Intergovernmental Oceanographic Commission
Reports of Governing and Major Subsidiary Bodies

IOC Intergovernmental Panel on Harmful Algal Blooms

Seventh Session

Paris, UNESCO Headquarters
16–18 March 2005

UNESCO

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ANNEXES

1. INTRODUCTION

1 The IOC Intergovernmental Panel on Harmful Algal Blooms (IPHAB) was formed at the Sixteenth Session of the IOC Assembly, March 1991, in order to identify adequate resources for a broad programme to try to solve some of the problems caused by harmful algae. The Harmful Algal Bloom Programme Plan and proposals (Document IOC-FAO/IPHAB-I/3) were adopted by the Seventeenth Session of the IOC Assembly in February-March 1993, and are also to be seen as IOC follow-ups to the United Nations Conference on Environment and Development (UNCED).

2 The Seventh Session of the Panel was held at IOC UNESCO Headquarters in Paris from 16-18 March 2005. The Session was opened by the Chair IPHAB, Dr. Beatriz Reguera (Spain), and the Technical Secretary IPHAB, Mr. Henrik Enevoldsen, on behalf of the Executive Secretary IOC, Dr. Patricio Bernal. The Panel was reminded of its importance as a mechanism to advise governments on HAB research and management with the ultimate goal to protect public health and food resources.

3 The Agenda for the Session was introduced by the Chair and adopted (Annex I hereto). Dr. C. McKenzie (Canada) was designated as Rapporteur.

4 The Session was attended by representatives from: Brazil, Canada, Chile, Colombia, Croatia, Denmark, Egypt, France, Germany, Italy, Japan, Namibia, Morocco, New Zealand, Slovenia, Spain, Sweden, United Kingdom, United States of America, Uruguay, the Scientific Committee on Oceanic Research (SCOR), and the International Society for the Study of Harmful Algae (ISSHA). The List of Participants is attached as Annex V hereto.

5 The Chair recalled the Terms of Reference for the Panel, as set out in Resolution XVI.4 of the Twenty-fifth Session of the IOC Assembly, March 1991 (Annex VI hereto) and the objectives in the IOC HAB Programme Plan (Annex VII hereto). **The Panel noted** that the Twenty-second Session of the IOC Assembly, Paris, 2003 had endorsed all the Recommendations of the Sixth Session of the Panel. The Resolution of the Twenty-second Session of the Assembly was introduced.

6 During its Seventh Session the Panel reviewed the actions completed during the intersessional period. The detailed report on HAB Progamme developments in the intersessional period is included as Annex VIII hereto. **The Panel noted with satisfaction** that considerable progress had been made and that the Recommendations of the Sixth Session of the Panel had been followed up to a large extent.

7 The objectives in the HAB Programme Plan (Annex VII hereto) were affirmed, priorities were set, actions to be taken were discussed and decided upon, and resources were sought, identified and committed to the extent feasible.

8 The Session was organized as six panel discussions: Panel 1 on capacity enhancement was chaired by A. Zingone (Italy) and introduced by H. Enevoldsen (IOC); Panel 2 on the joint IOC-SCOR GEOHAB Research Programme was chaired and introduced by Dr. P. Gentien (France); Panel 3 on biotoxin regulations was chaired and introduced by P. Busby (New Zealand); Panel 4 on HAB data bases was introduced by M. Lion (IOC-IEO SCCHA); Panel 5 on regional activities was introduced by the regional Chairs and chaired by B. Reguera (Spain); and Panel 6 on the operation of the HAB Programme, the role of the IPHAB and its future mission was chaired by B. Reguera (Spain) and introduced by H. Enevoldsen (IOC).

9 **The Panel endorsed** a number of intersessional activities to be implemented by Member States and the IOC Secretariat. These activities are summarized in the Workplan for the IOC HAB Programme 2006–2007, which is included in Annex II hereto.

10 A summary of the deliberations made and the decisions taken is given below.

2. PROGRAMME SUPPORT AND DEVELOPMENT

2.1. STAFFING OF THE HAB PROGRAMME

11 **The Panel discussed** the staffing of the programme and noted with concern that it is still completely dependant on extra-budgetary funding and that this earmarked extra-budgetary funding is phased out in 2005 as regards the IOC staff for the HAB Programme. As dedicated IOC staff for the HAB Programme remains crucial for focused development and implementation of the Programme, **the Panel expressed** concern to whether IOC is in a position to finance the post from other sources after 2005.

12 **The Panel acknowledged the importance** of the long-standing secondment through the Associate Expert Programme to the IOC Secretariat by Denmark, and took note that the programme had not been extended. **The Panel further acknowledged** that the support of Denmark and Spain for the Science and Communication Centre, with its status as a decentralized programme office, is essential for the ability of the Commission to implement the HAB Programme. An appropriate level of IOC staff for the Programme is still considered to be one senior and one junior staff member (Report IOC-FAO/IPHAB-I/3, Annex VII). **The Panel strongly reiterated its encouragement** to Member States to consider financial support for, or secondment of, staff members to the HAB Programme, and **urged** the Executive Secretary IOC to ensure adequate and continuous staff for the HAB Programme.

2.2. IOC SCIENCE AND COMMUNICATION CENTRES ON HARMFUL ALGAE

13 **The Panel welcomed** the developments and initiatives by the IOC Science and Communication Centres on Harmful Algae established in Copenhagen (Denmark) and Vigo (Spain). The Science and Communication Centres on Harmful Algae are established to provide assistance to Member States, and to developing countries in particular (Document SC/MD/101, para.80). **The Panel recalled** IOC Resolution XX-3 through which the IOC Assembly endorses the continuation of the Centres and urges Member States to continue to provide the support.

14 **The Panel referred to the decision of the Sixth Session of the Panel** that the IOC Science and Communication Centres develop along the lines recommended by the External Review Committee in 2002. This development takes into account the revised HAB Training and Capacity Enhancement Programme (Resolution IPHAB-VI.3), which endorses continuing ongoing activities with increased priority for capacity enhancement in monitoring and management and for activities responding to GEOHAB requirements. **The Panel noted with satisfaction** Recommendation IPHAB-VI.7 had been followed up and that the process of expanding the partnerships in the IOC Science and Communication Centres with relevant scientific institutions had started. The Panel welcomed Alfred Wegener Institute for Marine and Polar Research, the Senckenberg Research Institute, and Friedrich Schiller University Jena (Germany) as partners in the Centre. The objective of expanding the partnership is to provide a broader and longer-term platform for the implementation of capacity-building activities including courses, workshops, training through research, and individual training.

2.3. REGIONAL IOC HAB GROUPS

15 **The Panel took note** of the results and reports under the regional components of the HAB Programme, WESTPAC/HAB (Western Pacific), IOC/FANSA (South America), and IOCARIBE/ANCA (Caribbean), as well as the follow-up of Recommendation IPHAB-VI.1 concerning the establishment of new regional networks in particular the proposal for a regional network on harmful algae in North Africa under the auspices of the IOC.

16 The Chair of WESTPAC-HAB, Y. Fukuyo (Japan) gave a summary of the comprehensive activities and developments (see Annex IX hereto for details). The activities are lead by the Chair WESTPAC-HAB and Dr. Rhodora Azanza (University of the Philippines), Dr. Ann Anton (University of Malaysia Sabah), Dr. Ken Furuya (University of Tokyo). Issues of particular concern include difficulties in identifying an appropriate mechanism to establish a membership of individuals in WESTPAC Member States. This issue was brought up at WESTPAC-V but has not yet been resolved. It has been an impediment to the further development of WESTPAC-HAB that this issue has not been clarified and it is hoped that progress in this respect is made at the WESTPAC-VI session in May 2005. The establishment of the HAB-SEA Portal within the UNESCO Cross Cutting Project 'Ocean Portal' was welcomed and it is will be part of the 2006–2007 work plan of WESTPAC-HAB to further develop the portal to serve WESTPAC-HAB. It was noted with concern that the technical back-up from IOC Headquarters to the Portal needs to be strengthened and it was proposed that this maybe could be solved by operating the portal from the UNESCO Bangkok server and thereby draw on the technical back-up provided for the new WESTPAC web site which is set up in similar software.

17 The Chair COI-FANSA, L. Guzman (Chile), gave a summary of achievements and proposed future activities (see Annex X hereto for details). FANSA has a comprehensive range of initiatives and has become an important mechanism for regional cooperation on HAB and related issues. Members to FANSA are designated by the Member States; some are personal representing other institutions. FANSA, to the extent possible, endeavour to have two attendees from each country. The need for capacity building and the active involvement of the region in the development of GEOHAB was of particular importance. FANSA is working to establish a regional post graduate programme on HAB, and this initiative is, in particular, developed with the support of the University of Chile. In 2004–2005 the implementation of the UNESCO Cross Cutting Project on a web portal on HAB for Latin America is a major activity of FANSA. FANSA has planned its next meeting to be held in August 2005 in Peru.

18 The Chair COI-ANCA, E. Mancera (Colombia) gave a summary of ANCA objectives and activities to date, and presented priorities for the coming biennium (See Annex XI hereto for details). The Chair regretted that only a relatively small number of IOCARIBE Member States are able to attend the ANCA meetings due to lack of national funding and the limitations of the IOC budget. However, he noted that ANCA is in positive development and is gaining momentum. A major constraint to progress in the region is the lack of funding from governments for HAB research and establishment of monitoring and management systems. There is a pressing need to sensitize and inform authorities and politicians of the issues and how it affects society. Priorities included establishing a regional monitoring network. Furthermore, ANCA is now linking up with a regional initiative for a GEF proposal. Capacity building priorities include training courses in toxin analysis and species identification. The next ANCA meeting is planned for 2005. The Chair of ANCA indicated that he expected funds from Colombia to contribute to the coming ANCA Meeting.

19 The Panel expressed its appreciation and recognized the importance of the work carried out by the regional leaders and the importance of the resources made available to the regional activities by Japan, Spain and UNESCO Cross Cutting Projects

20 **The Panel endorsed** the proposed regional activities of WESTPAC/HAB, FANSA, and ANCA for 2006–2007 and integrated them in the Work Plan (see Recommendation IPHAB-VII.5 and its Annex 1).

21 Through Recommendation IPHAB-VI.1 the Panel recognized that there is a growing concern in North African countries about the negative impact of HAB events in the region. A considerable number of experts from the region participated in different IOC-sponsored training courses, workshops and symposia. There is a critical mass of expertise in North African countries that would benefit from the establishment of a regional network. Such a network of experts would promote the exchange of expertise, sharing of information, planning of common methodologies and would provide a synoptic view of common HAB-related problems in the Southern Mediterranean approaches. IPHAB-VI therefore recommended that an initiative be taken to establish a HAB network in North Africa and noted that regional bodies to be invited to cooperate in such an initiative include UNEP-MAP (Mediterranean Action Plan), FAO-COPEMED (Cooperation on Mediterranean Fisheries), and the International Commission for the Scientific Exploration of the Mediterranean Sea (CIESM: Commission Internationale pour l'Exploration Scientifique de la mer Mediterranée). Such initiative was taken at the regional Training Course on Harmful Algae held at Institut National des Sciences et Technologies de la Mer (INSTM) in Tunisia, 1–12 December 2003. Prof. Y. Halim who led the initiative presented the draft terms of reference to the Panel. The proposed Terms of Reference for an IOC Network on Harmful Algae in North Africa (HANA) includes: (i) Improving scientific knowledge of the physical, biogeochemical and physiological factors governing HABs; (ii) Creating a data-base relative to the incidence of HABs in the region; (iii) Establishing a directory of the personnel involved in HABs, their area of specialization and their level of expertise; (iv) Compiling an inventory of regional publications relevant to HABs; (v) Promoting the exchange of information through regular working groups, workshops and otherwise; (vi) Promoting capacity building for scientists and managers involved in HABs; (vii) Developing an identification guide book for harmful species from the region. The Salammbô Declaration proposing HANA is enclosed hereto as Annex XII.

22 **The Panel adopted** Resolution IPHAB-VII.3.

3. EDUCATIONAL PROGRAMME ELEMENTS

INFORMATION NETWORK

3.1 HARMFUL ALGAE NEWS

23 The IOC newsletter *Harmful Algae News* (HAN) on toxic algae and algal blooms has been published since January 1992 and the number of subscribers has stabilized to just above 2000. HAN is available in print and via the IOC HAB website. **The Panel reappointed** the Editor (Dr. Tim Wyatt) and the Editorial Board for HAN for the period 2006–2007. **The Panel recommended** continuing to prepare special issues on selected topics, and that HAN should be issued as regularly as possible (quarterly), even if some issues would have relatively few pages.

3.2 DIRECTORY OF EXPERTS: HAB-DIR

24 **The Panel noted with satisfaction** that the on-line International Directory of Experts in Toxic and Harmful Algae and their Effects on Fisheries and Public Health, HAB-DIR, has been re-launched as a sub-section of IOC expert database 'OceanExpert'. **The Panel encouraged** the scientific and managerial HAB community to register and make use of the HAB-DIR.

3.3 IOC MANUAL ON HARMFUL MARINE MICROALGAE

25 **The Panel recalled** that the Fifth Session of the Panel endorsed the preparation of a second revised and expanded edition of the IOC Manual on Harmful Marine Microalgae. The second edition of the Manual has the same editorial team as the first edition: D. Anderson (USA), A. Cembella (Canada), G. Hallegraeff (Editor in Chief), and H. Enevoldsen as Technical Editor. **The Panel noted with satisfaction** that the Manual was published in 2003 in the UNESCO series 'Monographs on Oceanographic Methodology' at a price of 49.50 Euros and that the second edition was already published in 2004 as the first edition was sold out. The publication of the Manual has been made possible through the financial support of the Danish Natural Science Research Council, the Danish Ministry of Science and Technology and Innovation, and Danida. The Manual is one of the best sales successes of UNESCO Publishing within natural science.

3.4 CO-SPONSORSHIP OF HAB CONFERENCES AND THEIR PROCEEDINGS

26 **The Panel noted with satisfaction** the follow-up of IPHAB Recommendation VI.6 and the continued co-sponsorship of the International HAB Conferences and the publication of their proceedings. IOC co-sponsored the XIth International Conference on Harmful Algae, Cape Town, South Africa, held from 15 to 19 November 2004, and the publication of the proceedings as a special issue of the *African Journal of Marine Science*.

27 **The Panel reiterated** the recommendation of IPHAB-VI for the continued co-sponsorship of the series of international HAB Conferences as it has been done since 1987. The support provided by the IOC has been crucial in securing the possibility of attendance by scientists from developing countries. **The Panel welcomed** the consolidation of the international HAB conferences under the auspices of the International Society for the Study of Harmful Algae (ISSHA). **The Panel recognized** this as part of a strengthened international NGO network on HAB, which provides better partnership possibilities for the IOC HAB Programme.

28 Recognizing that the availability of updated scientific literature is often a main handicap for the implementation of appropriate projects in developing countries/economies in transition, and that the dissemination of scientific results on harmful algae needs to be globalized for the sake of comparative studies, **the Panel reiterated its recognition** that the publication/co-publication by IOC of the proceedings of the International Conference on Harmful Algal Blooms, since 1995, has been a major achievement to ensure a world-scale dissemination (through the IOC Science and Communication Centres and partners) of the scientific results presented at these conferences.

29 **The Panel recommended** that the IOC keep close cooperation with ISSHA to ensure that this valuable series of proceedings continues to be published in a similar manner.

3.5 TRAINING

30 The Panel recalled the adoption by the Sixth Session of a revised IOC HAB Training and Capacity Enhancement Programme, and noted with satisfaction the training courses and workshops on harmful algae successfully implemented, regionally and globally, in 2003–2004 (listed in Annex X). **The Panel reiterated** that capacity building is a core component of the IOC HAB Programme. **The Panel expressed its appreciation** of the significant support provided by Denmark, Japan, and Spain, and welcomed both the new support provided by Germany for implementation (see item 2.2) as well as the indications from several other Member States who offered to support or to investigate the possibilities of supporting specific training activities in the period 2006–2007. The Panel strongly encouraged Denmark, Japan and Spain to continue to support IOC capacity-enhancement activities.

31 The Panel was provided with a summary of the development of a draft "IOC Strategy and Implementation Plan for Capacity Building", which will be presented for endorsement to the IOC Assembly in June 2005. **The Panel noted with satisfaction** that regional training needs on HAB have been explicitly expressed in the regional implementation plans and **the Panel acknowledged** the importance of a clearly formulated strategy and implementation plan also for the success of building capacity in Member States in management of harmful algal events.

32 **The Panel endorsed** the implementation of a number of proposed capacity building activities (listed in Annex II hereto (annex to Recommendation IPHAB-VII.9)).

4. SCIENTIFIC PROGRAMME ELEMENTS:

ECOLOGY AND OCEANOGRAPHY

4.1 IOC-SCOR PROGRAMME ON THE GLOBAL ECOLOGY AND OCEANOGRAPHY OF HARMFUL ALGAL BLOOMS: GEOHAB

33 At its Fourth Session the Panel, through Recommendation IPHAB-IV.2, endorsed the establishment of an international research programme on the global ecology and oceanography of harmful algal blooms, GEOHAB. GEOHAB is established jointly with SCOR and has as the overall goal of this initiative to develop the scientific knowledge needed in this field in order to increase the capability of mitigating the impacts of HABs. This will be addressed through improving capabilities for modelling the population dynamics in a number of selected systems identified as particularly suited for international research cooperation in comparative systems. Furthermore GEOHAB is intended to help Member States in setting national priorities and in particular to promote the establishment of national, regional and international research projects. GEOHAB has its web site at [www.geohab.info].

34 On behalf of the Chair of the IOC-SCOR Scientific Steering Committee (SSC) for GEOHAB, Dr. Grant Pitcher (South Africa), Dr. Patrick Gentien (France) gave a summary description of GEOHAB and reported on GEOHAB developments. The Terms of Reference for the GEOHAB SSC, the List of SSC Members, and a summary of GEOHAB activities and achievements are attached as Annex XIV hereto.

35 **The Panel took note** of the activities of the joint ICES-IOC-SCOR Study Group on GEOHAB Implementation in the Baltic (SGGIB) **and endorsed** its continuation with a focus on facilitation of the development and implementation of regional cooperative GEOHAB research in the Baltic. **The Panel recommended** that ICES be consulted in order to ensure focussed terms of reference for 2006.

36 The GEOHAB SSC and the SCOR and IOC Secretariats are still seeking the establishment of an international project office (IPO). The Chair IPHAB summarized the efforts of SCOR and IOC to establish the IPO. Unfortunately the negotiations with the Member States, which have shown interest, have so far (France, Norway, USA) have not resulted in identification of resources that would fully cover the cost of an IPO. In particular the cost of staff for the IPO remains the most difficult budget post to identify funds for. Negotiations with other potential hosts are ongoing. A model for a system where smaller contributions are pooled from different countries was presented based on experience from a similar research programme (InterRidge). The GEOHAB SSC will further explore this model.

37 **The Panel expressed its appreciation** of the work of the GEOHAB SSC and in particular the organization of the series of Open Science Meetings.

38 The Panel was provided with a summary of the developments of the European Commission (EC) and the United States National Science Foundation (NSF) 'EU-US Scientific Initiative on Harmful Algal Blooms'. The EU-US initiative is targeted to coordinate funding for research focussed closely on the same objectives as GEOHAB (European Commission, Workshop Report No. EUR 20578, 2003). **The Panel acknowledged** the importance for the development and implementation of GEOHAB of the EU-US coordinated call for proposals. **The Panel strongly encouraged** the continuation of the coordinated funding mechanism of the EU and the USA NSF and **also strongly encouraged** for other similar bilateral or multilateral coordinated funding initiatives.

39 Based upon information on GEOHAB advances, the Panel discussed ways it could assist in the implementation of GEOHAB and in the establishment of an IPO. **The Panel fully acknowledged** that an IPO established under the joint auspices of the IOC and SCOR is required to implement GEOHAB. **The Panel noted** that contributions for GEOHAB and the IPO can be made through several mechanisms such as direct contributions to IOC or SCOR, direct to an account of the IPO in the host country, in kind contributions, coverage of costs, etc, and that IOC and SCOR have appropriate measures to arrange different mechanisms. **The Panel recommend** that the funding model applied by InterRidge should be pursued by the GEOHAB SSC, IOC and SCOR.

40 **The Panel recognized** the importance of IPHAB Delegates to communicate GEOHAB needs to the national delegates to the IOC Assembly. The Panel requested that IOC and SCOR together with the GEOHAB SSC prepare a concise document, in time for IPHAB delegates to address their IOC Delegates, outlining IPO requirements and in particular the benefits for donors derived from their contribution to the IPO. The document should also suggest amounts to be contributed in a funding model as applied by InterRidge.

41 The Panel concluded the agenda item by discussing the strategy for the Panel to provide an efficient mechanism for promoting GEOHAB at the global, regional, and national levels. To this effect, **the Panel revised** both the IPHAB-VI guidelines to its Members on how to act in the intersessional period, and recommendations to Member States on how support the establishment an IPO for GEOHAB.

42 **The Panel adopted** Resolution IPHAB-VII.4 and Recommendation IPHAB-VII.1.

4.2 ICES-IOC WORKING GROUP ON THE DYNAMICS OF HARMFUL ALGAL BLOOMS

43 The Secretariat, on behalf of the Chair (J. Martin, Canada) of the ICES-IOC Working Group on Harmful Algal Bloom Dynamics (WGHABD), reported on the achieved results, and presented the 2005 Terms of Reference (attached as Annex XV hereto).

44 **The Panel noted with appreciation** the work of WGHABD and in particular advances made in the organization of an ICES-IOC inter-comparison workshop on "New and classic techniques for the determination of numerical abundance and biovolume of HAB species". The workshop, which is scheduled from 22 to 26 August 2005 at the Kristineberg Marine Biological Station, Sweden, was endorsed through Recommendation IPHAB-VI. 4. **The Panel strongly encouraged** the organizers of the workshop to seek publication of the results in an appropriate journal to ensure wide dissemination of the inter-comparison.

45 The Panel reiterated Recommendation IPHAB-VII. 4. on the importance of the ICES-IOC WG in having provided, and still providing, a significant part of the basis for the development of GEOHAB and other HAB activities, and the importance of the continuation of the WGHABD.

