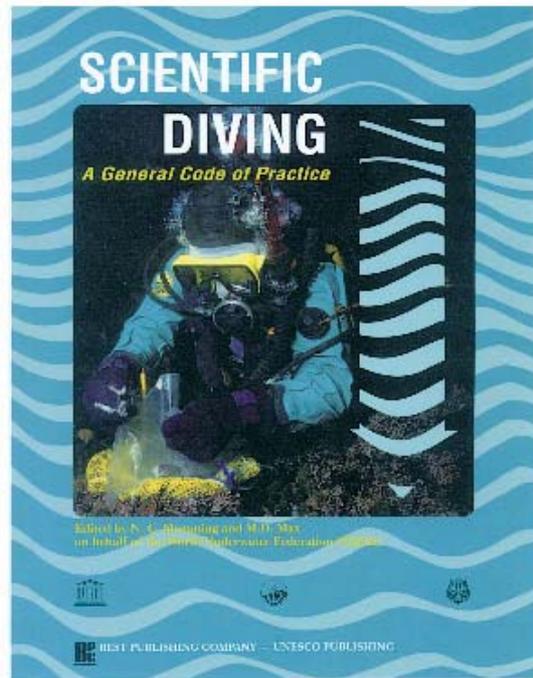
Publications and public information

In connection with its programme activities, the Division produced and widely distributed (to a great extent free of charge) a variety of publications, some of them also translated into other languages in addition to English. Included were documents, newsletters, monographs, bibliographies and other reference works.

One valuable source of information was the *International Marine Science (IMS) Newsletter*. It informed the scientific community on a broad spectrum of highlight activities of UNESCO and its partners in ocean science-related domains. A total of 76 issues were produced and distributed throughout the world to thousands of interested institutions and individual scientists. In the latter years, just prior to its discontinuation in 1996, it was available in the six UN languages. Available nowadays in the UNESCO archives, this periodical is particularly useful to historians in tracing the marine-related work of UNESCO, its sister agencies and other partners.



This 1986 book was awarded special recognition by the American Library Association.



Second edition (1996) of the scientific diving code.

The Division's publications also included a number and variety of non-serial publications, some more targeted than others as to the readership community. Certain titles (such as that on John Murray/*Mabahiss* Expedition, see above left) demonstrated the Organization's interest in preserving, where feasible and appropriate, historical information about scientific endeavours.

As well, data and information was complemented with practical advice to scientists in the conduct of their investigations. For example, scientific diving was the subject of a co-publication of a code of practice for scientific divers, produced by UNESCO in collaboration with the World Underwater Federation (CMAS) – see above right.

These publications of the Division were in significant demand by scientists, from all countries but especially in the less-developed ones. The covers of some of these are shown in this article and illustrate, to an extent, the variety of specialities and partners included in the OCE and MRI programme activities. The reader should not assume that the main purpose of the Division was the production of publications; rather that the publications were the products of the wide range activities of the Division or intended as source materials in support of the scientific community. Through the Division, UNESCO's main contribution lies in the impact it has had on the lives and work of many scientists and others the world over, particularly in the developing world.

In this article only a few of UNESCO's marine science publications have been shown. A complete historical list of all UNESCO major ocean-related publications (i.e. those which were priced titles), produced and distributed during the nearly forty years that have transpired since the first monograph and up to the date of the publication of this article, can be consulted. This list is on the IOC website (<http://ioc.unesco.org/>) in view of the fact that the IOC is now responsible for all marine science activities of UNESCO. These books were the subject of an exhibit during the recent (XXIII) IOC Assembly (June 2005, Paris).