46 The Panel was presented a request from a round table discussion on "Detection and monitoring of HABs" at the XI International Conference on Harmful Algae (Cape Town, South Africa, 15–19 November 2004) concerning the formation of a working group to facilitate transfer of technologies advancements between scientists and managers. **The Panel recognized** the rapid advances taking place in technologies for rapid detection of HAB cells and toxins and consequently the need of managers for accurate information on the reliability and operational availability of these technologies. However, it was noted that the activities of the ICES-IOC WGHABD, and in particular the forthcoming ICES-IOC inter-comparison workshop on "New and classic techniques for the determination of numerical abundance and biovolume of HAB species" (Kristineberg, 22–25 August 2005) addresses this need. **The Panel concluded** that the issue of the transfer of HAB cell and toxin detection technology is currently adequately addressed by the existing ICES-IOC WGHABD. At the next IPHAB session, the Panel will evaluate the results of the inter-comparison workshop, as well as the planned activities of the WGHABD to disseminate and expand those results, and then decide whether further action is required.

4.3 ICES-IOC-IMO WORKING GROUP ON BALLAST AND OTHER SHIP VECTORS (WGBOSV)

47 The reports of the ICES-IOC-IMO WGBOSV from the intersessional period were made available. **The Panel endorsed** the co-sponsorship of the Working Group for 2006–2007 and urged IOC to ensure a Representative at the meetings of the WGBOSV. The 2005 Terms of Reference of WGBOSV are attached as Annex XVI hereto.

48 **The Panel questioned** whether the Group had been sufficiently efficient in timely addressing critical scientific-technical issues in relation to the development of the guidelines for the implementation of the IMO Convention on Ballast Water. Several Member States expressed concern about the feasibility of implementing the guidelines in a meaningful way. **The Panel decided** to prepare a brief document that identifies the issues of IPHAB concern and provide this to WGBOSV and its sponsoring organizations for possible inclusion in the Terms of Reference.

49 **The Panel adopted** Recommendation IPHAB-VII.4.

4.4 TAXONOMY

50 The Fourth Session of the Panel established a Task Team on Phytoplankton Taxonomy through Resolution IPHAB-IV.1. The Fifth and Sixth sessions of the Panel both decided to continue the task team and revised the Terms of Reference. The Seventh Session reviewed the progress report of the Task Team Chair, Prof. Moestrup (Denmark), and

reaffirmed the strong need in the international research and management community for a reference list on potentially harmful algae.

51 **The Panel decided** to continue the Task Team with revised Terms of Reference. **The Panel adopted** Resolution IPHAB-VII.l**.**

52 **The Panel encouraged** the Task team to be open to potential interaction and linkages with the MICROBIS ('Integrated modular information systems in support of the Census of Marine Microbial Life' under the auspices of 'Census of Marine Life') initiative, which builds more comprehensive taxonomic databases.

4.5 TOXICOLOGY AND TOXIN CHEMISTRY

53 The Panel recalled the discussions at the Sixth Session of the Panel on Ciguatera Fish Poisoning (CFP), which continues to be a major health hazard in most tropical and sub-tropical regions. The Panel recognized that there may be effects of climatic trends and oscillations as well as of exceptional events on the spatial and temporal occurrence of CFP, and that the Tsunami disaster that occurred on 26 December 2004 significantly impacted the coastal environment of several countries facing the Andaman Sea such as India, Indonesia, Sri Lanka and Thailand. It is described in the scientific literature that CFP has occurred after such devastation of the coastal environment, because decay of live corals provides opportunities for proliferation of seaweeds, on which benthic toxic microalgae responsible for ciguatera grow. The conclusions of the discussion and measures to be taken to provide information of risks for consumption of coral fishes to prevent outbreak of ciguatera poisoning were summarized in a recommendation. In particular the Panel recommended the concerned IOC Regional Subsidiary bodies to encourage Member States to screen for the occurrence of benthic dinoflagellates on seaweeds and of ciguatera toxin contamination in endemic coral fish species in areas affected by the Tsunami.

54 **The Panel adopted** Recommendation IPHAB-VII.2.

5. OPERATIONAL PROGRAMME ELEMENTS

5.1 MONITORING AND RESOURCE PROTECTION

55 The Panel recalled its Resolution IPHAB-VI.2 where the Panel established a Task Team to address incompatibilities among biotoxin regulations in major markets. **The Panel welcomed** the merge of the Task team into a joint FAO/IOC/WHO Workshop held in Dublin April 2004 and a Joint FAO/IOC/WHO *ad hoc* Expert Consultation in Oslo to address the following specific questions posed by the WHO-FAO Codex Committee on Fish and Fisheries products (CCFFP):

- Provide scientific advice to the CCFFP to enable the establishment of maximum levels in shellfish for shellfish toxins;
- Provide guidance on methods of analysis for each toxin group;
- Provide guidance on monitoring and management of biotoxin forming phytoplankton and bivalve molluscs.

56 In relation to the establishment of maximum levels, the Expert Consultation categorised the biotoxins into eight distinct groups based on chemical structure. Risk assessments were then carried out, including hazard identification, hazard characterisation,

exposure assessment and risk characterisation. Based on the available information, the Expert Consultation derived provisional acute reference doses for five of the toxin groups – azaspiracid, okadaic acid, saxitoxin, yessotoxin and domoic acid. The database provided insufficient data to establish doses for brevetoxins, cyclic imines and pectenotoxins.

57 In relation to methods of analysis, the Expert Consultation made recommendations for each of the respective toxin groups. Most methods currently available do not strictly meet the criteria for CODEX Type II or III methods. The implementation of a marker compound concept to address complex toxin groups was recommended.

58 In relation to monitoring and management, the Expert Consultation agreed that decisions on the safety of shellfish can only be based on the direct measurement of toxins in shellfish flesh. However, an integrated shellfish and micro-algal monitoring programme is highly recommended to provide expanded management capability and enhanced consumer protection. For early warning purposes, it is recommended to have a programme to monitor growing areas for species of toxin-producing micro-algae. It was also recommended that sample size and sampling frequency be adequate to address spatio-temporal changes in micro-algae and toxins in shellfish.

59 The Expert Consultation also made recommendations on the management of new toxins and new analogues/metabolites of existing toxins.

60 To continue to address the issue systematically, **the Panel decided** on the Terms of Reference for an intersessional Task Team. **The Panel adopted** Resolution IPHAB-VII.2.

61 The Panel noted with satisfaction that the endorsement by the Fifth Session of the publication by IOC jointly with APEC of a major report on design of HAB monitoring strategies had been successfully followed-up. The report is a reedited version of a report prepared by a consortium of international experts and originally published by Hong Kong in cooperation with APEC. The report is published as *Monitoring and Management Strategies for Harmful Algal Blooms in Coastal Waters*, by D. M. Anderson, P. Andersen, V. M. Bricelj, J J. Cullen, and J. E. Rensel. APEC Report # 201-MR-01.1, Asia Pacific Economic Programme, and IOC Technical Series No. 59, Paris, France, 2001

5.2 DATA MANAGEMENT

62 The main data management activity under the HAB Programme is the Harmful Algal Event Data-base, HAE-DAT. The work on the further development of HAE-DAT was presented by M. Lion (IOC-IEO Science and Communication Centre Vigo (SCCHA)). HAE-DAT has its origin in the ICES-IOC Working Group on Harmful Algae Bloom Dynamics, which since 1987 has recorded harmful algal events in the ICES countries on an annual basis. In order to be able to give easy access to data and to facilitate data analysis HAE-DAT was established in 1997 in a Microsoft Access© 97 application. This first version of HAE-DAT had to be downloaded from the Internet to the personal computer of the user. However, HAE-DAT is now transferred from the Microsoft Access© desktop solution into a MySQL/PHP platform running on a Linux server. During the last year the IOC-IEO SCCHA and B. Sims at the IOC Secretariat have worked to establish the new format, which improves the data structure, allows HAE-DAT to be on-line searchable in a user-friendly environment, and will facilitate analysis.

63 During the data transfer process to the new MySQL format; problems have occurred with respect to harmonizing tables and fields. This extra work has caused a delay in completing the new format and the presentation on-line.

64 A key objective of the upgrading of the software format is to be able to generate maps, which draw directly on the data in HAE-DAT. To date the decadal maps presented at the IOC and ICES websites are made manually and not fully correlated with the records in HAE-DAT. To address this weakness in the maps, the IOC-ICES WGHABD requested in 2003 that IFREMER (which has been in charge of the production and updating of the ICES-IOC Decadal Maps of HAB Occurrences in the North Atlantic) and the IOC-IEO SCCHA evaluate the feasibility of generating HAE-maps automatically from HAE-DAT. A pilot study has been made using records from Spain, Portugal and USA to test the feasibility. The data worksheets exported from HAE-DAT were provided to IFREMER in order to produce decadal maps in the software used so far (ArcView and Flash) and then compare for consistency these new maps with the maps produced manually 1997–2001. Previously, the decadal maps just showed the presence of toxin or mortality observations from the last 10-year period, but once the new HAE-DAT is fully developed, it will be possible to generate maps for any period or specific year, shellfish syndrome, phytoplankton species or any other HAE-DAT parameter. Furthermore it is the objective to merge into HAE-DAT the database MON-DAT that contains systematic descriptions of the HAB monitoring systems in Member States. The first step will be a transfer of MON-DAT data to the same data base platform and structure as HAE-DAT. Clearly there is still work to be done before the above advances are implemented. It is expected this will be achieved during 2005, pending IOC resources and the support by expert institutions in Member States.

65 It is the strategy to build partnerships in order to develop HAE-DAT into a global database on harmful algal events. To this effect, there is an open invitation to non-ICES countries and regional organizations to joint HAE-DAT. To this affect IOC and the North Pacific Marine Science Organization (PICES) has agreed to establish a partnership in systematically compiling, storing and presenting on-line, records on harmful algal events within HAE-DAT. The regional networks of the HAB programme ANCA, FANSA and HANA are encouraged and supported to work as networks for compiling HAE records in HAE-DAT. Single countries in the Mediterranean such as Italy and Greece have also expressed a wish to join and Turkey has started its compilation of records.

66 **The Panel** welcomed the advances in the up grading of HAE-DAT **and gave priority** to the development and consolidation of HAE-DAT. **The Panel encouraged** the involved national agencies to continue their support to the activity.

67 **The Panel endorsed** the merge of MON-DAT into HAE-DAT.

68 The Panel welcomed the new partnership with PICES regarding HAE-DAT and the initiative taken to include the Mediterranean.

69 On behalf of the International Society for the Study of Harmful Algae (ISSHA) Dr. A. Zingone (Italy) gave a summary of the development of a database initiative called HAB-MAP. HAB-MAP is a coordinated international effort to compile a database on the occurrence of potential harmful species worldwide. As compared to HAE-DAT, HAB-MAP is a biogeographical database, which will be able to provide maps with the documented distribution of a given HAB species as compared to HAE-DAT data/maps on recorded harmful algal events. HAB-MAP will be built on the same database platform as HAE-DAT, which will be provided to ISSHA by the IOC. This will in the long-term perspective allow for merging of data.

70 The Panel acknowledged the HAB-MAP initiative and that it clearly complements HAE-DAT and the IOC Taxonomic Reference List. The Panel welcomed the cooperation between IOC and ISSHA on the software platform.

5.3 IMPLEMENTATION OF HAB MONITORING WITHIN THE GLOBAL OCEAN OBSERVING SYSTEM (GOOS)

71 The Panel recalled recommendation IPHAB-V.3 and IPHAB-VI.3, and that operational observation of HABs is a constituent of the Coastal Ocean Observations Modules of The Global Ocean Observing System (GOOS).

72 The Panel noted that the Integrated Strategic Design Plan and the associated draft Strategic Implementation Plan for the Coastal Module of GOOS does not yet specify the variables to detect the occurrence of HABs. To reflect its continuous interest in the development of the components of GOOS the Panel revised its recommendation regarding HABs as a constituent of Costal GOOS. The Panel expressed its wish to be more interactive with the appropriate GOOS groups in the further specification of suitable variables and of harmful algal observation and forecasting systems as an operational element of Costal GOOS.

73 **The Panel adopted** Recommendation IPHAB-VII.3.

6. HAB PROGRAMME WORKPLAN 2006–2007

74 **The Panel summarized** the priorities and needs for the next intersessional period and **recommended** a workplan for the period 2006–2007 as indicated in Annex II hereto. **The Panel adopted** Recommendation IPHAB-VII.5**.**

7. OPERATION OF THE IOC INTERGOVERNMENTAL PANEL ON HAB

75 The Panel recalled the definition by the Sixth Session of its purpose, which includes initiating and monitoring an improved dialogue between the scientific community with the user community with regard to harmful algal events. Hence, the role of IPHAB is to serve as a mechanism to make national governments or economies more effective in protecting human lives and in ensuring the sustainable development of aquaculture and fishery activities through regional and international cooperation.

76 The Mission of IOC HAB Programme is:

- To initiate or strengthen existing regional and international HAB programmes that can guide and help national governments in improving their understanding of, and coping mechanisms for HAB events, through enhanced education and effective dialogue with consumers, policy-makers, managers and the general public.

- To help plan and provide guidance on the implementation of regional and international activities such as workshops and intercalibration in order to harmonize and improve national management of HAB events.

77 **The Panel noted** that three days requires a very compressed agenda and leave little time to more detailed discussion, The Chair was invited to consider three and half day instead of three days for the session.

78 **The Panel decided** to continue its activities intersessionally under the co-ordination of the Chair. Dr. B. Reguera (Spain) was re-elected Chair, and Dr. P. Busby (New Zealand) was re-elected Vice-Chair.

79 The Panel and the Secretariat expressed their gratitude to Dr. Reguera and Dr. Busby for their wise and competent chairing of the Panel.

80 **The Panel stressed the importance** of the attendance of the Chairs of regional IOC HAB groups at IPHAB sessions, and urged the Secretariat to ensure this for the Eighth Session of the Panel. The Panel noted with satisfaction that all the regional chairs attended the Sevenths session.

81 **The Panel recommended** that the Eighth Session be announced to Member States no less than 12 months in advance.

82 **The Panel adopted** Recommendation IPHAB-VII.6. **The Panel requested** the Chair to present an Executive Summary, Resolutions and Recommendations to the Twenty-third Session of the IOC Assembly in June 2005.

ANNEX I

AGENDA

1. OPENING

1.1 OBJECTIVES OF THE INTERGOVERNMENTAL PANEL ON HARMFUL ALGAL BLOOMS. DECISIONS TAKEN BY THE IOC ASSEMBLY

2. ADMINISTRATIVE ARRANGEMENTS

2.1 ADOPTION OF THE AGENDA

2.2 DESIGNATION OF RAPPORTEUR

3. SUMMARY DESCRIPTION OF THE IOC HARMFUL ALGAL BLOOM PROGRAMME

4. HABP DEVELOPMENTS IN THE INTERSESSIONAL PERIOD:

4.1 CHAIR, IPHAB AND TECHNICAL SECRETARY´S SUMMARY REPORT ON ACTIVITIES AND IMPLEMENTATION OF IPHAB-V DECISIONS

5. NATIONAL STATEMENTS

6. MAJOR ISSUES REQUIRING INTERGOVERNMENTAL COOPERATION (INCLUDING INTERACTION WITH OTHER PROGRAMMES AND ORGANIZATIONS, AND REGIONAL COMPONENTS OF HABP):
PANEL SESSION

Panel 1. Capacity building
Panel 2. GEOHAB Research Programme:
Panel 3. HAB Monitoring in Coastal GOOS:
Panel 4. Formulation/endorsement of specific objectives for regional activities
Panel 5. Seafood safety regulation coordination:
Panel 6. Operation of the HAB Programme, role of the IPHAB and its future mission

7. OTHER RELEVANT ITEMS

8. RECOMMENDATIONS OF THE IPHAB, OVERVIEW OF RESOURCES AND NEEDS: WORKPLAN 2006–2007

9. OPERATION OF THE IPHAB

10. ELECTION OF CHAIRS

11. ANY OTHER BUSINESS

12. ADOPTION OF EXECUTIVE SUMMARY AND RESOLUTIONS/RECOMMENDATIONS

13. CLOSURE

ANNEX II

ADOPTED RESOLUTIONS AND RECOMMENDATIONS

Code	Title
	Resolutions
Resolution IPHAB-VII.1	Task Team on Algal Taxonomy
Resolution IPHAB-VII.2	Task Team on Biotoxin Monitoring, Management and Regulations
Resolution IPHAB-VII.3	Regional HABP Development
Resolution IPHAB-VII.4	IPHAB operation regarding GEOHAB
	Recommendations
Recommendation IPHAB-VII.1	Development of GEOHAB
Recommendation IPHAB-VII.2	Assessment of the Potential Effect of Tsunami on the Temporal and Spatial Changes in Ciguatera Occurrence
Recommendation IPHAB-VII.3	Implementation of HAB Monitoring within the Global Ocean Observing System
Recommendation IPHAB-VII.4	ICES-IOC-IMO Working Group on Ballast and Other Ship Vectors
Recommendation IPHAB-VII.5	HABP Workplan 2006–2007
Recommendation IPHAB-VII.6	Operation of the IOC Intergovernmental Panel on Harmful Algal Blooms

Resolution IPHAB-VII.1

TASK TEAM ON ALGAL TAXONOMY

The IOC Intergovernmental Panel on Harmful Algal Blooms,

Recognizing the pivotal role of harmful algal taxonomy in training, scientific and monitoring activities in the HAB Programme,

Acknowledging the valuable sources for identification of harmful algae e.g. provided by the *IOC Manual on Harmful Marine Microalgae*, Hallegraeff, G. *et al.* (eds.), UNESCO 1995, 2003, and 2004 and *Identifying Marine Phytoplankton*, Thomas, C. R., (ed.) 1995,

Recalling the frequent change of names of many harmful algae,

Noting the instability of names as a source of confusion for ecologists, toxicologists, and monitoring workers,

Recalling the decisions of the previous Sessions of the Panel regarding the Task Team on Algal Taxonomy,

Acknowledging the progress of the Task Team and the Inter-net publication of the IOC Taxonomic Reference List of Toxic Plankton Algae,

Decides, with reference to the HAB Programme Plan, objective 6.2.2, ii (Annex V), to continue the Task Team on Algal Taxonomy with the following terms of reference:

(i) maintain, complete and update the list of toxic algal species;

(ii) maintain, complete and update the information about the known occurrence of toxic strains of each species;

(iii) include illustrations showing diagnostic features of each species or reference to such illustrations or links to such illustrations;

(iv) include a description of each species or a link to such a description;

(v) organise a Session at the XIIth International Conference on Harmful Algal Blooms (Copenhagen, Denmark, September 2006), during which the web site is demonstrated and discussed;

(vi) provide the Reference List with a short section on application of the botanical and zoological codes of nomenclature to microalgal taxonomy;

Decides also that the Task Team will be composed of: Ø. Moestrup (Denmark) Chair, Y. Halim (Egypt), M. Elbraechter (Germany), A. Zingone (Italy), Y. Fukuyo (Japan), M. Faust (USA), S. Fraga (Spain), F.R.J. Taylor (Canada), G. Codd (UK), and G. Cronberg (Sweden). The Task Team may be expanded as required to fulfil the Terms of Reference;

Notes that the Task Team will continue its work until otherwise decided by the Panel, and that it will work by correspondence and/or meet on an opportunistic basis, as for example during the XIIth HAB Conference in Copenhagen, September 2006, and provide a progress report including a workplan for the intersessional period to the Chair IPHAB prior to IPHAB-VIII.

Resolution IPHAB-VII.2

TASK TEAM ON BIOTOXIN MONITORING, MANAGEMENT AND REGULATIONS

The IOC Intergovernmental Panel on Harmful Algal Blooms,

Recalling Resolution IPHAB-VI.2 concerning compatibility of regulations on aquatic biotoxins,

Acknowledges the result of the IPHAB-VI Task Team on Biotoxin Regulations as a result of its merge into the Joint FAO/IOC/WHO ad hoc Expert Consultation on Biotoxins in Bivalve Molluscs;

Acknowledges the continued existence of various groups which address the scientific aspects of methodology and legislation with regards to the contamination of seafood with phycotoxins, and that each group generates valuable scientific information that may be used to recommend on regional or national policies [such as those of the Asia Pacific Economic Cooperation (APEC), EU National Reference Laboratories, CEN, AOAC];

Notes with concern that there is limited coordination and exchange of information among these groups;

Notes with concern the potential incompatibility of regulations and the associated impediments to trade in seafood products;

Decides to establish a Task Team the following Terms of Reference:

(i) identify incompatibilities among regulations in various markets;

(ii) take the initiative to expand the participation in the Task Team (e.g. EC, APEC, US FDA, and relevant experts) as required to assist the Codex Committee on Fish and Fisheries Products (CCFFP) to clarify and include into the CCFFP Standard and Code of Practice for Live Bivalve Molluscs the recommendations contained in the Report of the Joint FAO/IOC/WHO ad hoc Expert Consultation on Biotoxins in Bivalve Molluscs;

(iii) in cooperation with the Joint FAO/IOC/WHO executive, complete the background papers to the report of the Joint FAO/IOC/WHO ad hoc Expert Consultation on Biotoxins in Bivalve Molluscs in preparation for publication.

Decides that the Task Team will be chaired by Phil Busby (New Zealand). The Chair may establish the membership of the Task Team as required to address the Terms of Reference;

Encourages the relevant organizations to invite the IPHAB Task Team to participate as observer at the principal meetings of their respective groups in order to facilitate international compatibility of applied methodology and legislation with respect to phycotoxins;
Notes that the Task Team is established until otherwise decided by the Panel, and that it will work by correspondence and/or meet on an opportunistic basis, and provide a progress reports for the intersessional period to the Chair IPHAB prior to IPHAB-VIII.

Resolution IPHAB-VII.3

REGIONAL HABP DEVELOPMENT

The IOC Intergovernmental Panel on Harmful Algal Blooms,

Recalling the priority of the implementation of IOC programmes at the regional level,

Noting with appreciation the reports of the regional activities within WESTPAC/HAB, ANCA, and FANSA,

Recalling Recommendation IPHAB-VI.1 concerning assessing the feasibility of undertaking regional HAB activities in Northern Africa,

Recognizing with satisfaction the results from a regional workshop in Tunisia, December 2003, to identify priorities and formulate terms of reference for a regional network on HAB for North Africa,

Endorses the proposed work plans of ANCA, FANSA and WESTPAC-HAB for 2006–2007 subject to availability of funding**;**

Decides to establish the IOC Regional Network on Harmful Algae in North Africa (HANA) with general Terms of Reference to:

(i) Improve scientific knowledge of the physical, biogeochemical and physiological factors governing HABs;

(ii) Establish a database relative to the incidence of HABs in the region as a contribution to HAE-DAT;

(iii) Establish a directory of the personnel involved in HABs, their area of specialization and their level of expertise as a contribution to the HAB-DIR;

(iv) Compile an inventory of regional publications relevant to HABs;

(v) Promote the exchange of information through regular working groups, workshops and otherwise;

(vi) Promote capacity building for scientists and managers involved in HABs;

(vii) Develop an identification guidebook for harmful species from the region.

HANA is expected to submit to each session of IPHAB a report with their prioritised needs and proposed activities for each two-year period coinciding with the biennial budgets of IOC. HANA will be supported by the IOC subject to available funding.

Request that the regional Chairs maintain contact and coordinate activities when feasible and appropriate and ensure that activities for e.g. data bases use the same IOC formats;

Urge Member States to contribute resources to help implement the work plan of the regional networks and groups.

Resolution IPHAB-VII.4

IPHAB OPERATION REGARDING GEOHAB

The IOC Intergovernmental Panel on Harmful Algal Blooms,

Referring to the establishment of the joint SCOR-IOC International Science Programme on the Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB) through IOC Resolution EC-XXXI.3, and the associated GEOHAB *Science Plan,*

Recognizing that GEOHAB cannot be implemented without a strong involvement of the scientific community and funding agencies at national and regional levels,

Decides, that the individual IPHAB members will continue to:

(i) inform their national representatives at the IOC Assembly about GEOHAB and related IPHAB recommendations and resolutions;

(ii) encourage the establishment of committees, working groups, mailing lists as appropriate in order to facilitate the coordination of their national activities and international collaboration relevant to GEOHAB, and serve as a focal point for interactions with the Scientific Steering Committee (SSC) for GEOHAB and International Programme Office (IPO);

(iii) examine the possibilities and draft a proposal to include GEOHAB research activities into development projects;

(iv) in cooperation with the GEOHAB SSC Members, inform relevant regional bodies (e.g. ICES, PICES, HELCOM, OSPARCOM, etc.) about GEOHAB, the related IPHAB-VII Recommendations and Resolutions, and make suggestions for their support and/or action.

Recommendation IPHAB-VII.1

DEVELOPMENT OF GEOHAB

The IOC Intergovernmental Panel on Harmful Algal Blooms,

Recalling the establishment of the joint SCOR-IOC International Science Programme on the Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB) through IOC Resolution EC-XXXI.3, and the associated GEOHAB *Science Plan* and *Implementation Plan,*

The Panel acknowledged the importance for the development and implementation of GEOHAB of the coordinated call for proposals by the European Commission (EC) and the United States National Science Foundation (NSF);

The Panel strongly encouraged the continuation of the coordinated funding mechanism of the EC and the USA NSF and **also strongly encouraged** for other similar bilateral or multilateral coordinated funding initiatives;

Acknowledging that an International Programme Office established under the joint auspices of the IOC and SCOR is required for a satisfactory implementation of GEOHAB,

Recognizing that a model where contributions are pooled from different countries has been applied with success by a similar research programme (InterRidge),

Recommends that the application of such a model be further explored by the Scientific Steering Committee for GEOHAB and the IOC and SCOR Secretariats;

Recommends that the national representatives of IOC Member States to the IOC Assembly and Executive Council take the necessary action to explore the feasibility of their governments to provide a contribution to the establishment and operation of an IOC-SCOR International Programme Office for GEOHAB.

Recommendation IPHAB-VII.2

ASSESSMENT OF THE POTENTIAL EFFECT OF TSUNAMI ON THE TEMPORAL AND SPATIAL CHANGES IN CIGUATERA OCCURRENCE

The IOC Intergovernmental Panel on Harmful Algal Blooms,

Recognizing that Ciguatera Fish Poisoning (CFP) is a major health hazard in most tropical and sub-tropical regions,

Recognizing the possible effects of climatic trends and oscillations as well as of exceptional events on the spatial and temporal occurrence of CFP,

Recognizing that the tsunami disaster that occurred on 26 December 2004 significantly impacted the coastal environment of several countries facing the Andaman Sea such as Indonesia, Thailand, Sri Lanka and India,

Noting that CFP has occurred after such devastation of the coastal environment, because decay of live corals provides opportunities for proliferation of seaweeds, on which benthic toxic microalgae responsible for ciguatera grow,

Recommends that IOC, its Subsidiary Bodies, and Member States in conjunction with WHO and other relevant agencies, develop and provide information to health care workers in areas potentially impacted by CFP on the signs and symptoms of the syndrome to ensure that these unusual effects are recognized and appropriate treatment administered;

Recommends further that IOC consult with WHO on a mechanism to provide information of risks for consumption of coral fishes to prevent outbreak of ciguatera poisoning to Member States;

Recommends that areas that have experienced significant destruction of coral reefs according to the UNEP/OCHA Environmental Impact Assessment and other official evaluations, also be identified as areas of highest risk for CFP outbreaks;

Recommends also that the IOC in cooperation with WHO gather information on previous and current reports of CFP from the appropriate structures in the area (hospitals, food control

agencies, municipalities, fisheries communities, scientists, etc.) to determine where CFP is occurring and whether it has increased;

Recommends that IOC and its concerned regional subsidiary bodies encourage Member States to screen for the occurrence of benthic dinoflagellates on seaweeds and of ciguatera toxin contamination in endemic coral fish species in areas affected by the Tsunami.

Recommendation IPHAB-VII.3

IMPLEMENTATION OF HAB MONITORING WITHIN THE GLOBAL OCEAN OBSERVING SYSTEM

The IOC Intergovernmental Panel on Harmful Algal Blooms,

Recalling Recommendation IPHAB-V.3 and IPHAB-VI.3,

Recognizing that in the Integrated Strategic Design Plan for the Coastal Ocean Observations Modules of The Global Ocean Observing System, the reduction of public health risks and the restoration and protection of living marine resources are among the goals of GOOS with operational observation of HABs as an important constituent,

Noting that three of the goals of the coastal GOOS are to reduce public health risks, control and mitigate the effects of natural hazards more effectively, and protect and restore healthy ecosystems more effectively,

Noting that the provisional common variables include biological variables,

Noting that Integrated Strategic Design Plan and the associated draft Strategic Implementation Plan for the Coastal Module of the Global Ocean Observing System does not specify the variables to detect the occurrence of HABs,
Recognizing the rapid development of innovative techniques for detection of HABs and their toxins and that active research programmes are underway to develop HAB observation and forecasting systems including *in situ* sensors, Autonomous Underwater Vehicles, and molecular probes,

Recognizing that harmful algal observation and forecasting systems are now operational in the eastern Gulf of Mexico, and have potential to become so in other regions, and are used by local management officials,

Recommends that the IOC Secretariat and the Chair of IPHAB work together with the IOC/GOOS programme, its Subsidiary Body (I-GOOS) and the coastal component of GOOS (COOP)**;**

Acknowledging that JCOMM is the vehicle for the collection, archiving, distribution and utilisation of ocean and meteorological data, and that their Terms of Reference allow for the coastal module of GOOS to include non-physical variables,

Recommends that IPHAB cooperate with JCOMM and GOOS Regional Alliances to develop effective systems for monitoring algal blooms, harmful species and/or their toxins, and the environmental conditions conducive to harmful algal event development, which would allow

the detection of detrimental changes in marine systems to be made in order to understand and manage coastal ecosystems.

Recommendation IPHAB-VII.4

ICES/IOC/IMO WORKING GROUP ON BALLAST AND OTHER SHIP VECTORS (WGBOSV)

The IOC Intergovernmental Panel on Harmful Algal Blooms,

Noting with satisfaction the progress of the ICES/IOC/IMO WGBOSV 2003, 2004 and 2005,

Recognizing the valuable contribution of the WGBOSV to the adoption of the International Convention for the Control and Management of Ships' Ballast Water and Sediments,

Recognizing also the important contribution of the WGBSOV to the development of guidelines for the implementation of the Convention,

Recalling the IPHAB Ballast Water Background Paper of May 2003,

Recommends that the ICES/IOC/IMO BSOSV continue 2006–2007 under the joint auspices of ICES, IOC and IMO;

Recommends the sponsoring organizations to consider inviting PICES to join to the WGBOSV in recognition of PICES actively addressing the same issues in the Northern Pacific Area;

Recommends that the IOC continue to ensure participation in the WGBOSV of an expert in HAB events in relation to transfer via ballast water of invasive organisms between IOC Member States;
Recommends that it be included in the 2006 terms of reference of the WGBOSV to evaluate the portion of the Convention guidelines involving phytoplankton and other microorganisms, taking into account the comments of the IPHAB;

Urges IOC Member States to support activities to assess the effectiveness of the Convention to prevent invasion of aquatic organisms via ballast water.

Recommendation IPHAB-VII.5

HABP WORKPLAN 2006–2007

The IOC Intergovernmental Panel on Harmful Algal Blooms,

Referring to the deliberations of its Seventh Session and the priorities identified prior to the session by WESTPAC/HAB, FANSA and ANCA,

Endorses the implementation of the Work Plan for the IOC Harmful Algal Bloom Programme as annexed to this Recommendation within the resources available,

Urges Members of the Panel and the IOC Secretariat to identify the required resources.

Annex to Recommendation IPHAB-VII.5 (on *next page*)

Recommendation IPHAB-VII.6

OPERATION OF THE IOC INTERGOVERNMENTAL PANEL ON HARMFUL ALGAL BLOOMS

The IOC Intergovernmental Panel on Harmful Algal Blooms,

Recommends that the IOC Intergovernmental Panel on Harmful Algal Blooms continue until otherwise decided by the IOC. The Terms of Reference should remain unchanged.

Annex to Recommendation IPHAB-VII.5

IOC HAB PROGRAMME WORKPLAN 2006-2007
(Activities and funding identified as of 1 April 2005 only)

IOC SCC HA = IOC Science and Communication Centres on Harmful Algae

ACTIVITY:	**ORGANIZER/ RESPONSIBLE**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**FUNDING IDENTIFIED: In USD 1000** **IOC**	**Ex Bud**	**FUNDING REQUIRED TOTAL: In USD 1000**	**AUTHORITY & REMARKS**
OPERATION & SERVICES								
IOC SCC HA & HAB Programme Office	IOC	Global	Cph	2006-2007	**2 x 10K**	IOC TF/ Danida 2006:140K 2007:107K	267K	IPHAB-VII
IOC SCC HA	IOC	Latin America & North Africa	Vigo	2006-2007	-	2 x 25K and in kind	2 x 25	IPHAB-VII
PUBLICATIONS								
HAN Editor	Wyatt	-			**2 x 2K**		4K	Key activity
GEOHAB OSM Report: HAB's in Stratified Systems	Gentien	Global	HQ	2006	**6K**		6K	Key activity

ACTIVITY:	ORGANIZER/ RESPONSIBLE	TARGET GROUP/ Region:	WHERE:	WHEN:	FUNDING IDENTIFIED: In USD 1000 IOC	Ex Bud	FUNDING REQUIRED TOTAL: In USD 1000	AUTHORITY & REMARKS
XIIth HAB Proceedings	Moestrup	Global		2007	**7K**		20K	IPHAB-VII
COSPONSORSHIP OF CONFERENCES								
XIIth HAB	ISSHA	Develop. Country.	Copenhagen	2006	**10K**		Unknown	IPHAB-VII
TRAVEL								
IOC Staff	IOC	-		Yearly	**2 x 4K**	2 x 7K	2 x 15K	
Chair IPHAB Travel	T.b.d.	-		Yearly	**2 x 2K**		2 x 2K	
SCIENTIFIC ELEMENTS								
GEOHAB	IOC/SCOR	-	-	-	**2 x 20K**	2 x 50K via SCOR	2 x 120K	Agreement with SCOR
ICES-IOC WGHABD	Martin	Develop. Country		Yearly	**2 x 4K**		Unknown	IPHAB-VII
ICES/IOC/IMO WGBOSV	Gollash/IOC/ICES	Global		Yearly	**-**		Unknown	IPHAB-V & IPHAB-VII
ICES/IOC/SCOR SGGIB	Vitaasalu/IOC/ICES	Baltic						
HAE-DAT\MON-DAT development	IOC/ Lion-Sims-Enevoldsen	Global	-				5K	IPHAB-VII

ACTIVITY:	ORGANIZER/ RESPONSIBLE	TARGET GROUP/ Region:	WHERE:	WHEN:	FUNDING IDENTIFIED: In USD 1000 IOC	Ex Bud	FUNDING REQUIRED TOTAL: In USD 1000	AUTHORITY & REMARKS
REGIONAL GROUPS								
Regional Working Group on Harmful Algal Blooms in South America (IOC FANSA)	Guzman	S-America	To be decided	Yearly	**2 x 7K**		2 x 10K	IPHAB-VII
Regional Working Group on Harmful Algal Blooms in the Caribbean (IOC ANCA)	Mancera	Caribbean	To be decided	Yearly	**2 x 7K**		2 x 10K	IOCARIBE and IPHAB-VII
Regional Group on Harmful Algal Blooms in the Western Pacific: WESTPAC-HAB	Fukuyo	WESTPAC	To be decided	Yearly or at least once			2 x 10K	IPHAB-VII and pending WESTPAC-6
Regional Working Group on Harmful Algal Blooms in North Africa (IOC HANA)	Halim	North Africa	To be decided	Yearly	**2 x 5K**		2 x 10K	IPHAB-VII
IOC Ocean Portal HAB Component – UNESCO Cross Cutting Project	IOC SCC HA CPH	Africa/Latin America	virtual	2006-07	**50K**	-	50K	UNESCO

ACTIVITY:	ORGANIZER/ RESPONSIBLE	TARGET GROUP/ Region:	WHERE:	WHEN:	FUNDING IDENTIFIED: In USD 1000 IOC	FUNDING IDENTIFIED: In USD 1000 Ex Bud	FUNDING REQUIRED TOTAL: In USD 1000	AUTHORITY & REMARKS
West African HAB Project	IOC SSC HA CPH	Western Africa	To be decided	2006-07			50K	IPHAB-VI
CAPACITY ENHANCEMENT								
IOC Advanced Training Courses on the Taxonomy and Biology of Harmful Marine Microplankton	IOC SCC HA CPH	Global, Develop. Country	University of Copenhagen, Denmark	2006 and 2007	-	IOC TF /Danida: 2 X 50K	2 x 50K	IPHAB-VII
IOC-IEO-AECI Individual Training Grants	IOC-IEO SCC HA Vigo	Latin America, Develop. Country	Instituto Español de Oceanografía, Vigo, Spain	Yearly	-	2 x 25 IOC TF/Spain	2 x 25K	IPHAB-VII
IOC Training Course on Qualitative and Quantitative Determination of Algal Toxins	Elbrächter/Luckas/Cembella	Global, Develop. Country	Germany, AWI	2006/ 2007	-	German partners and IOC TF/ Danida	40K	IPHAB-VII
WESTPAC-HAB TTR Project	Fukuyo/Azanza	WESTPAC	To be decided	Yearly	**2 x 5K**	2 x 17K Japan FiT	2 x 42K	WESTPAC and IPHAB-VII
Regional Training Workshop on HAB Monitoring and Management	t.b.d.	FANSA	t.d.b.	?				IPHAB-VII

ACTIVITY:	ORGANIZER/ RESPONSIBLE	TARGET GROUP/ Region:	WHERE:	WHEN:	FUNDING IDENTIFIED: In USD 1000 IOC	FUNDING IDENTIFIED: In USD 1000 Ex Bud	FUNDING REQUIRED TOTAL: In USD 1000	AUTHORITY & REMARKS
Regional Training Workshop on HAB Monitoring and Management: sampling, identification and quantification of HAB species	t.b.d.	ANCA	t.b.d.	2006			30K	IPHAB-VII and IOCARIBE
Regional Training Workshop on HAB Monitoring and Management: toxin assessment	t.b.d.	ANCA	Mexico or Venezuela	2007			30K	IPHAB-VII and IOCARIBE
Regional Training Workshop on HAB Monitoring and Management	IOC SSC HA/Anil	Indian Ocean	Tentatively India	2006			30K	IOCINDIO/ IPHAB-VII
Regional Training Workshop on HAB Monitoring and Management	IOC SSC HA/Zaker	Gulf	Tentatively Iran	2006 or 2007			30K	IOCINDIO/ IPHAB-VII
North Africa Workshop on Harmful Algae Monitoring and Management	IOC SSC HA	North Africa	T.b.d.	2006 or 2007		IOC TF /Danida & Spain COPEMED to be sought	30K	IPHAB-VII

ACTIVITY:	ORGANIZER/ RESPONSIBLE	TARGET GROUP/ Region:	WHERE:	WHEN:	FUNDING IDENTIFIED: In USD 1000 IOC	Ex Bud	FUNDING REQUIRED TOTAL: In USD 1000	AUTHORITY & REMARKS
In-country Training Workshop on HAB Monitoring and Management	Ennaffah/ IOC SSC HA	Morocco	Morocco	(2005) 2006		Morocco Teachers and training materials from IOC	15K	IPHAB-VII

ANNEX III

NATIONAL STATEMENTS

A. BRAZIL

Results

HAB related activities have increased in the country as response for needs on sanitation control and also, due to the participation in international initiatives, such as the ICO/HAB program. This increase can be observed for example by the number of publications or post-graduation mononograph related to HAB in the country. In the fresh water, sanitation control needs has directed the federal health authorities to settle a comprehensive legislation on cianobacteria and phycotoxins towards public water supply. Phycotoxin and cianobacteria have now become main issues for managers, scientists and others, in accordance to WHO guide lines. In the marine environment, the expansion on the aquaculture and the detection of the presence of phycotoxins in shellfish (DSP, ASP and PSP) has stimulated the discussion for the necessity of monitoring and sanitation control. A group, including participants representing different actors from segments such as health, agriculture, environment, universities and others, has been settled to discuss a general plan for mussel sanitation in the country. The group settled under the demand of the federal government, aims not only the public health for local consumers, but also to harmonize with international regulation for exporting.

Priorities

For the following years, priority should be focus on the capacity to settle monitoring harmful algae and phycotoxin programmes along the coast to assure a sustainable shellfish activity. Also, priority should include enhancement of the analytical capabilities for new toxins either in the marine or in the fresh water environment as strategies for monitoring action plans.

B. CANADA

National Programmes

The Canadian Government recently announced two programmes that have direct implications for international harmful algae bloom studies. The National Aquatic Animal Health Programme (NAAHP) will be jointly managed by the Department of Fisheries and Oceans and the Canadian Food Inspection Agency. Through an enhanced surveillance and certification regime for aquatic species, the NAAHP will meet international trade standards, protect and expand export markets which will help protect Canada's seafood exports, and bolster Canada's position in the fish and seafood markets of the world. Directly related to the NAAHP is the Canadian Shellfish Sanitation programme (CSSP), which is currently undergoing review, and restructuring to align more closely to international shellfish export/ import regulations. One issue under discussion is the need for harmful algae monitoring at Canadian shellfish and finfish aquaculture sites to meet international certification and regulation requirements which include phytoplankton monitoring in most countries involved in the seafood product trade. The CSSP is managed jointly by the Canadian Food Inspection

Agency, the Department of Fisheries and Oceans and Environment Canada. Through the NAAHP Canada will develop a strong, proactive monitoring and surveillance programme that is a co-operative effort among federal and provincial governments, industry and Academia. Canada can now meet new international standards for aquatic animal health, secure seafood export markets and bring Canada's aquatic inspection and certification regime on par with Canada's system currently applicable to terrestrial animals.

The other national programme recently announced is the Invasive Alien Species Strategy. This strategy is led by Environment Canada and is intended to minimize the risk of aquatic invasive species in Canadian waters. This strategy will protect the Canadian environment, restore and maintain native species, and prevent new invasions of these harmful species. The Department of Fisheries and Oceans (DFO) will take strategic actions to minimize the risk of aquatic invasive species in Canada. Emphasis will be put on the prevention of new invasions and the mitigation of harmful established invaders. DFO is engaged in a partnership with 13 universities to develop a national research network to improve knowledge needed to prevent new invasions and control existing ones. Included in the Invasive Alien Species Strategy is the role of ship ballast water in the introduction of invasive species including harmful algae and toxic cysts. Ballast water exchange is an important issue in Canada with the high level of ship traffic in coastal regions. The introduction of alien and harmful species is of particular concern with the shellfish and finfish aquaculture industry.

Research Projects

Fisheries and Oceans Canada (DFO) has research programmes on harmful algae in most regions with several recent studies funded through the Aquaculture Collaborative Research and Development Programme (ACRDP). This programme is Industry driven and provides research and development toward the sustainability of Canadian Aquaculture. Additional HAB research is conducted at Universities and other government agencies including the Institute for Marine Biosciences (IMB) National Research Council and provincial departments.

Harmful algal bloom (HAB) research within the federal government is discussed through the national advisory group that was created in 1987 called the Phycotoxin Working Group (PWG). This group is comprised of a project leader from each of DFO's regions, a national representative from CFIA and a representative from the National Capital region. Included in the mandate for the PWG is the coordination of a Canadian Workshop on Harmful Marine Algae.

Communications

A. Electronic – Phycotoxin mailing list. This bulletin board was initiated to deal with marine phycotoxins and HABs. This list was established in 1994 and has subscribers all over the world and is maintained by Don Richard (CFIA).

B. Canadian Workshop on Harmful Marine Algae

The 8th Canadian Workshop on Harmful Marine Algae took place in Moncton, New Brunswick (May 2003). Participants were from Canada and the United States as well as six other counties outside of North America. A Technical Report was published with abstracts and extended abstracts.

The 9th Canadian Workshop on Harmful Marine Algae will be held in association with the Aquaculture Association of Canada 05 Conference in St. John's, Newfoundland and Labrador (July 2005).

C. CHILE

Activities and status of PSP, DSP and ASP as well as HABs between October 2001 and February 2005 were informed.

During this period detection of PSP, DSP and ASP has persisted, and also the presence of the dinoflagellates *Alexandrium catenella, Dinophysis acuta* and the diatoms *Pseudo-nitzschia australis* and *P. pseudodelicatissima* were observed. However the most notable event was constituted by a northward expansion in its geographic distribution of *A. catenella*, associated to a harmful event which encompassed an important portion of the East coast of Chiloé Island, severely affecting aquaculture and small fishermen activities. Bloom was detected on January 2003 and toxic shellfish presence lasted for various months. The highest toxicity record of this event was 22.000 µg eq. STX 100 g^{-1} at Tranqui Island. The outbreak was associated to 37 intoxications and 1 fatal case. Since then, although *A. catenella* have been detected at very low concentrations, PSP levels, when detectable by mouse bioassay, have been under the quarantine level. On the other hand, in the southernmost area of the country, during 2002 a PSP increase of toxicity levels was observed, particularly the Northern area of the Magellan region, reaching 12.636 µg eq. STX 100 g^{-1} at Puerto Edén, breacking the declination tendency observed since 1994. In the last two years PSP level have been higher than previous to 2002. In this region, at 2002 three new fatal intoxications occurred due to irresponsible shellfish consumption by fishermen, from banned areas. In the region of Aysén has continued the simultaneous presence of PSP and DSP. Also, although not reaching risk levels, again domoic acid has been detected at the Northern part of the country (Coquimbo region) and Chiloé Island in the South. Besides, the presence of other harmful taxa was observed, as *Alexandrium ostenfeldii* and *Protoceratium reticulatum* along fjords and channels of Southern Chile. A *Chatonella* species was observed for the first time in the Northern area of fjords and channels.

The regular monitoring programmes, in each of the southernmost regions of the country, i.e.Los Lagos, Aysén and Magallanes were informed, including as well a general outline on five research projects financially supported by the State after the PSP outbreak occurred at Chiloé Island, basically oriented to improve the comprehension of HABs in Northern fjords and channels as well as to enhanced marine toxins and phytoplankton monitorings. Also the phytoplankton monitoring carried since 1988 and supported by the salmoniculture sector was mentioned.

As a complement due to the interest caused by news distributed in mass media, the outburst of *Vibrio parahaemoliticus* affecting part of Los Lagos region associated to intoxications of human beings due to consumption of fresh shellfish was mentioned, clarifying that these intoxications were not linked to DSP.

The structure and organisation of Chilean institutions and the role of the Health regional Units, the National Fisheries Service and the Public Health Institute to assure shellfish quality for internal consumption and for exportations in relation to marine toxins, were emphasized.

D. COLOMBIA

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Results in the ANCA Region

The Third Session of the ANCA IOCARIBE-HAB-III Working Group was held at the Instituto Nacional de Investigaciones Agrícolas (INIA) in Cumaná – Venezuela from 16 to 18 July, 2003. The Meeting was attended by representatives of Colombia, Costa Rica, Cuba, Mexico, El Salvador, Guatemala and Venezuela. The work of the Group was reinforced and a review of main events occurred in the region were presented by each participating country.
Six training courses in topics like sampling, taxonomy, quantitative enumeration of phytoplankton, has been offered in ANCA region: Mexico (3), Costa Rica (1), Colombia (1), Guatemala (1).

Regional experts published in Revista de Biologia Tropical (vol.52 Suppl.1, 2004) an especial issue on HAB in the Caribbean.

Priorities and Request 2005 – 2007

During the III ANCA session it was concluded that for a better understanding of HAB in the Caribbean region, it is necessary to enhance the research capacity of the countries of the region, and to implement a regional monitoring programme. The group recognized the lack of information about sources and potential consequences of HAB available in the region. This lack of information is evident at all levels including governmental, scientific, academic, and society in general. Therefore, no much attention is addressed to this potential problem and non-significant financial support is allocated for HAB research and monitoring. Morover, there are only a few research groups and most of them need logistic support. At the same time, the group noted with concern that only some countries have national programmes.

Since IOCARIBE countries mainly use fishing to exploit marine resources and aquaculture is very rare (exception: shrimp aquaculture), there are few or no laws or regulations in most of ANCA countries related to HAB problems. In some cases, regulations are emerging as consequence of intoxications.

The ANCA working Group decided to focus their Action Plan in the implementation of three main activities: 1. Capacity Building, 2. Research, and 3. Communication.

1. Capacity Building:
   Taking advantage of the regional capabilities, convene at least two (2) basic training courses to address technical elements for the assessment of red tides in the Caribbean region. A manual on Standard Operative Procedure (SOP) for HAB monitoring purposes should be prepared.
   The first course should cover sampling, identification, and quantification techniques of potentially toxic phytoplankton. It will be directed to technicians involved in monitoring plans.

2. Research:
   Ciguatera, Ballast water, and massive-growth organisms such cyanobacteria, are the

major priorities. Venezuela, Mexico, and Cuba are working together to prepare a proposal to study the distribution of benthonic species that may cause ciguatera. Colombia and Cuba are also willing to prepare a proposal to study ballast water.

E. CROATIA

HAB research in Croatia has been carried out through National monitoring programme "Systematic Research of the Adriatic Sea as a Base for Sustainable Development of the Republic of Croatia". The main goal of this project is systematic ecosystem research of the whole national marine territory to ensure compatibility between exploitation and protection of marine resources.

These investigations are performed all year long in the open and coastal waters of eastern part of the Adriatic Sea.

Another monitoring programme applied on Croatian shell breeding farms initiated in 2000 and is performed in four breeding areas (Northern Adriatic, Novigrad Sea, Šibenik Channel and Mali Ston Bay). The biggest breeding area is Mali Ston Bay where over 100 farms are situated. In the framework of this programme an environmental monitoring has been performed (phytoplankton composition, toxic species, chlorophyll *a*, transparency, temperature, oxygen, pH and sanitary bacteriology) together with monitoring of phycotoxins in shellfish (PSP, DSP and ASP). From April to October samplings of water and shellfish are performed twice a month, while from November to March only once a month. In the case of potential toxic species bloom samplings are performed every week. Mouse bioassay is used for determination of PSP and DSP shellfish toxicity whereas HPLC method is used to determine ASP toxicity. The great part of toxicity examinations is performed on mussels (*Mytilus galloprovincialis*) and lesser part on *Pecten jacobeus*.

For the first time at the beginning of summer in 2000, DSP shellfish toxicity was recorded in the Northern Adriatic. The same occurred in 2001 during summer time. During 2002 and 2003 there was no shellfish toxicity recorded, but in summer/fall of 2004 it has appeared again. Shellfish toxicity in the Adriatic is related to blooming of a few species of *Dinophysis* genera *(D. acuminata, D. acuta, D. caudata, D. fortii D. rotundata, D. sacculus),* which are the most abundant in late spring and at the beginning of the summer. The shellfish toxicity appears, usually, for fifteen days or one month after *Dinophysis* bloom. Increase of abundance of *Dinophysis* species in that period is also noticeable in other parts of the Adriatic, but with lower cell abundance intensity and lesser number of *Dinophysis* species.

By analyzing toxins we have established that DSP shellfish toxicity is not related to high concentrations of OA, but to higher concentrations of DTX toxins and other lipophilic toxin compounds.

Besides *Dinophysis* species there are other suspect toxic species in the Adriatic, such as *Prorocentrum minimum, P. lima, Alexandrium tamarense, A. minutum, Coolia monotis, Lingulodinium polyedrum* and *Pseudonitzschia delicatissima*, but nevertheless other toxicities (PSP and ASP) were not recorded.

In some areas of the Eastern Adriatic occasionally red tides have been recorded, too. The strongest and the most often red tide was in Kaštela Bay usually caused by *L. polyedrum* bloom.

The most intensive summer blooms occurred during 80's and very often were followed by fish mortality, which was provoked by oxygen depletion. In the last decade this phenomena has lesser intensity. Summer red tide caused by *Prorocentrum minimum* without fish mortality usually occurs in Šibenik Bay. Red tide bloom of *Noctiluca scintilans* occurred by the end of winter in 2001, 2002 and at the beginning of spring 2003 on the whole east coast of the Adriatic, with different intensity lasted between two and three months. In the Adriatic occasionally occur very specific phenomena - "mucilaginous bloom". Since the end of 90's this bloom has occurred frequently, particularly in the Northern Adriatic. During summer of 2004 mucilaginous bloom was very intense and widely distributed.

The HAB problem has included in international collaboration through INTERREG projects (ADRIA-SAFE and REQUISITE) and through MEDPOL program.

Priorities:

- Provision of standards of shellfish phycotoxins
- Participation in international (regional) inter-calibration for identification of shellfish toxins
- Participation in international (regional) inter-calibration for identification of toxic species
- Participation in training courses for identification of shellfish toxins and toxic species
- Prompt exchange of information of shellfish toxicity with neighbouring countries
- Creation of joint measures for control of ballast water with other Adriatic countries

F. EGYPT

Harmful Algal Blooms in the Egyptian waters:

Investigations of HABs in the Egyptian waters began in the summer of 1956 with the observation of a heavy red tide caused by a dinoflagellate, (new at the time), *Alexandrium minutum*.

Subsequent observations focused on two coastal areas from the region of Alexandria: the Eastern Harbour and Mex Bay.

The Eastern Harbour of Alexandria:

Long-term records, since 1956, show that the Eastern Harbour went through three phases.

The pre –High Dam phase: (before 1967) Heavy blooms causing discolouration were caused by the proliferation of only one species, *Alexandrium minutum* Halim. The blooms remained a recurrent but harmless summer phenomenon. The summer red tide was followed by a multi species "Nile bloom " in autumn (Halim, 1960 and Hassan, 1972).

The post-High Dam phase up to 1994: A succession of red tides was recorded during

each year cycle, and not only in summer. Such blooms were triggered by the continuous input of domestic waste waters, which maintained a high level of nutrients (4.1-73 µ mole. Nitrate N l^{-1} and 2.6-5.8 µ mole. PO_4 $P1^{-1}$) , accompanied by a stable stratification of the water column in summer (Zaghloul and Halim, 1992). During this phase *A. minutum* was not the only causative species for the blooms, *Cerataulina pelagica, Prorocentrum minimum, P. triestinu*m and *Skeletonema costatum* contributed with *A.minutum* to the development of red tides.

The last red tide caused by *A.minutum* was recorded in 1992. The bloom was abnormally extensive. It extended out of the harbour along 20 km of coast with a peak density of 24.10^6 cell 1^{-1} (Labib and Halim, 1995). For the first time massive fish kills in the whole area accompanied the bloom. Fish and invertebrates inside the public aquaria were also killed, in spite of filtration and continuous aeration of the water supplied to the aquaria from the harbor. The toxins were not analysed but it is obvious that they were water-soluble.

Third phase, since 1995: The most important feature in this phase is the complete disappearance of *A.minutum* from is type locality, the Eastern Harbour of Alexandria (Ismael and Halim, 2001) . The species became replaced by other potentially harmful species, which occasionally form red tides and remain endemic to the harbour. *Chattonella sp., P.minimum P. triestinum . Pseudonitzschia pungens, Skeletonema costatum and Chaetoceros* spp.

Mex Bay

The phytoplankton of Mex bay received less attention. Studies on phytoplankton were carried out since 1987. With no attention to red tides (Dorgham et al., 1987 and El-Sherif, 1989).

Mex Bay is a marine transitional system located west from Alexandria. It receives a large input of agricultural runoff ($6.6.10^6$ m^3d^{-1}). loaded with agrochemicals, domestic and industrial wastes. The high daily discharge from this source leads to stratification of the water column all the year round and to the continuous availability of nutrients (1.16-20.45 µ mole.Nitrate Nl^{-1} , 0.55-4.45 µ mole PO_4. Pl^{-1} and 49 – 131.17 µ mole $NH_4 – Nl^{-1}$) The land runoff accelerates phytoplankton growth, leading to successive intensive blooms and to “green tides” .

In 1992, five blooms discoloured the water all over the bay from April to September. The causative species were successively: *Prorocentrum triestinum. Scrippsiella trochoidea, Cylindrotheca* (*Nitzschia*) *closterium* and *Alexandrium ostenfeldii* (Gergis, 1997).

Current word:

1- Cysts. It is projected to try to germinate A. minutum cysts collected from the E.H sediments.
2- Monitoring of bivalves and fish.
3- Experimental toxicity studies using cultured species.

G. GERMANY

Monitoring and HAB-species occurrence

During the routine monitoring of phytoplankton - the protocol of this is unchanged since the last report - toxic algae have been reported repeatedly each year. Due to high DSP contents, caused by species of the genus *Dinophysis* (Dinophyceae), mussel harvesting had to be closed in few instances. Other toxic dinoflagellates like *Alexandrium tamarense* and *A. ostenfeldii* are present each year but in low numbers, not causing PSP problems.

Various *Pseudo-nitzschia* species (Bacillariophyceae) are found regularly in coastal waters, but so far no ASP-intoxication occurred. The ichthyotoxic members of the Raphidiophyceae *Fibrocapsa japonica* and *Heterosigma akashiwo* are present in the last few years but without causing any harm proofed so far. In 2003 cf. *Chattonella veruculosa* was identified in the German Bight but no adverse effects have been reported so far. High cell numbers of *Prymnesium* (Prymnesiophyceae) killed locally some fish but no aquaculture sites have so far been affected.

A benthic euglenid, *Euglena* sp. is now discolorating regularly large areas of the German tidal flats of the North Sea in Niedersachsen and Schleswig-Holstein. The question arises whether this species has been overlooked in the past, as no discolorations have been reported earlier or whether the species was introduced together with aquaculture products.

In the Baltic Sea, each year mass developements of several potentially toxic cyanobacteria are recorded. In 2003 beaches had to be closed for the public at various localities due to massive scum of toxic cyanobacteria, mainly *Nodularia spumigena*.

Research

Prof. Luckas, Friedrich-Schiller-University Jena, refined the chemical analytic methods. Now cyanobacterial toxins dissolved in water can be analysed quantitatively without prior concentration, whereas PSP-toxins dissolved in seawater have still to be concentrated so far.

Training

IOC and the three German Institutions Forschungsinstitut Senckenberg (DZMB) [FIS], Friedrich-Schiller-Universität Jena [FSU] und Stiftung Alfred-Wegener-Institut für Polar- und Meeresforschung in der Helmholtz-Gesellschaft [AWI] implemented a IOC HAB Training and Capacity Enhancement Programme. Five Trainings-Courses on Qualitative and Quantitative Detrmination of Algal Toxins will be jointly organized in Germany. During spring 2005 the first of these IOC German Training Courses was held at the Wattenmeerstation Sylt, Alfred-Wegener-Institut für Polar- und Meeresforschung. In addition, a ten-day international training course on dinoflagellate taxonomy was held at the Wattenmeerstation Sylt in August 2004.

H. ITALY

Almost all of the 36 toxic or potentially toxic species that have been recorded in the Mediterranean area are also found along Italian Seas. Main problems are DSP events in the Adriatic Sea, which are due to okadaic acid produced by *Dinophysis* species and to yessotoxins produced by *Protoceratium reticulatum* and *Lingulodinium polyedrum*. This events cause the closure of aquaculture plants for several months every year. At times yessotoxins is detected also in absence of these species, which indicates that other species so far considered innocuous might produce yessotoxin. An emerging problem is constituted by blooms of the benthic species *Ostreopsis* cf. *ovata*, which produce neurological symptoms and dermatitis following exposure to areosol. These blooms are recorded in several places along the Italian coasts. Finally, tunicates (*Microcosmus sulcatus*) that are consumed in Apulia have been identified as potential vectors of hydrosoluble toxins so far of unknown origin. Discoloration of coastal waters due to blooms of *Fibrocapsa japonica* are also a recurrent feature in the Adriatic coasts, whereas green tides due to *Pyramimonas* have been recorded along the Campania coasts. In neither cases toxicity has been detected.

A national **monitoring** programme of italian coastal waters is running since 1996; it is funded by the Italian Ministry of the Environment and carried out by the maritime regions. For this program, reference methods have been published on 2001 and intercalibration exercises have been run through QUASIMEME. A **Manual for the Identification of phytoplankton species along the Italian coasts**, including all the toxic ones, has been prepared as a joint effort of several Italian scientists and will be published shortly by ICRAM (Central Institute of Applied Marine Research) and the Italian Ministry of the Environment.

A **Workshop on Harmful Algae along Italian coasts** has been organised in 2004 by the National Institute of Health (Istituto Superiore di Sanità, ISS). Results will be in a special issue of the ISS publications (Rapporti ISTISAN), which are available online at http://www.iss.it/.

A number of **research projects** are conducted with Italian funds on HAB species taxonomy, physiology, ecology and biogeography as well as on new detection methods, comparing traditional and molecular methods. Projects are also ongoing on conventional and new methods to detect marine biotoxins. An EU INTERREG aims at a better management of HABs in the Adriatic Sea, including the Eastern coasts. Several research groups participated in the HAB related project '*New strategy of monitoring and management of HABs in the Mediterranean Sea*' (STRATEGY) within the 5th EU FWP. Two new projects funded within the 6th FWP, address harmful algae: SEED (*Life cycle transitions among HAB species and the environmental and physiological factors that regulate them*) - also endorsed by GEOHAB - and ESTALL (*Expression of toxicity in harmful algae*). The project "*Comparative analyses between satellite observations (SeaWiFS) and Harmful Algal Blooms in the Mediterranean Sea* " is conducted in cooperation with JRC-EC, Ispra, and Spanish institutions.

Research tasks on HABs are included in the national project VECTOR (*Vulnerability of coasts and Italian Marine Ecosystems to Climate Change and their role in the Carbon Cycle in the Mediterranean seas*) funded by the Italian Ministry of University and Research (MIUR). The **Eighth Advanced Phytoplankton Course (APC8)**, with several sessions on harmful species, will take place in Naples from 2 to 23 April 2005. The course is funded by the Stazione Zoologica and by the EU Network of Excellence on Marine Biodiversity (MARBEF) and has received additional support by several agencies including IOC. A WEB

database on Taxonomy and Biology of Mediterranean Phytoplankton within the MIUR-funded project ASTAPLAN will be shortly published on the WEB. Italy is also contributing to the special project of the International Society for the Study of Harmful Algae (ISSHA), HAB-MAP, with the compilation of a summary on the occurrence of HAB species in the Mediterranean region.

At the Mediterranean level, Italian research Institutes are providing support to the development and implementation of the Eutrophication monitoring strategy of MED POL (UNEP- MAP): training courses on phytoplankton monitoring have been organised and reference methods are going to be finalised shortly.

Main Italian priorities on HAB research/management/education are:

- Development of alternative methods for phytoplankton and toxin monitoring, including research on unknown toxins, new harmful species and possible vectors.

- Development of knowledge on the relationships between phytoplankton distribution (including toxic species and discoloration events) and water quality, in compliance with the EU Water Framework Directive.

- Research on bloom dynamics and on the response of HAB species to environmental factors (both anthropogenic and natural).

- Continued taxonomic training to operators involved in monitoring activities at local level

- Increased awareness on HABs and related activities among marine scientists, operators in monitoring, public health and food control agencies, and common people.

I. MEXICO

1. Education and Communication Element:

Several courses were developed in Mexico during the intersessional period (Nov. 2002 – Mar. 2005), devoted to biological, chemical and monitoring aspects as well. Among them:
- September 30 - October 11, 2002. Sponsored by CIBNOR, La Paz, Mexico. Course: Biotechnological applications for microalgae cultivation. Harmful Algal Bloom aspects, 80 Hrs. Post-graduate level, 20 asistants.

- November 12-16, 2003. Sponsored by the Veracruz Aquarium, Veracruz, Mexico. Course: Evaluation of Harmful Algal Blooms, 40 Hrs. Post-graduate level, 20 assistants.

- February 28-29, 2004. Sponsored by the Mexican Association of Clinical Biochemistry, Tuxtla Gutierrez, Chiapas, Mexico. Course: Actualization in Marine Biotoxins. Toxicology of HAB´s, 16 Hrs. Post-graduate level, 10 assistants.

- September 20-24, 2004. Sponsored by the University of Ciudad Juarez, Chihuahua, Mexico. Course: Marine Biotoxins, Toxicology and Toxin Chemistry. 40 Hrs. Post-graduate level, 12 assistants.

- October 25 – November 3, 2004. Sponsored by CIBNOR, La Paz, Mexico. Course: Biotechnological applications for microalgae cultivation. Harmful Algal Bloom, toxin extraction and detection, 80 Hrs. Post-graduate level, 24 assistants.

-November 8-11, 2004. Sponsored by the National Laboratory of Public Health, Federal Health Ministry, Mexico City, Mexico. Course: Actualization in Marine Biotoxins, Toxicology of Ciguatera and determination of Ciguatoxins. 40 Hrs. Post-graduate level, 5 assistants.

A major meeting was organized by the Federal Health Ministry during October 16-17, 2003 in Huatulco, Oaxaca, to analyze the events occurring in the coasts during previous years. The most relevant outcome of the meeting was a call to the open science community to input for the modification of the current legislation regarding the monitoring aspects (biological and technical). The draft of the new legislation is under scrutiny, but still is adequate to deal with NAFTA agreement but did not fulfill EU rules for the trade of bivalves. A very important point of the new legislation is that the principal aim is no longer the export to US market but to protect the consumer in and out of the country. A monitoring scheme is included while it has difficulties on implementation due to economic restraints and the wide diversity of environments within the more than 10,000 km of coastlines in Mexico.

Many presentations were carried out in national and international meetings as well as many peer-reviewed articles were published. All together, this showed up that the field is active in the country although not on the same pitch.

2. Scientific Element:

The current system applied in Mexico for management of the funds for research has not supported lately many projects related directly or marginally to HAB research. Only few small projects are currently ongoing in Mexico with Federal Funds:

- Histopathology caused by chronic exposure to Saxitoxin (PSP) and Brevitoxin (NSP) in an experimental model (mouse). (Currently ongoing).

- Molecular detection of *Karenia brevis (Gymnodinium breve)* in the marine environment in the coasts of the Yucatán peninsula. (Currently ongoing).

Many institutions run small local projects devoted to restricted fields: local monitoring of organisms (Jalisco, Nayarit and Veracruz), toxins produced by local species of cyanobacteria (Oaxaca), distribution of HAB species in the Gulf of Mexico or in the Gulf of California, etc.

3. - Operational Element:

Managers and politicians are now aware about the importance of establishing systematic monitoring, direct efforts to the control of ballast waters and educate the people and physicians on the different toxic syndromes and its appropriate diagnosis. Thus, modifications of the previous legislation as well as development and publication of new regulations profiled new attitudes to solve the problems, while still there are difficulties on implementation due to scarcity of funds and trained officials.

The Federal Health Authorities have recognized recent outbreaks of Ciguatera in the Caribbean acknowledging also, the presence of DSP toxins and related organisms (*Dinophysis sp.*) as an emerging problem in the country. Plans for reviewing the epidemiology of DSP and Ciguatera are under development as a first step to launch a follow up programme aimed to protect the populations at risk.

Environmental Authorities have recognized that invading species are a major treat to the country, and also, it is recognized a profound lack of knowledge and activities related to ballast

waters analysis and control. Legislation related is under development but implementation of the control programmes have many technical and economical constraints that will not allowed yet for its success.

CONCLUSIONS AND RECOMMENDATIONS

Subjects to be approached with the support of IOC IPHAB:

*It is recommended that the local experts favors their collaboration with the authorities to set, keep and improve the existing monitoring and to develop more actions in order to provide a safeguard to the public health and to minimize the impact of HABs.

*It is recommended that evaluation of the socioeconomic impacts of HABs on aquaculture, fisheries, tourism, etc. will develop in a short time to provide hard information to politicians and decision makers allowing for funds flow to research and development of monitoring and protection activities.

*The country is interested in participating on the workshop under planning to be developed by FANSA regarding ballast waters (management, regulations, sampling, analysis and identification of cysts of toxic species, etc,), request economic support for the attendance of the meeting by regional experts to be trained.

*Mexico endorse the proposal of FANSA to develop a meeting entitled First Ibero-Latinamerican Conference on HABs together with a seminar on Harmful Algae taxonomy with the support and collaboration of IOC, offering to actively participate on the organization and development of the event.

*Mexico recommends to IOC the continuity of the economic support to the IOC Science and Communication Centres in Copenhagen and Vigo in order to strengthen the development of Programme activities.

*Also further recommends supporting and promoting the actions of the HAB Programme for the realization of research visits to the IOC Science and Communication Centres and specialized science institutions to receive expert advice and training.

*As well, Mexico recommends the support to the IOC Science and Communication Centre in Vigo to continue the distribution of Bibliographic aids by providing the appropriate information produced in the region (thesis, internal reports, news articles, etc.).

*Within Mexico it is necessary to review the current situation in a forum with authority to pronounce regarding priorities of research, since evidently the status of official priorities is not backed up with hard data that support its scope.

*It is necessary to increment monitoring and research in the Gulf of Mexico and the Caribbean, starting with prospective and epidemiological studies.

*The ANCA-WEB Page should be activated as a link for knowledge exchange and prompt alerts within the scientific community, since official links cool off their exchange of information in the absence of poisoning events and are slow to react when they occur.

*Also, ANCA-WEB Page should promote a discussion forum among the Latinamerican research community on HABs. The aim is not to substitute PHYCOTOXINS, but to

incorporate the hundredths of scientists not being able (or willing) to use English. Web-Master, or else a helping colleague, will post translations of relevant posts into and from PHYCOTOXINS for feed back within both lists.

EXTENDED REPORT

Monitoring and follow-up of major events:

The guidelines established for the development of monitoring activities derived from the **NORMA Oficial Mexicana de Emergencia NOM-EM-005-SSA1-2001** and are included in the following table:

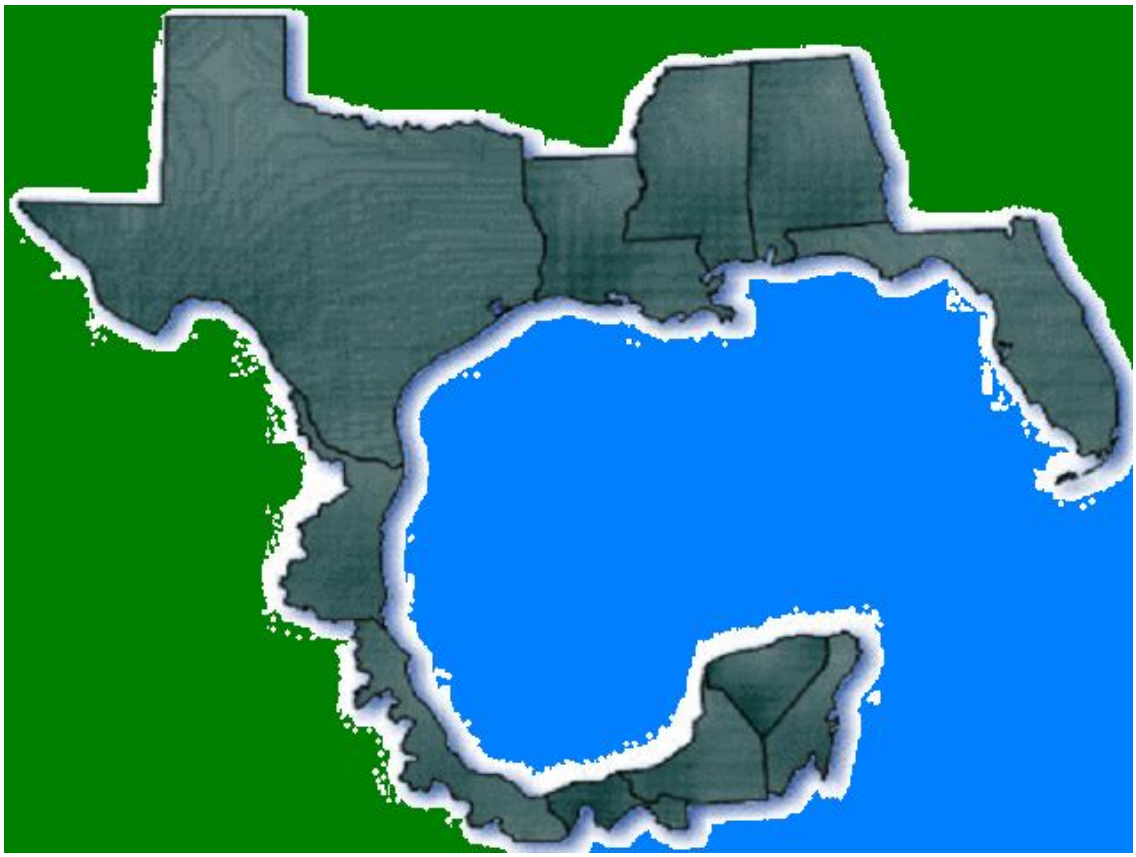
TOXIN or PLANKTON	*Permisible concentration*	*Current status!*
Brevetoxin	No Detectable	by mouse bioassay, ELISA is used as screening test
Saxitoxin	80µg/100 g of meat	by mouse bioassay
Domoic Acid	20 ppm	by HPLC
Karenia brevis	5,000 cell/l	by microscope
Pseudonitzchia ssp	50.00% over average counts determined by microscope in the sampling point	Average not determined yet!
Alexandrium ssp	20.00% over average counts determined by microscope in the sampling point	Average not determined yet!
Pyrodinium bahamense var. compressum	20.00% over average counts determined by microscope in the sampling point	Average not determined yet!

Once a ban is imposed, the borders of the affected States remain closed until values resume normal levels so, the protection not only cover exports but local consumption as well.

Nevertheless, regulations did not include other toxins, nor harmful phytoplankton or cyanobacteria. Ciguatera is recognized but there is not a plan of attack for outbreaks or prevention.

Gulf of Mexico: Tamaulipas, Veracruz, Tabasco, Campeche and Yucatan.

There is a plan of collaboration within the GOM including Mexico and US coastal states for sharing information on monitoring activities and training of Mexican officials to develop the activities following US standardized procedures.



The monitoring actors are mainly the Health Ministry trough local offices in all coastal states and collaboration with US; the Acuario de Veracruz, because local red tides in Veracruz have affected the species they kept in exhibit; the National Autonomous University of Mexico (ICMyL-UNAM) making cruises once or twice a year and, the National Polytechnic Institute (CINVESTAV-IPN) with the Merida Station monitoring Yucatan coasts.

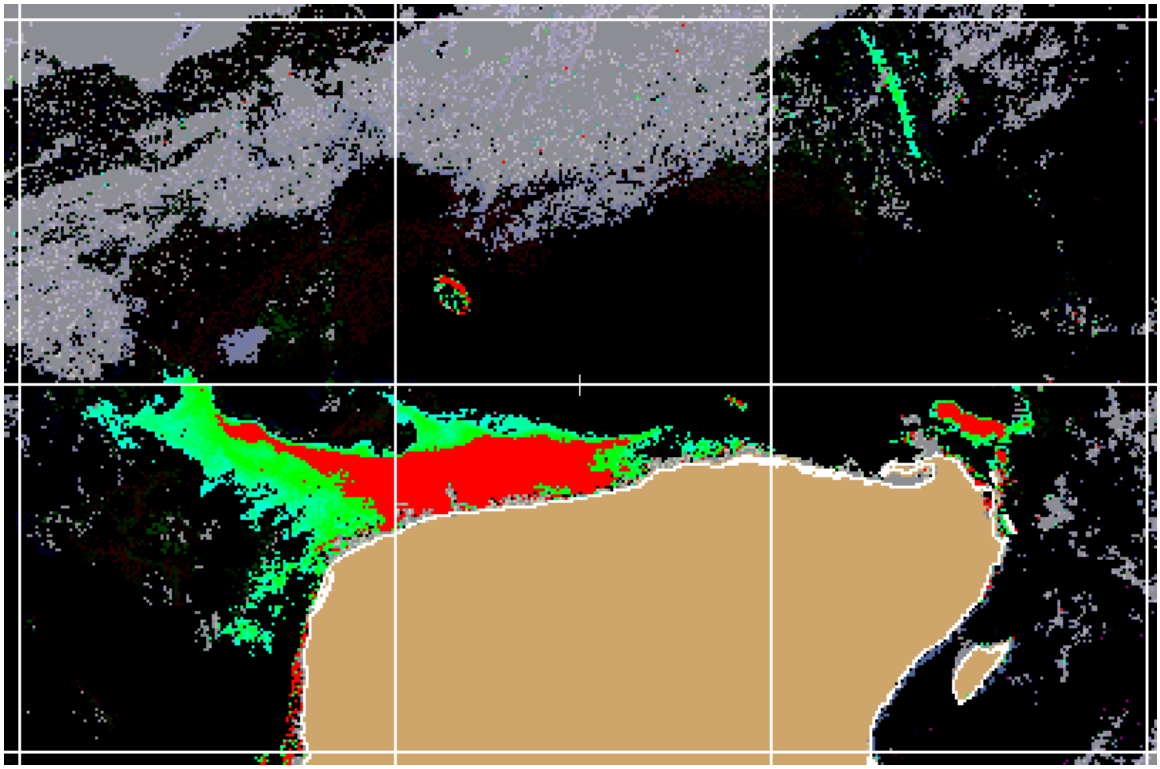
From North to South:

Tamaulipas has no reports of red tide or high numbers of dinoflagellates during the period covered by the present report (Nov. 2002 – March 2005).

Veracruz experienced huge events during August 2003 reaching *K. brevis* concentrations of 50000 cells/l, producing fish mortality and closure of shellfish harvesting. In the Aquarim, several fish were affected including some turtles and sharks kept on pens outside the beach in preparation to be introduced in the aquarium. During 2004 the most relevant observation was the presence of huge blooms of *Protoperidinium quinquecorne*, which remained forming small populations in some places like the Yatch Club during July.

Tabasco reported blooms of non harmful species but during April and September, high numbers of *K. brevis* were reported with some fish mortalities.

Yucatan suffered from major outbreaks causing huge fish mortalities during summer 2003 (mainly 25-31 July). The bloom covered 10000 km2, lasted 7 weeks and the estimated cost was calculated in 6 million US dollars.



The bloom was multispecific: *Scrippsiella trochoidea*, *Prorocentrum lima* and *Prorocentrum mexicanun* and *Cylindroteca closterium.* Total density reached over 6 million cells per liter.

Recently, several poisoning cases related to Barracuda and puffer fish consumption were reported in the Yucatan Peninsula. Ciguatera caused 40 poisoning cases in two related events in Quintana Roo, from barracuda catch in the Caribbean, in the east side of the peninsula. Several required hospitalization but all of them recover after a few days. What is uncommon is that Ciguatera outbreaks were usually reported during summer months but these cases occurred during late autumn and searching epidemiological data, in recent years, winter cases were also reported.

On a different event, in Quintana Roo State, a small girl (7 years old), eat puffer fish and developed severe paralysis and required respiratory support.

Contacts doing studies, monitoring or research in the GOM:

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www.ssaver.gob.mx
This site post the information obtained in the Mexican coasts of the GOM almost in real time and have some general information of HABs in Mexico.

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South Pacific Coast: Nayarit, Jalisco, Colima, Michoacan, Guerrero, Oaxaca and Chiapas.

The states of the southern Pacific of Mexico have in common climatologic, geographical and biological features shared with the counties in Central America and also are affected by the same species producing HAB events. It is frequent the exchange of information among the scientists in the region.

The monitoring actors in Mexico are mainly the Health Ministry trough local offices in the states and in some instances in collaboration with the local University in Jalisco and Oaxaca. The southern states (Guerrero, Oaxaca and Chiapas) are the area with the highest rate of poisoning and death cases in the country.

Nayarit shares the Matanchen Bay with the neighbor state Jalisco, conforming Puerto Vallarta. A survey during February 2003 described a bloom produced by the Rhaphidophyceaen *Fibrocapsa japonica*, reaching a density of 4-6 million cells/l, representing 97% of the total phytoplankton. No fish mortality was observed but it produced an abrupt decrease in crustacean larvae numbers. Later, during the summer of 2004 in an island nerby the cost of Nayarit, an increasing population of *Ostreopsis siamensis* was observed. Both species have not been reported in the area previously.

In Jalisco, seven events were observed during 2003 and four during 2004. Harmful, toxic and innocuous organism formed these events. *Mesodinium rubrum* being the more frequent, and the awkward occurrences were those produced by *Fibrocapsa japonica*, *Protoperidinium quinquecorne*, and *Alexandrium sp.*

Colima and Michoacan has no report of events and the small monitoring developed in

the region does not produced notifications of HABs or even increasing numbers of any phytoplanker.

Guerrero experienced the most severe outbreaks of PSP during 1995-1996 and 2001-2002. The average of red tide days/year is 142 calculated by the occurrences of the last 8 years. During 2002 the records reported 365 red tide days while in 2003 only 247 days were reported. Nevertheless, the amount of toxin accumulated by shellfish was below the expectancy, with levels above the action limit during January, June, August and September 2003. Bans were imposed and no poisoning cases occurred.

Oaxaca experienced increases in toxicity and cell numbers following the same pattern observed in Guerrero, without major events in the recent years. In Oaxaca, The University of the Sea (UMAR) have developed a monitoring programme nearby the tourist area Huatulco Bays and also in the inland lagoon Mar Muerto (Death Sea) in the southern border with Chiapas state. In this region flooded by fresh water inputs, huge dominance of cyanobacteria occurred associated to the rainy season. Several toxic species occurred as well high biomass producers. Among them it is possible to mention *Pseudanabaena, Trichodesmium* and *Lyngbia* which spread with the coastal currents in the peak of summer season. During winter 2002, was notorious the occurrence of increasing populatins of the genus *Pseudonitzschia* in the southern coasts of the state in the border with Chiapas. Even when its presence could not be considered a bloom its conspicuous presence resulted notorious during the cold season.

In Chiapas during the last part of 2002 the concentrations of *P. bahamense var. compressum* cells decreased and when the winter started, the presence of *Pseudonitzchia* was evident in the coast. Next year, 2003, was a warmer one and during April, cyanobacteria showed up in the coasts, mostly close to the lagoon Mar Muerto, but after the rains, the outflow of the lagoon transported cyano blooms outside and into the saline sea environment, spreading the occurrences northward and southward of the Tehuantepec oceanic gyre. Summer months coincided with increases in *Dinophysis* occurrences, both in Chiapas and Oaxaca, but no abrupt increments in DSP was experienced.

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Gulf of California and Northwest Pacific coast: Sonora, Sinaloa, Baja California and Baja California Sur.

As well as in the rest of the country, the monitoring actors are mainly the Health Ministry trough local offices in the states. Also this is the region with the most important aquaculture activity, so private laboratories and several research institutions participate in this activities. The region has profound contrasts in human activities as well as in ecology

between the peninsula and the continental side of the GOC. On the continental side, extensive agriculture, industry and in the last 10 years shrimp farming have contributed to great extent to de deterioration of the environment, while in the peninsula, the lack of fresh water have actuated as a restrictive barrier for the development of extensive degradation of the environment.

The Gulf of California, a semi enclosed ecosystem, have been impacted from historic times by the presence of Harmful Algal Blooms (HABs). Climatic variability affected HABs occurrences at scales from interseasonal to decadal, allowing forecasting the possibility of geographical spread or decline of certain HAB species and events in the region. The augmented use of coastal zones for human activities is also paralleled by increased awareness of global climate changes in the region; making evident major changes in the biodiversity and biogeography of HAB organisms associated to both causes. Within the Gulf, red tides are common in areas associated to seasonal upwelling events and are absent when “El Niño” events appear. The cooling trend associated with the increasing SOI index from 1991-1995 was accompanied by southward expansion of *Pseudonitzchia australis* from Canada, down along the US Pacific coast, to the Gulf of California. *Gymnodinium catenatum*, *Prorocentrum minimum*, *Ceratrium dens*, *Pseudonitzchia australis* and recently *Cochlodinium* cf. *catenatum* have had caused episodes of HABs in the last decades. Eutrophication due to aquaculture farms output flow; provide favorable conditions for cyanobacteria blooms that have affected

the aquaculture industry causing severe losses in shrimp farming ponds. To date, several toxins have been frequently detected in the region causing a serious treat to public health and animal populations, urging to improve the current monitoring efforts.

In the GC massive mortality of marine organisms have been associated to HAB since 1943 and since then documented for different animal groups: sea birds, turtles, fish, and marine mammals. Moreover, HABs can also negatively affect spawning and recruitment of marine species including massive pelagic fishes of commercial value as demonstrated for other regions of the Pacific rim. During the last several years interest in HAB ecology has grown because of their role in public and ecosystem health, and also because it seems that HABs respond very fast and dramatically to environmental changes. The GC is often considered a region of relatively small human impacts. However, at some locations there is evidence indicating some degree of coastal eutrophication and increased HABs that are caused by industrial and human waste, agricultural run-off and the emerging aquaculture facilities.

In the GC only four major ports are currently fully operational (Cabo San Lucas, La Paz, Guaymas and Mazatlan). Six more ports are to be built or modified during the next few years (Loreto, Mulege, Santa Rosalia, San Felipe, Puerto Peñasco and Topolobampo). The effect of developing new ports is still unknown, but experiences from other regions of the World should provide important clues. In the Mediterranean, an inner sea comparable to the GC, HABs increased after water dynamics where changed by the construction (Villa et al, 2001). An interesting event in the GC that is different to what happens in other regions is that during El Niño years the number of HAB events decreases. This is probably the result of reduced upwelling and decreased nutrient input, thus causing a drastic modification of the phytoplankton community. However there has been a tendency to increase the length of the HAB events that occur after each major ENSO. This deserves further attention. Besides interannual HAB responses to human induced or natural environmental variations, one of the only long and consistent HAB time series in the GC is from Mazatlan Bay. Observations of discolored water during the last 22 years indicate the number of toxic species, the length of the events, and frequency are increasing. The occurrence of events of more than 30 days of duration seems to be a common phenomenon since 2000. The number of discoloration days per year increased two to three times during the last five years reaching 273 days/year, 46% of those observed in 22 years.

Another tendency worth mentioning is the recent presence of non-native species driving strong phytoplankton community structure changes. Non-native tropical phytoplankton species suggesting tropicalization during recent years have not been reported previously on detailed exhaustive studies of phytoplankton in the Gulf. *Cochlodinium* cf. *catenatum*, an ichtiotoxic species, producing huge blooms and mortality of fish since 2000 along the coasts of Colima, Jalisco, Nayarit, Sinaloa and Baja California Sur (BCS), in the mouth of the Gulf of California. In the middle of the Gulf, in Kun Kaak bay, *Chattonella marina* produced huge blooms causing fish and benthic organisms mortalities during May, 2003. A month later, *Chattonella marina* caused a big discoloration producing fish mortality. Also *Pseudonitzschia australis* and more recently *Pseudonitzschia pseudodelicatissima* are examples of the recent introduction of a temperate water species now occurring frequently in the Gulf waters. Odd occurrences of organisms like *Protoceratium sp.* or *Gyrodinium instriatum (see video!)* are becoming more frequent. Hypothesis to explain the presence of these new species include overseas human transport and colonization by natural advection related to anomalous ocean conditions.

In any case, it is clear that HAB research in the GC region requires interdisciplinary efforts, consider not only the ecology but also the ocean dynamics, ecosystem role and human influence, and maintain a wider than regional perspective to effectively provide answers.

In Sianalo, specifically in Mazatlan, one event of red tide occurred during November 2002 caused by *Scrippsiela trochoidea*. During 2003, two events developed in spring and autumn caused by *S. trochoidea* and *Cochlodinium catenatum*, respectively. Finally, during 2004, four events occurred in winter, spring and autumn. The most notorious being the bloom of *Pseudonitzschia pseudodelicatissima* producing domoic acid and maybe associated to pelican mortality observed during the same period.

In Sonora, a fish mortality was reported during may 2003 in Kun Kaak Bay (Kino Bay) and it was caused by *Chatonella marina*. The bloom consisted 17-57% of *Gymnodinium catenatum* and 11-36% of *Chatonella*. The event affected the production of shrimp larvae in nearby nurseries causing up to 40% mortality. A month later, *Oscillatoria erythraea* (*Trichodesmium erythraea*) (90% abundance), dominated the bay causing the closure of the tourist resort area and shellfish harvesting.

During January 2004, a massive dolphin stranding occurred in the northern beaches and 79 bottlenose dolphins *(Delphinus capensis)* stranded at Bahía La Salada, inside Bahía San Jorge, Caborca, Sonora (31° 03’ 54” N, 113° 07’ 51” W). Twenty-eight of them died. LCMS analyses of blood samples detected the presence of domoic acid (311-312 mz) on three of the four samples tested. LCMS-MS of ions captured at 311-312 mz and fragmented, produced daughter ions of 266-267 mz on all the four samples, a characteristic degradation product of domoic acid. A month later, carcasses of sea lions and pelicans were found nearby the stranding site, whose condition suggested a death period similar to the dolphins stranding event.

During recent years, in the coasts of the peninsula de Baja California were not reported HABs that worth to be mentioned.

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J. MOROCCO

Moroccan Monitoring Programme For Harmful Algal Bloom

- 3500 km coastal waters
- 7 coastal laboratory based on the Atlantic and the Mediteranean coast.
- 7 eminents scientists workers
- 7 inverted microscope whose one equiped by the camera

Programme of HAB Monitoring example: Oualidia Shores

- Walidia region: an area of intense aquaculture
- Culture of oyster: *Crassostrea gigas* and produce 200t/ha
- The naturel beds of clams and mussels are also present, and exploited by the population.
- HAB events are necessarly as persistant threats of oyster culture.
- Toxic events are possible any time of the year: human illnesses and severe economic losses to industry economic.

Strategy of sampling

The frequency of sampling is bimensual and can become hebdomadary when toxic species were detected.

If the concentration levels of toxins in shelfish exceed the trigger level,

↓

Increase of sampling frequency

- If the phycotoxin test confirm the toxicity of Shelfish

↓

Closure of shelfish harvest

Sampling

- Sampling of algae
- Sampling of Shelfish
- Parameters physico-chimicals

Analysis of samples

-Identification of Harmful algae
-Quantification of harmful algae
- Quantification of toxicity

↓

Dissemination of Information-(Departement of Quality and Marine Medium Safety – INRH)

↓

Mitigation Measures

TOXIC EVENTS

Mediterranean coast

- *Gymnodinium catenatum* was permanently present (since 1989).
- PSP toxin was routinely found in the shelfish
- PSP level: exceeding 80µg STX equiv/100g flesh

Atlantic coast

- *Dinophysis* species was identified in a number of samples and A number of DSP toxicity episodes were also recorded.
- In many cases; *Dinophysis acuta* was recorded at high number, but the DSP toxin were not found in Shelfish samples in the area.
- *Pseudo-nitzschia spp* was found at Moroccan coastal water.
- ASP was measured at low levels in shelfish.

Priorities of Moroccan Monitoring Programme of Harmful Algal Bloom

- Organisation of training course on taxonomy for the Moroccan Scientist Monitoring worker: Help of the IOC
- The base line study of the distribution of potentially harmful algae in the Moroccan coastal waters

- Participation in an inter-calibrate exercices : Help of The IOC

Research Projects under umbrella of IOC

- Identification of species by electronic microscopy : which need the Equipement by electronic microscopy
- Examine the influence of eutrophication and climate change on the Harmful algal blooms
- The effect of sediment disturbance on resting stages of toxic phytoplancton: Training course for cyst identification
- Creation of culture laboratory: important for the identification, systematic position, pigment content, ultrastructure, genetics, life cycles, storage products, nucleic acid contents toxin production, and toxin identification.
- The correlation between toxin producing cells in the water and toxin levels in shellfish
- Develppment, validation and assessment of methods dor the determination of ASP, DSP, and PSP using liquid chromatography mass spectrometry techniques
- Development of methods for the toxins recently discovered in Moroccan shellfish: production of toxins standards and development of liquid chromatography mass spectrometry techniques, the toxins to be studied are: the azasparacides, yessotoxins, pectinotoxins.

Proposition for IOC

The Organisation for the next training course on HABS for the North Africa Scientist in Fisheries Research National Institute -Morocco

K. NAMIBIA

BACKGROUND

Namibia is one of the countries comprising the Benguela Large Marine Ecosystem off the southwestern African coast. Perennial upwelling at Lüderitz in southern Namibia results in continuous and high downstream primary production along the central and northern Namibian coast.

These highly productive, unpolluted waters have the potential to support a significant aquaculture industry. Recognizing the potential, the Namibian Government is promoting and fast-tracking aquaculture development. Government legislation in Namibia pertaining to Aquaculture was promulgated in 2003 (the Aquaculture Act 2002). This establishes the legal mandate for HAB monitoring for both local food safety and to satisfy the requirements of trading partners. Increased production of oysters and other molluscan shellfish hinges on access to international markets, which in turn relies on a comprehensive regulatory

programme. A staffed unit for this purpose was put into place at the coastal institute by the Ministry of Fisheries Aquaculture Directorate in 2004.

Thus with strong regional dependence on growing aquaculture industries, management of HABs is urgent. The importance of HAB investigation in the Benguela region was identified by IPHABVI, and by international programmes such as the Benguela Current Large Marine Ecosystem BCLME, which is currently running a suite of projects to address various aspects of HABs, and by the IAEA technical cooperation programme. Namibia is presently leading three BCLME projects which address the establishment of comprehensive shellfish sanitation programmes in the region: EV/HAB/02/01: *Harmonization of Regulations for Microalgal Toxins for Application in Countries Bordering the Benguela Current Large Marine Ecosystem*; EV/HAB/02/02a: *Development of an operational Capacity for Monitoring of Harmful Algal Blooms in Countries Bordering the Northern Part of the Benguela Current Large Marine Ecosystem: Phase I – Design*, and EV/HAB/04 Shellsan: *Development of a Shellfish Sanitation Programme Model for Application in consort with the Microalgal Toxins Component*. The IAEA project will transfer the receptor binding assay (RBA) technology for detecting algal toxins to the three countries of the Benguela, South Africa, Namibia and Angola.

Phytoplankton monitoring

Phytoplankton monitoring was established as part of the Ministry of Fisheries' Environmental programme in the late 1990's. Priority was given to biomass estimates for fisheries purposes. Prior to 2004 HAB observations were irregular, reactive and ad-hoc. Following staffing of the new Aquaculture Directorate in 2004, regular monitoring involves sampling for HABs from all growing areas along the central coast every two weeks. As aquaculture activities increase, sampling will be expanded to cover more of the coastline.

History of HABs

- Numerous reports in the first half of the 20th century attribute fish mortalities to *Gymnodinium galatheanum = Karlodinium micrum*.
- Pieterse and Van der Post (1967) listed potentially toxic species: *Gymnodinium galatheanum* (= *Karlodinium micrum*), and *Goniaulax tamarensis* (now *Alexandrium tamarense*) and species of the genus *Dinophysis*. *Dinophysis* sp. was previously reported (Hart et. al 1960).
- A mass mortality of seals in 1980 was ascribed to toxic algae (Wyatt 1980).
- In 1995 mussels grown in the Lüderitz region repeatedly tested positive for PSP (The Sea Fisheries Research Institute SFRI Cape Town, unpublished). *Alexandrium catenella* has been identified from the Lüderitz region (a PSP producing species).
- SFRI also reported a fish kill in 1997 in Swakopmund, which was ascribed to toxic algae (unconfirmed).
- Recently *Alexandrium tamarense* a PSP producing species was also found in the Walvis Bay Region; cysts are present in sediment.
- Recently 2003 and 2004 blooms of *Karlodinium micrum* were identified during the winter months. Some reports of dead fish along the beach were reported but no toxin analysis could be carried out.

- In August 2004 domoic acid was found in phytoplankton samples and dying pilchard guts (Greg Doucette, Charleston labs using RBA and confirmed from HPLC and LC-MS). During that period species of *Pseudonitschia* were regularly found.
- In December 2004 and again in February 2005 oyster sample gave isolated and single positive tests for DSP (CSIR Cape Town: regulatory mouse bioassay).

There are clearly a number of potentially toxic HAB species that occur along the Namibian coast.

Biotoxin analysis

The greatest hindrance to satisfactory biotoxin monitoring is the lack of biotoxin analytical facilities in Namibia.

If Namibia is to comply with international testing standards, toxin-testing facilities must be set up within the country. Because biotoxin analysis can presently be carried out only by one single commercial biotoxin laboratory in the Benguela region (CSIR laboratories, Cape Town, using the regulatory mouse bioassay for PSP and DSP toxin groups, and HPLC for ASP toxin), the long turnaround time, together with analytical and transport costs, are unsatisfactory.

Training and Capacity building

Namibia has benefited considerably from IOC-sponsored training courses:

- Phytplankton identification course interfaced with the first training course of IAEA project RAF 7005 in Cape Town, June 2004 (2 participants). Follow-up in Namibia, October 2005, holds promise for continued research on species in Namibian waters.
- IOC-Trainings-Course on Qualitative and Quantitative Determination of Algal Toxins, Germany, 22 February to 03 March 2005 (1 participant)
- Phytoplankton identification course (to be held in Italy in April of this year) (1 participant).

Co-sponsorship of Namibian participation in capacity building activities was provided by the two regional programmes BENEFIT and BCLME: attendance at the Harmful Algae Conference in Cape Town (2 participants) and per diem assistance at training courses. This support is gratefully acknowledged.

FUTURE

With appropriate support to strong and enthusiastic Government commitment, Namibia is poised to develop the required HAB monitoring system to facilitate export opportunities for mariculture products. Steps towards establishing a national molluscan shellfish sanitation programme have progressed rapidly in the last year. Capacity for biotoxin analysis within the country will be essential to attain the required monitoring standards.

L. NEW ZEALAND

The key priority for international cooperation on HAB remains the encouragement of uniformity or the acceptance of equivalence of seafood safety requirements for HAB and marine biotoxins in international trade.

- New Zealand does not have a coordinated national HAB research strategy. Organisations interested in HAB research competitively bid for government funding or form an alliance with the shellfish industry/ private sector.
- The New Zealand Marine Biotoxin Science Workshops, held biannually, bring together all interested parties for a one-day workshop on presentations and discussion on all aspects of HAB science and regulatory marine biotoxin management.
- In 2004 proposed changes to the marine biotoxin requirements for commercial shellfish areas were distributed to interested parties for comment as part of a complete revision of New Zealand's shellfish growing area standards. The new standards are expected to come into effect 2005/2006. Some of the revised requirements include the use of precautionary closures; a review of the phytoplankton action level table, revised reopening criteria after a marine biotoxin closure; frequency of sampling "rules"; the inclusion of a Marine Biotoxin Action plan and more detailed training of samplers.
- The New Zealand Marine Biotoxin Technical Committee, in February 2005, revised the Phytoplankton Action Level Table, which is used in marine biotoxin management of both the commercial and recreational marine biotoxin management programmes.
- While New Zealand is a geographically isolated country, active participation in international HAB related meetings occurs, such as participation in

1. The Commonwealth Science Council (CSC) Asia- Pacific Workshop on Marine Toxins in Fiji, 2002 and a follow up meeting in Queensland, Australia in 2003. The CSC initiative has resulted in CSC approaching IOC to determine common goals.
2. The ECVAM/DG SANCO Workshop on the three Rs Approaches in Marine Toxin testing, 24-26 January 2005 at Ispra, Italy. The goal of the workshop was to discuss potential ways to reduce, refine and replace animal based assays for toxin testing of shellfish
3. The ICES-IOC Working Group on Hazardous Algal Bloom Dynamics
4. The ICES Workshop "Real Time Coastal Observing Systems for Ecosystem Dynamics and Harmful Algae Blooms", France, 2003.

M. SPAIN

National Report 2005-2007

In Spain, the most serious impacts of HAB events in the last few years have been caused by proliferations of *Dinophysis* spp that lead to prolonged closures of bivalves harvesting in Galicia, Atlantic coast of Andalucia and the Ebro Delta region. In 2004, DSP toxins were first reported from the Cantabrian coast. Other toxic outbreaks affecting shellfish included PSP events caused by *Gymnodinium catenatum* in Málaga (Alboran Sea), ASP

events caused by *Pseudo-nitzschia* spp. in Galicia and western Andalucía, and minor very localized PSP events caused by *Alexandrium minutum* in Galicia and the Catalan coasts. Intense water discolorations from blooms of different *Alexandrium* spp. cause visual pollution and impact on the rich tourist industry from the coasts of Catalonia and the Balearic Islands.

Different Spanish institutions are involved in various HAB-related activities that include international cooperation projects, national research projects and monitoring and management activities carried out by governments of the Autonomous Communities. Ongoing activities can be summarized as follow:

EU (FP6)-US Projects (2005-2008)

1. SEED (*Life cycle transformations among HAB species, and the environmental and physiological factors that regulate them*).

Coordinator: Esther Garcés (ICM-CSIC, Spain). Partners: Spain (CSIC-IMEDEA; IEO-Vigo), Italy (SZN-Naples; CNR-Messina; CBA-Urbino; DBEV-Sardinia), Ireland (NUIG), Sweden (Univ. Lund), Finland (FIMR; Univ. Helsinki; Univ. Tartu), UK (Univ. Westminster) and USA (WHOI)

2. HABIT (*Harmful Algal Blooms in Thin Layers*).

Coordinator: Robin Raine (NUIG, Ireland). Partners: France (IFREMER Brest and L'Homeau), Spain (IEO-Vigo), UK (CEFAS).

Other EU Projects

ALGADEC (*Development of a rRNA-Biosensor for the Detection of Toxic Algae*) CRAFT-COOP-CT-2004-508435.
Coordinator:

Coordinator: Thomas Hanken (ISITEC GmbH-Germany). Partners: Germany (AWI), The Netherlands (Cytobuoy BV, Palm Instruments BV), Spain (IEO-Vigo; J.J. Martín-Rodríguez S.A.), Norway (IMR-Flodevigen; Skagerrak Skjellmottak R/S), UK (Univ. Westminster; Gwent Electronic Material Ltd.; North Bay Shellfish Ltd.), Denmark (Exiqon R/S).

2. HAB-BUOY (In-Situ *Imaging and Recognition of Harmful Algae Bloom Species by Artificial Neural Network***).** CRAFT Programme Q5CR-2002-71699

Coordinator: Phil Culverhouse (Univ. Plymouth). Partners: UK (Nimbus Management Ltd; Challenger Oceanic Systems and Services; APT Promotions), Spain (IEO-Vigo; INTECMAR; Concello Regulador Mejillón de Galicia), Italy (ISME-Genoa; Graal Tech S.R.L-Genoa; LBM-Trieste; COMAA-Trieste), Ireland (MI-Galway;.Hensey Glan Uisce Teo-Galway; Killary Fjord Shellfish-Galway).

3. *Population Dynamics and Toxicity of Harmful Microalgae in Coastal Embayments***.**

PIs: D. Barton (III-CSIC Vigo), A. Cembella (AWI, Germany), M. A. Quilliam (NRC-Canada), J. Diogène (IRTA-Tarragona), D. Blasco (ICM-CSIC Barcelona), J. Franco (UA Fitoplancton Tóxico CSIC-IEO Vigo)

4. NEMEDA (*Network to mitigate the impact of* Dinophysis *in aquaculture*). INTERREG-Atlantic 3b # 46.

Coordinator: Robin Raine (NUIG, Ireland). Partners: Spain (IEO-Vigo; IIM-CSIC-Vigo), Portugal (IPIMAR), France (IFREMER-L'Homeau), Ireland (MI-Galway).

National Plan- Spain

1. PHYCODISIS: *Physical biolgical interactions in populations of* Dinophysis
Coordinator: B. Reguera (IEO-Vigo). Includes two subprojects:

- *Genetic variability of* Dinophysis *populations in Galicia and Andalucía.* CTM2004-04078-C03-03/MAR (PI: I. Marín, CBM-UAM, Madrid).
- *Physical biolgical interactions in populations of* Dinophysis *in Galician coastal waters*. CTM2004-04078-C03-01/MAR (PI: B. Reguera, IEO-Vigo)

2. TURFI. *Effect of small-scale turbulence on harmful algae proliferations* (REN2002-01591/MAR)
PI: E. Berdalet (ICM-CSIC Barcelona)

3. *Application of* in vitro *assays for early detect of phycotoxins in multispecific populations of phytoplankton*. REN 2002-02486.
PI: S. González-Gil (IEO-Vigo)

4. *Harmful microalgae and phycotoxins in aquaculture sites subject to monitoring: Impact on the development and viability of aquaculture projects*. ACU02-005**.**
PI: J. Diogène (IRTA, Tarragona).

5. *Seafood toxins analysis: Identification and cultuvation of the causative agents, production of toxins, mechanisms of action and detection methods.* AGL2005-07924-C04. Coordinator: M. Norte (Univ. La Laguna). Includes four subprojects:

- *New strategies in mass cultures of dinoflagellates producers of seafood toxins*.
PI: F. García-Camacho (Univ. Almería)

- *Production of liposoluble toxins (Ostreocins and yessotoxins) in dinoflagellate cultures. por cultivos de dinoflagelados*
PI: J.M. Franco (UA CSIC-IEO-Vigo de Fitoplancton Tóxico)

- *Chemical studies of toxic dinoflagellates of the genera* Protoceratium *and* Ostreopsis.
Pl: M. Norte (Univ. La Laguna)

- *Evaluation of the toxicity of microalgae polyether molecules in primary cultures of cerebellum. Interactions between different toxins and new detection methods.*
PI: M.T. Fernández-Sánchez (Univ. Oviedo)

Governments of the Autonomous-Communities of Spain

The Autonomous Communities of Spain are responsible for the monitoring of their local coastal and interior waters. Monitoring programmes on harmful phytoplankton and phycotoxins are financed by these governments.

Regional monitoring programmes:

- Andalucía (Junta de Andalucía) http://www.dap.es/index.html
- Galicia (INTECMAR, Xunta de Galicia) www.intecmar.org
- Catalonia (IRTA, Generalitat de Catalonia, Fisheries Dpt.) http://www.irta.es/ and ICM-CSIC-Barcelona (Generalitat de Catalonia, Environment Dpt.).

Below is a non-comprehensive list of various research projects focused on regional HAB-related problems, and funded by the autonomous communities.

1. *Depuration kinetics of DSP toxins in the mussel (*Mytilus galloprovincialis*) and ASP toxins in scallops (*Pecten maximus). PGIDIT04RMA501007PR.
Coordinator: J.Blanco (CIMA). Partners: INTECMAR and CETMAR (Xunta de Galicia).

2. Research and development of advanced technologies for the detection and monitoring of toxic cyanobacteria in reservoirs. CGL2004-02701.
PI: E. Costas (U. Complutense, Madrid).

3. Detection and characterization of sapids and toxin-producing microalgae, and protozoan pathogens in pre-treated and treated water supplies from the depuration plant of Araca (AMVISA)and in the water supply for the city of Vitoria. Artículo 83 LRU, AMVISA (Vitoria)
PIs: L. Ortega-Mora, E. Costas.

4. Detection and characterization of toxic microalgae in pre-treated water from Sevilla. Artículo 83LRU, EMASESA, Sevilla.
PIs: E. Costas, V. López-Rodas (U. Complutense, Madrid).

5. Cyanobacteria in the national park of Doñana: impact in mass mortalities of aquatic birds. Early warning network and management strategies. MMA 93/2002.
PI: E. Costas (U. Complutense, Madrid).

6. Impact evaluation of the building works in Doñana (2005) on cyanobacteria and microalgae populations. Artículo 83LRU, Consorcio Doñana 2005.
PIs: E. Costas, V. López-Rodas (U. Complutense, Madrid)

National and International Coordination

There is no specific "National Programme on Harmful Algal Blooms" in Spain. Good communication between HAB experts take place in the biannual "Iberian Workshops on Toxic Phytoplankton and Marine Biotoxins" that have been held since 1990, or in locally organized seminars in Galicia dedicated to harmful algae issues.

International Representation

Spanish delegates/members participate in the next fora:

- ICES/IOC Working Group on Harmful Algal Blooms Dynamics.
- Scientifc Steering Committee (SSC) of the SCOR-IOC GEOHAB Programme.
- Intergovernmental Panel on Harmful Algal Blooms (IPHAB).
- International Society for the Study of Harmful Algae (ISSHA)

"European Community Reference Laboratory for Marine Biotoxins" (CRLMB).

The CRLMB is an independent unit within the organization structure of the Spanish Seafood Agency (AESA). L. Botana (University of Santiago de Compostela in Lugo, Luis.Botana@lugo.usc.es is the Director of the CRLMB, which has its laboratories in Vigo (Head: M.L. Rodríguez-Velasco luisa@sanidad.vigo.pontevedra.map.es).

The main objectives of the CRLMB, in cooperation with the other European *National Reference Laboratories on Marine Biotoxins* (NRLMB) are: "To coordinate, harmonize, or suggest modifications on methodologies and regulations for toxin detection and determination in seafood products".

"IOC-IEO Science and Communication Centre on Harmful Algae"

This centre was established in 1996 as a support to the training and education component of the IOC programme on "Harmful Algal Bloom". Training courses, management of international databases on experts and toxic events, assessment to developing countries, document distribution and participation in regional workshops are part of the activities carried out in this centre, in close cooperation with the IOC Centre in Copenhagen and the HAB Programme Office at the IOC Secretariat in Paris. A new document of understanding between the IOC Secretariat and the Spanish Institute of Oceanography (IEO) was signed in 2001 to extend the activities of the centre until the end of 2006. Head: Monica Lion monica.lion@vi.ieo.es.

N. SWEDEN

National Statement Sweden 2005

In Sweden monitoring of shellfish toxicity and toxin-producing algae is mainly performed on the Swedish west coast. DSP is the main problem, even if PSP may occur. The Swedish Food Administration is responsible and species identification and toxin analysis is performed weekly the year around, in order to certify the shellfish put on the market.

In the Baltic Sea the monitoring for toxin-producing algae – mainly cyanobacteria – is carried out in regional and national monitoring programmes. The results are made public by Information Centres on Internet and by press releases. The monitoring for phytoplankton blooms is also performed during the summer months by remote sensing. Daily distribution maps, based on satellite images, are shown on Internet (www.smhi.se).

In Sweden there is no central national research programme on HABs. There is individual participation in different projects, including EU-projects.

O. UNITED KINGDOM

Monitoring of Harmful Algal Species

Monitoring harmful algal species in U.K. waters is performed in compliance with the EU shellfish hygiene directive 91/492/EEC (funded by the Food Standards Agency) and the

OSPAR eutrophication assessment criteria. Additional monitoring and research programmes are performed by Fisheries Research Service Marine Laboratory, Aberdeen (FRS), the Centre for Environment, Fisheries and Aquaculture Science (CEFAS), the Department of Agriculture and Rural Development Northern Ireland (DARDNI), the Scottish Association of Marine Science (SAMS) and Plymouth Marine Laboratory (PML).

Alexandrium spp., *Dinophysis* spp. and *Pseudo-nitzschia* spp. continue to be detected in UK waters with closures of shellfish harvesting areas enforced when concentrations of the toxins associated with paralytic shellfish poisoning (PSP), diarrhetic shellfish poisoning (DSP) and amnesic shellfish poisoning (ASP) exceed the concentrations defined in 91/492/EEC. Closures of offshore *Pecten maximus* fishing beds in Scotland due to high levels of domoic acid continue to occur.

Additional toxin producing species such as *Prorocentrum lima, Lingulodinium polyedrum*, *Protoceratium reticulatum* have been observed in low numbers in U.K. waters, however concentrations of Pectenotoxins or Yessotoxins in shellfish flesh exceeding the closure limits determined in 2002/225/EC have yet to be observed.

High numbers of *Karenia mikimotoi* were detected in the Orkney and Shetland Islands (North of Scotland) during August 2003 and were associated with mortalities of farmed fish in this region.

Long term ecosystem monitoring continues at five stations in Scotland (Stonehaven, Orkney, Shetland, Loch Ewe, Loch Maddy) in order to generate a long-term time series that will allow effects of climate change on the marine ecosystem to be examined. In the South coast of England the 'L4' transect south of Plymouth continues to be monitored.

The UK National Reference Laboratory for Marine Biotoxins Phytoplankton Working Group has harmonised methods for the sampling, identification and enumeration of toxic producing phytoplankton species between regional laboratories working to fulfil 91/492/EEC.

Government funding agencies within the UK have encouraged laboratories to seek UK laboratory accreditation for the identification and enumeration of potential toxin producing phytoplankton (in compliance with 91/492/EEC) under ISO 17025.

Research Activities

Research activities focussing on harmful algal species in the UK include a study examining the correlation between the presence of potential toxin producing phytoplankton in the water column and toxin levels in shellfish flesh. Molecular examination of *Dinophysis* species and *Alexandrium* species was also performed.

Two projects examining the dynamics of *Pseudo-nitzschia* spp. have been completed during the last two years. One examined the diversity of *Pseudo-nitzschia* spp. in Scottish waters, identifying *Pseudo-nitzschia* cells to species level in 100 samples from Scottish coastal and offshore waters using transmission electron microscopy. A successful Ph.D. project examined the diversity and ecology of *Pseudo-nitzschia* species in Scottish waters. This project identified *Pseudo-nitzschia* cells to species level, identified molecular diversity within the genus and examined the effects of environmental variables on their growth rate. Toxin production was examined in a number of species and *P. seriata* and *P. australis* from Scottish waters was observed to produce domoic acid in laboratory culture.

Current research work is focussed on development of molecular probe technologies for the identification of harmful algal species. In addition, research is being performed into directly measuring the toxicity of phytoplankton populations. Jellet rapid test™ kits and Liquid Chromatography Mass Spectrometry (LC-MS) methods for the detection of shellfish toxins in phytoplankton are being trialled in Scotland. In addition Scotland are also researching techniques developed in New Zealand for the passive adsorption of marine biotoxins onto porous synthetic resin to directly measure the *in situ* accumulation of algal toxins in the water column. This will be trialled in the field in 2005.

P. UNITED STATES OF AMERICA

Harmful algal blooms (HABs) are now recognized as persistent threats to coastal resources, local economies, and human health in the U.S. Increased attention to the occurrence and problems associated with HABs is being demanded at National and State levels. Currently, with the exception of diarrhetic shellfish poisoning (DSP), U.S. waters are subject to most of the major HAB poisoning syndromes and impacts (Figure 1). These include paralytic shellfish poisoning (PSP), amnesic shellfish poisoning (ASP), neurotoxic shellfish poisoning (NSP), ciguatera fish poisoning (CFP), as well as a host of HABs that kill fish or cause ecosystem or recreational impacts. A recent discovery is that more than half of all marine mammal mortalities in U.S. waters are now being attributed to marine biotoxins, compared to a small percentage just a few years ago. The difference is not an expansion in the problem, but rather improved techniques that now make it possible to detect these algal toxins in animal tissues. Another development in recent years is the absence of significant apparent impact from *Pfiesteria* sp. blooms.

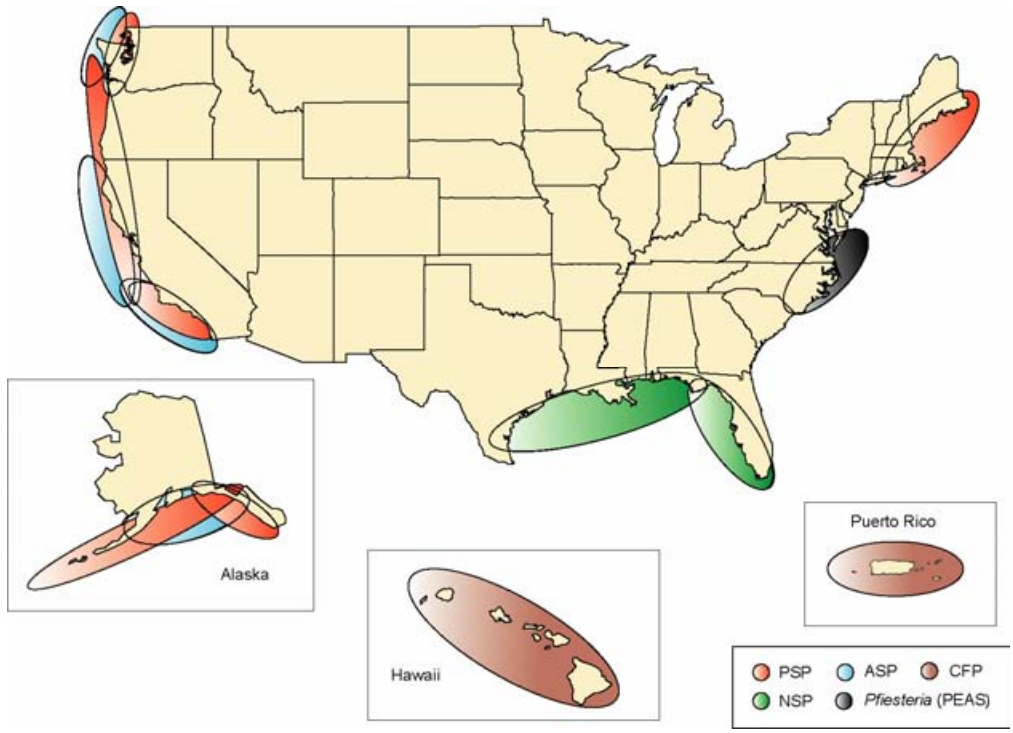

Figure 1. Distribution of major HAB syndromes and events in the U.S. Source: US National Office for Marine Biotoxins and HABs, Woods Hole, MA.

National Activities

Most monitoring of shellfish and shellfish waters is implemented at the state level including measurements of accumulated toxins in fisheries resources, and these states and others are now adopting state-Federal partnerships for monitoring HABs and responding to HAB events. These partnerships are co-sponsored with the states and at least three Federal agencies (Food and Drug Administration (FDA), National Oceanic and Atmospheric Administration (NOAA), and the Environmental Protection Agency (EPA). Further, through a NOAA program, states can request Federal assistance for immediate response to HAB events that exceed normal state response capabilities.

The large commitment to HABs at the National level is through an assemblage of various agency activities that address the majority of the eight specific goals of our *National HAB Plan* (Anderson et al., 1993). This National HAB Plan is now undergoing revision and will be released in 2005. Basic research on bloom development, persistence, and food web interactions as well as basic ecology, physiology, behavior, and toxicity of individual HAB species is addressed through several agencies, with the largest effort being the interagency ECOHAB Programme (Ecology and Oceanography of Harmful Algal Blooms). This Program, established in 1995, has provided research funding through peer and panel review to over 76 projects (6 of them regional studies) with almost US$66 million contributed by NOAA, EPA, NSF, ONR, and NASA. There are 4 regional studies in progress now (Gulf of Maine *Alexandrium*, Gulf of Mexico *Karenia brevis*, mid-Atlantic *Pfiesteria*, and northeast brown tide). Two new additions to the large regional programmes are a Pacific Northwest *Pseudonitzchia* project, and one on macroalgae in Hawaii. Recent projects focus on the following themes: 1. Prevention, control, mitigation strategies; 2. Development of predictive

models, and hopefully forecasts; 3. Regional studies; and 4. Targeted studies: HAB physiology, toxicity, detection, ecosystem effects, etc.

NOAA also operates the Monitoring and Event Response for Harmful Algal Blooms (MERHAB). This program, in operation since 1998, focuses on transferring newly developed tools and technologies to state and local-level managers who have significant monitoring needs related to harmful algal blooms. This programme also supports both regional and targeted studies.

Two major Federal initiatives for "Oceans and Human Health" (OHH) were initiated in 2004, one by NSF and NIEHS and the other by NOAA. The NSF and NIEHS programme established four national "centers" with external funding and the NOAA programme established three "centers of excellence" within NOAA. The NOAA programme also has an external research grants program. All of these programmes encompass a wide range of research topics concerning the impacts of the oceans on human and animal health. A large part of the portfolio of research in each of these initiatives is HAB-related. Another aspect of human health, seafood safety, including monitoring for HAB toxins, is also an identified Federal responsibility, generally under the purview of the FDA. Research on HAB-seafood safety linkages is focused in two Federal agencies (FDA and the CDC (Centers for Disease Control), developing diagnostics for HAB exposure and therapies as well as determining toxin pharmacologies, with intra- and extramural programmes.

The total 2005 Federal investment in HAB-related extramural research grants under ECOHAB, MERHAB and OHH is expected to be in the range of $10-15 Million.

A few agencies also have other non-specific internal funding programmes that provide support for HAB oceanographic research projects as well. Toxin identification, chemistry, assay development and research on linkages between oceans and human health is primarily centered in three agencies (NOAA, FDA, and the NIEHS (National Institute for Environmental Health Sciences). Developments from these two activities, basic ecology/oceanography and toxin/cell identification and assay development are rapidly incorporated into the expanding Federal-State partnered monitoring programmes described above.

This coordinated effort results in a rather comprehensive National research capability for HABs, toxins, and human health, communicated to the national and international community through the federally supported National Office of Marine Biotoxins and Harmful Algae at the Woods Hole Oceanographic Institution. This national office also works closely with the IOC HAB programme, and is the North American "node" for distribution of conference proceedings and other publications of the IOC.

Every two years, a U. S. National HAB meeting is held. The 3rd National HAB meeting will be held 3–7, Oct., 2005 in Monterey, CA.

International activities

The present highlight of attention of the U. S. at the international level is an ongoing discussion about cooperation with the EU on comparative and collaborative science on the ecology and oceanography of harmful algal blooms. This is anticipated as part of International GEOHAB efforts. Explicit EU-NSF cooperation will not preclude the involvement directly of other agencies and governments in projects. A workshop was held in

Trieste in September 2002 and a joint Science plan issued on the cooperative program. One call for proposals has been issued, and two_EU-US partnerships are being supported. The future of the EU-US programme is not clear, but discussions are ongoing to try to keep the concept alive.

NOAA's labs (Northwest Fisheries Science Center in Seattle, Charleston, SC Lab and the Beaufort, NC Lab) have continued to assist foreign countries with toxin assays and HAB identification.

NOAA has also regularly supported international HAB meetings including the recent meeting in South Africa and the GEOHAB open science meeting on the link between HABs and eutrophication. Pat Tester, a NOAA researcher, now chairs ISSHA.

With respect to future priorities_to be pursued in coordination with the IOC HAB Programme, the U.S. comments and recommendations about international activities that could be coordinated by IPHAB include:

1) **Capacity building and training.** We note that the IOC Science and Communication Centres in Copenhagen and Vigo have shown clear benefits to the international community through their outreach and training efforts, and continued support for these centers should be provided. U. S. scientists are willing to assist in these activities. It is recommended that a list of course prospectuses_be developed to help secure the necessary funding or in-kind support from various sources for these training efforts in the future.

2) **The newsletter,** *Harmful Algae News*, is an excellent communication tool, and should be continued.

3) **Regional IOC HAB groups**, such as WESTPAC, FANSA, and ANCA are important mechanisms to prioritize, plan, and implement HAB activities throughout the world. Efforts should be made to continue these activities, and to expand their activities. The U. S. does not presently participate in many of these regional groups, but would like to do so in the future.

5) **Regional and national regulations** on algal toxins in seafood products are unfortunately not uniform internationally. The U. S. supports activities that will lead to harmonization of regulations, as this is critical to efficient importation and exportation of seafood potentially contaminated with algal toxins.

6) **HAB databases** of international scope are a valuable service that is provided by the IPHAB. NOAA is pursuing the necessary expertise to add interactive mapping capabilities to the Harmful Algal Event Data Base.

7) The **Global Ocean Observing System (GOOS)** is of great relevance to HAB monitoring and research activities worldwide. Likewise, there is a growing recognition in the global observing community that capabilities to detect HABs, their toxins or environmental conditions that may indicate that a HAB is likely, increase the value of observing systems. The incorporation of HAB-related detection capabilities, tailored to regional needs would be of great value in documenting trends and in facilitating monitoring and management efforts, and may lead to prediction and forecasting of HAB events. Continued involvement of HAB scientists and management experts in the GOOS programme is highly recommended, and pilot projects on HABs should be considered by GOOS during programme implementation.

We believe that highlighting specific elements of international programmes and their benefits to contributing nations holds the best promise of near and long-term support.

ANNEX IV

LIST OF WORKING DOCUMENTS

Document Code	Title
WORKING DOCUMENTS	
IOC/IPHAB-VII/1 prov.	Provisional Agenda
IOC/IPHAB-VII/1 Add.	Provisional Timetable prov.
IOC/IPHAB-VII/2	Annotated Provisional Agenda (suppressed)
IOC/IPHAB-VII/3 prov.	Executive Summary, Draft Summary Report (to be prepared during the Session)
IOC/IPHAB-VII/4 prov.	Provisional List of Documents (this document)
IOC/IPHAB-VII/5 prov.	Provisional List of Participants
INFORMATION DOCUMENTS	
IOC/IPHAB-VI/3	Report of the IOC Intergovernmental Panel on Harmful Algal Blooms, Sixth Session, St. Petersburg, 17-19 October 2002
IOC/IPHAB-VII/Inf.1	Extract from: Twenty-second Session of the IOC Assembly, Paris, 2003
IOC/IPHAB-VII/Inf.2	Information on HABP developments 2002-2004 (Agenda Item 4.1)
IOC/IPHAB-VII/Inf.3	Overview of resources and needs: Draft HABP Work Plan, 2005-2007 (To be finalized during the session)
IOC/IPHAB-VII/Inf.4	Report 2003: IOC-IEO Science and Communication Centre on Harmful Algae, Vigo, Spain
IOC/IPHAB-VII/Inf.5	Report on IOC/WESTPAC
IOC/IPHAB-VII/Inf.6	UNESCO Cross Cutting Project HAB-SEA
IOC/IPHAB-VII/Inf.7	Report of the VI IOC Regional Working Group on Harmful Algal Blooms in South America (FANSA), 22-24 October 2003, Guayaquil, Ecuador
IOC/IPHAB-VII/Inf.8	FANSA Portal Project Work Plan
IOC/IPHAB-VII/Inf.9	Report of the III IOC Regional Working Group on Harmful Algal Blooms in the Caribbean, IOCARIBE/COI/ANCA, 16-18 July 2003, Cumaná, Venezuela.
IOC/IPHAB-VII/Inf.10	New IOC Regional Group on HABs: HANA (Harmful Algae of North Africa) incl. the HANA Declaration, December 2003, Salammbo-La Goulette, Tunisia.

IOC/IPHAB-VII/Inf.11	Overview of IOC training courses on HAB
IOC/IPHAB-VII/Inf.12	GEOHAB SSC 2005 and Terms of Reference.
IOC/IPHAB-VII/Inf.13	Requirements for the GEOHAB IPO
IOC/IPHAB-VII/Inf.14	ICES/IOC/SCOR Study Group on GEOHAB Implementation in the Baltic
IOC/IPHAB-VII/Inf.15	ICES-IOC Working Group on Harmful Algal Bloom Dynamics: Report of the meeting, 17-20 March 2003, Aberdeen, United Kingdom Report of the meeting 5-8 April 2004, Corsica, France
IOC/IPHAB-VII/Inf.16	Reports of the ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors
IOC/IPHAB-VII/Inf.17	IPHAB Ballast Water Background Paper
IOC/IPHAB-VII/Inf.18	Report on IPHAB Task Team on Algal Taxonomy
IOC/IPHAB-VII/Inf.19	Report of the IPHAB Task Team on Biotoxin Regulations
IOC/IPHAB-VII/Inf.20	WHO water quality guidelines for desalination
IOC/IPHAB-VII/Inf.21	Draft version of 'Strategic Implementation Plan for the Coastal Module of the Global Ocean Observing System'
IOC/IPHAB-VII/Inf.22	XIth International Conference on Harmful Algae: Summary of a round table discussion on 'Detection and Monitoring of HABs'.
IOC/IPHAB-VII/Inf.23	Establishment of a Commonwealth – Marine Toxin Research and Resource Centre (STRAP) at the Marine Science Centre, University of the South Pacific, Fiji.
IOC/IPHAB-VII/Inf.24	General Information
GEOHAB Report No. 1	Science Plan of the IOC-SCOR Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB) Programme (on-line at http://www.geohab.info
GEOHAB Report No. 2	Implementation Plan of the IOC-SCOR Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB) Programme (on-line at http://www.geohab.info).
GEOHAB Report No. 3	GEOHAB Open Science Meeting on HAB's in Upwelling Systems
GEOHAB Report No. 4	GEOHAB Open Science Meeting on HAB's in Fjords and Coastal Embayments
GEOHAB Report No. 5	GEOHAB Open Science Meeting on HAB's and Eutrophication
IOC Annual Report No. 3	IOC Annual Report 2002 (on request)
IOC Annual Report No. 4	IOC Annual Report 2003 (on request)

ANNEX V

LIST OF PARTICIPANTS

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ANNEX VI

TERMS OF REFERENCE OF THE IOC INTERGOVERNMENTAL PANEL ON HARMFUL ALGAL BLOOMS

RESOLUTION XVI-4

INTERGOVERNMENTAL PANEL ON HARMFUL ALGAL BLOOMS

The Intergovernmental Oceanographic Commission,

Recalling that the IOC, at the Fourteenth Session of its Assembly, endorsed the development of the sub-programme on Harmful Algal Blooms, and that the Twenty-third Executive Council, through its Resolution EC-XXIII.1, endorsed the programme development so far,

Being aware of the increasing socio-economic risks posed by toxic algae and harmful algal blooms to marine organisms, fisheries, aquaculture, human health and the coastal environment,

Approves the formation of an *Ad hoc* Intergovernmental Panel on Harmful Algal Blooms, with the Terms of Reference shown in the Annex hereto;

Invites FAO to co-sponsor the *Ad hoc* Panel;

Invites Member States which intend to be involved in the implementation of a programme on Harmful Algal Blooms to nominate their representatives for the *Ad hoc* Panel and inform the Secretary IOC accordingly;

Decides to review, at the Seventeenth Session of the Assembly, the Terms of Reference of the *Ad hoc* Panel, in conjunction with the Commission's review of the overall organization of the OSLR Programme;

Instructs the Secretary to convene the First Session of the *Ad hoc* Panel as soon as possible.

Annex to Resolution XVI-4

Terms of Reference of the *Ad hoc* Intergovernmental Panel on Harmful Algal Blooms

1. FUNCTIONS

The *Ad hoc* Intergovernmental Panel on Harmful Algal Blooms is established to meet the scientific, managerial, implementation, and resource needs of the Harmful Algal Blooms Programme.

The Panel will carry out the following functions:

1.1 Review and identify programme requirements;

1.2 Promote efficient and cost-effective implementation of the HAB programme and prepare recommendations on this implementation to the Assembly and Executive Council;

1.3 Identify the resources necessary to meet HAB programme needs.

1.4 Ensure effective interaction and communication with regional intergovernmental (e.g., ICES, ICSEM and GFCM) as well as regional and global non-governmental (e.g., SCOR) organizations involved in research on toxic algae and harmful algal blooms; and

1.5 Report to the Twenty-fifth Session of the Executive Council and the Seventeenth Session of the Assembly.

2. COMPOSITION

The membership of the *Ad hoc* Panel is open to Member States of IOC (and FAO, if it agrees to co-sponsor the Panel), which have declared to the Secretary IOC their involvement or intention to participate in the development and implementation of the Harmful Algal Bloom Programme on a global, regional, or national scale. The Panel shall include the Chairman of the OSLR Guiding Group of Experts, representatives of IOC regional and other subsidiary bodies, and of other interested international organizations, particularly SCOR. Invitations to participate in Panel activities may be extended to scientific experts at the request of the Panel and with the approval of the Secretary of the IOC.

3. ORGANIZATION OF THE SESSIONS

3.1 The Panel will, prior to the closure of each Session, elect from its Members a Chairman who will serve in that capacity until the closure of the next Session.

3.2 The Sessions shall, in principle, be arranged without financial costs to IOC. Sessions will be conducted, documentation will be provided, and the report of each session will be prepared in English and in other working languages of the Commission as appropriate and required.

3.3 Secretariat support for the Panel will be provided by the Secretary IOC.

ANNEX VII

IOC HARMFUL ALGAL BLOOM PROGRAMME PLAN
(**Revised extract from IOC Workshop Report No. 80**)

IPHAB-IV REVISION

6.1. EDUCATIONAL PROGRAMME ELEMENTS

6.1.1 Information Network

Goal: To develop, encourage and maintain the flow of information, technology and expertise to scientists, administrators and the general public.

Objectives:

(i) Produce a regular newsletter for reporting bloom occurrences, recent publications, meetings, new techniques, and requests for assistance and general information.

(ii) Prepare and publish a 2nd edition of the IOC manual containing standardized methodology for the study of harmful algae.

(iii) Prepare identification sheets and reference slides for harmful species, preserved material and video documentation, updated as necessary.

(iv) Maintain and update as necessary the IOC lists of experts grouped according to areas of expertise.

(v) Ensure rapid communication of harmful events, new problem species, methodologies and other common information to researchers, administrators and medical personnel.

(vi) Prepare, distribute and maintain fact sheets on toxin for administrators, the medical community and the general public.

(vii) Facilitate worldwide distribution of reference books, conference proceedings and equipment.

(viii) Ensure the distribution of material with respect to public safety and education.

6.1.2 Training

Goal: To promote and facilitate the development and implementation of appropriate training programmes in order to distribute the necessary knowledge and expertise on a global basis.

Objectives:

(i) Facilitate workshops and training programmes on taxonomy, ecology, toxin extraction and analysis, management strategies, public health and safety and mitigation techniques.

(ii) Promote access to equipment and the extensive training of selected individuals in regions that lack adequate facilities and properly trained personnel for toxin analysis.

6.2 SCIENTIFIC PROGRAMME ELEMENTS

6.2.1 Ecology and Oceanography

Goal: To understand the population dynamics of harmful algae.

Objectives:

(i) Develop the necessary understanding of bloom dynamics of harmful algae, which includes the phases of bloom progression (excystment or bloom initiation, exponential growth, aggregation, toxicity, as well as death, grazing, encystment, sinking or dispersal) and the succession of phytoplankton species.

(ii) Develop numerical models (and eventually reliable predictions) of toxic blooms based on hydrodynamic, chemical and biological principles as well as the unique hydrography, chemistry and plankton composition determined by regional research programmes.

(iii) Determine the role of nutrients (total amounts and ratios) in the dynamics of harmful algal events; investigate the relative importance of natural versus anthropogenic sources.

(iv) Elucidate the importance of human activities in the dispersal of certain harmful species (e.g., via ship ballast water; transfer of shellfish stocks).

(v) Derive quantitative relationships among the biological, physical and chemical parameters with respect to the bloom-forming species that can be used in a local management context through predictive models and management strategies.

(vi) Determine the ecological role of toxicity in the population dynamics of toxic species and the consequences of toxicity to living resources.

(vii) Design appropriate experimental and field studies to develop the required understanding of the hydrography, ecology and oceanographic conditions controlling the population dynamics of harmful species.

(viii) Determine the ecophysiological capabilities of causative species (K, vmax, allelopathic substances, grazer repellant, life-cycle strategies).

(ix) Establish long-term trend monitoring stations to document changes in phytoplankton species composition and associated physical and chemical variables over decadal time-scales.

(x) Develop studies on cyst assemblages to document the areal distribution of harmful, cyst-forming species in order to identify risk areas for harmful algal blooms.

(xi) Encourage analysis of sediments, especially from anoxic basins, that can provide evidence (cysts, frustules, etc.) for the prior occurrence of harmful species in regions where recent introductions are suspected.

6.2.2 Taxonomy and Genetics

Goal: To establish the taxonomy and genetics of the causative organisms at the appropriate levels.

Objectives:

(i) Develop and maintain the capability to recognize, characterize and identify harmful species by morphological criteria, including ultrastructural and phenotypic variability and also by different life stages such as resting cysts.

(ii) Establish a group to make taxonomic recommendations and to develop identification standards for preparation of manuals, reference materials and training standards.

(iii) Determine the genetic heterogeneity within species and isolates with respect to mating compatibility and molecular characteristics.

(iv) Support existing and establish new regional culture collections specializing in harmful species.

(v) Promote the development of new, rapid, automated identification, discrimination and counting techniques such as, image analysis, flow cytometry and immuno-labelling.

(vi) Encourage and enable the development of computerized taxonomic databases of harmful species.

(vii) Organize and conduct intercalibration exercises.

6.2.3 Toxicology and Toxin Chemistry

Goal: To determine the physiological and biochemical mechanisms responsible for toxin production and accumulation and to evaluate the effect of phycotoxins on living organisms.

Objectives:

With respect to physiology:

(i) Establish the biosynthetic pathways of toxin production in algae including defining the role of endo- or exocellular bacteria and viruses.

(ii) Determine the physiological mechanisms underlying variable toxicity among strains of species or within single strains grown under different conditions.

(iii) Define the toxin accumulation, chemical conversion and depuration processes in contaminated seafood.

(iv) Determine the processes of toxin degradation.

With respect to chemistry:

(v) Isolate, identify and/or elucidate the structure of toxins.

(vi) Prepare and supply toxin standards and reference materials.

(vii) Develop new chemical analytical methods for toxins, specifically:

1. alternative assay methods to replace such tests as mouse and other bioassay organisms, while improving the sensitivity, specificity and reproductibility of all methods; and
2. simple field assay kits.

With respect to toxicology:

(viii) Define the fate and effects of algal toxins in the marine food web.

(ix) Elucidate mechanisms of toxicity to marine animals.

(x) Determine the mechanisms responsible for the mass mortalities of fish and other marine organisms caused by toxic substances.

(xi) Establish pathological indicators to determine toxins responsible for mortalities and other impacts.

6.3 OPERATIONAL PROGRAMME ELEMENTS

6.3.1 Resource Protection

Goal: To develop and improve methods to minimize the environmental and economic consequences of Harmful Algae.

Objectives:

(i) Assist managers in designing, evaluating and improving cost-effective procedures for selecting and protecting aquaculture sites; applying methods for early warning of toxicity and mass mortalities; and developing management strategies.

(ii) Assist managers in applying scientific results as quickly and effectively as possible to resolve management, mitigation, public safety, public education and public relations problems.

(iii) Assist managers in developing strategies and procedures for protecting the tourist and amenity value of coastal areas.

6.3.2 Monitoring

Goal: To promote and facilitate the development and implementation of appropriate monitoring programmes.

Objectives:

(i) Provide a source of information and guidance on design and implementation of monitoring programmes.

(ii) Interact with, and encourage, long-term regional, national and international monitoring plans and programmes to identify trends and cycles in the frequency of harmful algal

blooms, their resulting toxicity for marine life, and suspected causes (e.g., climatological, hydrographical, or nutrient changes).

(iii) Ensure the compatibility (e.g., techniques, type of data collected) of plankton and toxin monitoring programmes with basic studies of algal bloom dynamics and ecology.

6.3.3 Public Health and Seafood Safety

Goal: To protect public health and ensure seafood quality.

Objectives:

(i) Facilitate monitoring for toxic species and seafood toxins.

(ii) Encourage standardization of methods for toxin detection and levels for market closure.

(iii) Facilitate testing of techniques for the mitigation of noxious blooms: (e.g., forced sedimentation, aeration, sea surface scum collection).

(iv) Where appropriate, assist with measures to avoid or mitigate harmful events.

(v) Develop antidotes against seafood toxins.

ANNEX VIII

IOC INTERGOVERNMENTAL PANEL ON HARMFUL ALGAL BLOOMS INFORMATION ON DEVELOPMENTS IN THE INTERSESSIONAL PERIOD

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8.4 HAB and the Global Ocean Observing System
8.5 HABWATCH Monograph
8.6 Forum for HAB Monitoring

Appendice I - An overview of contributions to the IOC for development and implementation of the Harmful Algal Bloom Programme 2003-2004.

Appendice II - Implementation of IPHAB-VI Resolutions and Recommendations

PROGRAMME DEVELOPMENT

1. STAFFING

1.1 STAFFING OF THE PROGRAMME OFFICE

The IOC Secretariat has one staff assigned to the HAB Programme. H. Enevoldsen is located at the decentralized Programme Office at the IOC Science and Communication Centre on Harmful Algae at University of Copenhagen, Denmark. The post for the HAB Programme is not a permanent post and has until 2004 been paid by the Danish contribution to IOC. In 2005 it will be 50% funded by the IOC and 50% by the Danish contribution. Ms. Virginie Bonnet is the administrative Assistant for the HAB Programme and is located at IOC Headquarters, Paris.

The HAB programme has previously benefited from the secondment by Denmark of Associate Experts to the IOC Secretariat. However, this arrangement has ended after 20 years. Danida has reduced its Associate Expert programme and UNESCO is terminating it in general.

1.2 HAB SCIENCE AND COMMUNICATION CENTRES

The establishment of HAB Programme activity centres was proposed at the Twenty-fifth Session of the IOC Executive Council (Paris 10-18 March 1992) and the idea was further elaborated at the First Session of IPHAB (23-25 June 1992). At the Seventeenth Session of the IOC Assembly (Paris, 25 February-11 March, 1993), Denmark and Spain offered to host and establish Science and Communication Centres on Harmful Algae. The main purpose of the Centres is to provide the framework for systematic assistance in training and capacity building to developing countries with respect to harmful algae.

The IOC Science and Communication Centre on Harmful Algae in Copenhagen, Denmark, opened in May 1995. The Centre is a decentralized programme Office for the IOC HAB Programme and is staffed by Mr. Henrik Enevoldsen, IOC Project Coordinator, and Associate Professors Drs. Jacob Larsen and Gert Hansen. The Centre is hosted by, and located at, the Institute of Biology with Professor Ø. Moestrup as the focal point at the University. Activities are centred on capacity building in identification of harmful algae and associated services. The Centre is sponsored by DANIDA, the University of Copenhagen, the National Environmental Research Institute, the Fisheries Research Institute, and the IOC. The core extra-budgetary support is provided by Danida to the IOC Trust Fund.

Following the decision taken at IPHAB-V, and in view of the formulation of a new work plan for 2003-2007, a panel was composed with the aim of reviewing the activities of the IOC Science and Communication Centre on Harmful Algae in Copenhagen. The reviewers unanimously expressed the judgment that the Centre has been a success, its plans are appropriate and it deserves continued support. The review concluded that plans for 2003-07 were realistic and credible. The reviewers suggested additional activities as well as the expansion of those presently carried out to more countries and regions. Of particular challenge is the role that the Centres can have in organizing international cooperation in HAB research and monitoring, and in providing capacity building in new fields.

As a follow up to recommendations of the review, negotiations were made during 2003 and 2004 with the Danish donors. However, due to changed policy of the Danish government with respect to the UN agencies it has not been possible to augment the support, at the contrary it has been a hard struggle to maintain the present level. Early 2005 Danida committed to co-fund the Centre until end 2007. The continuation of the Centre beyond 2007 will require identification of new extra-budgetary funding. As a follow-up to IPHAB-VI.3 the partnership in the Copenhagen Centre has been expanded through formal memoranda of understanding with Alfred Wegener Institute for Polar and Marine Research, the Research Institute Senckenberg, and the Freidrich Schiller University Jena, Germany. The new partnership will provide the platform for implementation of training courses on qualitative and qualitative determination of algal toxins.

The IOC-IEO Science and Communication Centre on Harmful Algae in Vigo, Spain, was established in October 1996, after a document of understanding was signed between IOC and IEO (Instituto Español de Oceanografía). The Centre is located at the Oceanographic Centre in Vigo. The Centre staffs are the head, Mrs. Monica Lion, and one assistant, Mrs. Cristina Sexto. The Centre also draws on the scientific staff of the IEO in Vigo under the coordination of Dr. Beatriz Reguera. The Centre provides advice, and scientific and technical assistance on problems related with monitoring and management of harmful algae events, and the characterization of the microalgae and their toxins (taxonomy, toxin content, ecology). Priority is given to the cooperation with Iberoamerican and the Maghrebian research institutions. The Centre is sponsored by the IEO (through the IOC Trust Fund), and IOC. The “Spanish Agency for International Cooperation”(AECI) cosponsors the courses held at the Vigo Centre. The agreement and sponsorship was renewed in March 2002 to continue the activities of the Centre until end of 2007.

The activities of the two Centres are coordinated and coupled as appropriate, and are intended to be as complementary as possible. Both Denmark and Spain have provided part of the resources for the Centres to the IOC Trust Fund.

The IOC Assembly has expressed its wish to continue the Centres beyond the initial periods through Resolution XX.3.

An executive summary of the 2003 Activity Report of the Vigo Centre is available as Document IOC/IPHAB-VII/Inf.4. The annex to Document IOC/IPHAB-VII/Inf. 4 is an executive summary of the HABViet project implemented by the Centre in Copenhagen.

2. REGIONAL GROUPS AND WORKSHOPS

2.1 IOC WORKING GROUP ON HARMFUL ALGAL BLOOMS IN SOUTH AMERICA (COI-FANSA)

A detailed report of FANSA activities is given in Document IOC/IPHAB-VII/Inf.7.

A copy of the FANSA Portal Work Plan is attached as Document IOC/IPHAB-VII/Inf.8

2.2 IOC WORKING GROUP ON HARMFUL ALGAL BLOOMS IN THE CARIBBEAN (COI-ANCA)

A detailed report of ANCA activities is given in Document IOC/IPHAB-VII/Inf.9.

2.3 IOC/WESTPAC HAB

IOC/WESTPAC-HAB has, through the WESTPAC-HAB Chair Dr. Y. Fukuyo, received support from Japan to conduct capacity building in the WESTPAC region and to provide a species identification service. The support is for a ten-year period starting from 1995. In 2004 WESTPAC/HAB started training through research project (TTR). From 21-27 October 2004 a technical standardization meeting of TTR Research Group on Cyst Mapping and an Executive Committee meeting of TTR was held in in Nagasaki, Japan.

A detailed report of WESTPAC/HAB activities is given in document IOC/IPHAB-VII/Inf.5.

A description of the UNESCO Cross Cutting Project HAB-SEA is given in document IOC/IPHAB-VII/Inf.6

Information on a proposal for a centre on marine biotoxins for the South pacific is given in document IOC/IPHAB-VII/Inf.23.

2.4 HARMFUL ALGAE OF NORTH AFRICA: HANA, A REGIONAL NETWORK

The Participants at the "Regional Training Course on Harmful Algae" organised by IOC in cooperation with the AECI, NAUTA, IEO, COPEMED and DANIDA, from 1 to 12 December 2003 at the INSTM, Salammbô, Tunisia, had detailed discussions led by Professor Y. Halim regarding improved cooperation on HAB among the countries along the North African coast. Recalling the serious impacts of this problem on marine resources and on aquaculture, and referring to the desirability of combining efforts and means and of cooperation at the regional scale towards a better management of the HAB problem, the participants formulated the establishment of a network "Harmful Algae of North Africa ", HANA. The group also expressed their strong wish to see this network affiliated to and supported by IOC.

This is initiative is a follow-up to IPHAB Recommendation IPHAB-VI.1 (see Annex II).

The proposed terms of reference for IOC/HANA are available as document IOC/IPHAB-VII/Inf 10.

EDUCATIONAL ELEMENTS

3. INFORMATION NETWORK

3.1 *HARMFUL ALGAE NEWS* - AN IOC NEWSLETTER ON HARMFUL ALGAE AND ALGAL BLOOMS

Issues No. 24-27 of *Harmful Algae News* have been published. HAN is published

whenever there is sufficient material for an issue. The number of subscribers has stabilized just above 2,000. HAN is produced by the IOC Centres in Vigo and Copenhagen and is supported 'in-kind' by the Botanical Institute, University of Copenhagen, and the Spanish Institute of Oceanography. Subscriptions and back issues are available at http://ioc.unesco.org/hab/news.htm

An Editorial Team composed of regional co-editors was established in 1993 in order to support the Editor in his efforts to make HAN a broad newsletter both scientifically and geographically. At IPHAB-III and IV the limited support from the Editorial Team was noted and discussed. The members of the Editorial Team are listed below.

THE EDITORIAL TEAM FOR THE IOC NEWSLETTER "*HARMFUL ALGAE NEWS*" 1993-

EDITOR, Dr. Tim Wyatt, Instituto de Investigaciones Marinas, SPAIN

CO-EDITORS:

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Dr. Laurita BONI, University of Bologna, ITALY

Dr. José Ignacio CARRETO, Instituto Nacional de Investigación y Desarrollo Pesquero, ARGENTINA

Dr. Allan CEMBELLA, NRC, CANADA

Dr. Rhodora AZANZA, University of the Philippines, PHILIPPINES

Dr. Einer DAHL, Institute of Marine Research, NORWAY

Dr. Yasuwo FUKUYO, Asian Natural Environmental Science Center, JAPAN

Ms. Itaf GNINGUE, Centre de Recherches Oceanographiques de Dakar Thiaroye, SENEGAL

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Dr. Adelaide SEMESI, University of Dar-es-Salaam, TANZANIA

Dr. Sandra SHUMWAY, Department of Marine Resources, USA

3.2 DIRECTORY OF EXPERTS, HAB-DIR

The Directory has been prepared to assist countries facing toxic and harmful algal bloom emergencies by facilitating rapid access to scientists, fisheries managers, public health officials, and physicians dealing with toxic and harmful algal blooms and their consequences to fisheries, aquaculture, and public health. The second edition of Directory was a joint IOC-NOAA (USA) effort, and was published by the IOC in May 1995. As recommended by IPHAB-III, HAB-DIR became a searchable database at the Internet (IOC HAB Homepage: http://ioc.unesco.org/hab/data1.htm#1). HAB-DIR is a sub-section of the IOC global directory of experts in marine and freshwater science, the 'Ocean Expert'. HAB-DIR can be edited on-line, and new entries can also be submitted on-line. HAB-DIR is regularly announced at PHYCOTOXINS and in Harmful Algae News and people are encouraged to up-date their information of to join the directory.

3.3 REGIONAL DIRECTORY OF EXPERTS AND DATA-BASE

Following the request by the IOC-FANSA Working Group, the UNESCO/ROSTLAC Office in Montevideo has established an IOC-FANSA DATA BASE containing (i) a regional directory of scientists working on phytoplankton and harmful algae problems in South America and (ii) a list of all the scientific publications on phytoplankton and harmful algal blooms available in South America. This product will now be integrated into the FANSA Portal.

3.4 IOC MANUAL ON HARMFUL MARINE MICROPLANKTON

The IOC Manual on Harmful Marine Microplankton (Editors G.M. Hallegraeff, D.M. Anderson & A. Cembella), including methodologies, taxonomy, and monitoring and management issues was published early 1996 as an IOC technical report in low cost format. The printing was made possible through financial support from the Danish Institute for Fisheries Research and DANIDA. It was printed in 4000 copies but has been out of stock since 2000. IPHAB-IV (1999) decided that a second edition of the manual should be prepared. The editorial team for the first edition accepted to prepare the second edition. The expanded and improved second edition was published in 2003 as a volume in the UNESCO Publishing series 'Monographs on oceanographic methodology'. The publication was made possible through the financial support of Danish Natural Science Council, the Danish Ministry of Science, Technology and Innovation, and Danida. The second edition was published in 2004 and the Manual has been one of the best scientific sales successes of UNESCO Publishing. The Manual can be ordered at http://upo.unesco.org/details.aspx?Code_Livre=4040

3.5 IOC CO-SPONSORSHIP OF INTERNATIONAL CONFERENCES RELATED TO HAB

The HAB Programme co-sponsored the Eleventh International Conference on Harmful Algae Blooms, Cape Town, South Africa, 15-19 November 2004. The IOC support covered the participation of scientists from developing countries. Proceedings will be published as a special issue of the African Journal of Marine Science with IOC as co-sponsor..

The HAB Programme also co-sponsored the Tenth International Conference on Harmful Algae, St. Petersburg, Florida, 21-25 October 2002. The IOC support covered the participation of scientists from developing countries. The IOC is co-sponsoring the Proceedings, which unfortunately have not yet been published by the organizers.

The HAB Programme co-sponsored the Fourth International Conference on Molluscan Shellfish Safety, Santiago de Compostela (Spain) from 4-8 June 2002. The Proceedings are co-published by Xunta de Galicia and the IOC.

The HAB Programme co-sponsored the Second International Conference on Harmful Algae Management and Mitigation, HAMM2001, which was held at 12-16 November 2001 in Qingdao, China. IOC co-sponsored the publication in 2004 of the joint proceedings of the first and second conference together with APEC, SOA, IOI, Qingdao Municipal Government and WHO.

3.6 PROVISION OF LITERATURE

The provision of HAB related literature to scientist in developing countries has been taken care of by the IOC HAB Centres in Copenhagen, Vigo and through WESTPAC/HAB. A

high number of book grants were offered in 2003-2004 and the most important titles include:

Harmful Algal Management and Mitigation. Hall, S. et al, APEC, 2004

Manual on Harmful Marine Microalgae, G. Hallegreaff et al. (eds.), UNESCO Publishing 2003 and 2004

Molluscan Shellfish Safety, Villalba A. et al, 2003

GEOHAB. Global Ecology and Oceanography of Harmful Algal Blooms, Implementation Plan. P. Glibert and G. Pitcher (eds.) SCOR and IOC, 2003

Proceedings of the Ninth International Conference on Harmful Algae Blooms, G. Hallegraeff *et al.* (eds.), 2002

Floraciones Algales Nocivas en el Cono Sur Americano, E.A. Sar *et al.* (eds.), 2002.

Monitoring and Management Strategies for Harmful Algal Blooms in Coastal Waters, D. M. Anderson *et a* (eds.) 2001

GEOHAB. Global Ecology and Oceanography of Harmful Algal Blooms, Science Plan. P. Glibert and G. Pitcher (eds.) SCOR and IOC, 2001

Technical Guide for Modern Dinoflagellate Cyst Study, Matsuoka, K., and Fukuyo, Y. 2000

Algae, Graham, L.E., Wilcox, L.W. 2000

Toxic Cyanobacteria in Water, Chorus, I., and Bartram, J., WHO, 1999

Proceedings of the Seventh International Conference on Toxic Phytoplankton, T. Yasumoto et al. (eds.), 1996

Proceedings of the Eighth International Conference on Harmful Algae, B. Reguera et al. (eds.), 1997

Biology, Epidemiology and Management of *Pyrodinium* Red Tides, Proceedings of the Management and Training Workshop, Brunei Darussalam, 23-30 May 1989

The Genus *Alexandrium* Halim, E. Balech, 1994

Marine Phytoplankton, C. Tomas et al. (eds.), 1997

The Biology of Dinoflagellates, F.J.R. Taylor (ed.), 1987

Physiological Ecology of Harmful Algal Blooms, NATO ASI Series, D. Anderson et al. (eds.), 1998

Algal Toxins in Seafood and Drinking Water, I.Falconer (ed.), 1993

Phytoplankton Pigments in Oceanography, S.W. Jeffrey et al. (eds.), 1997

Proceedings of the First International Congress on Toxic Cyanobacteria, Ø. Moestrup et al. (eds.), 1996

3.7 HARMFUL ALGAL EVENT DATA BASE, HAE-DAT

The ICES-IOC Working Group on Harmful Algal Bloom Dynamics has recorded events related with harmful microalgae on a regular basis since 1987. Since then, a National Report form has been implemented by national representatives in order to organize, on an annual basis, data on harmful algae events in different countries.

Increasing interest in data analysis led to a proposal in 1997 to create a computer data base of these events: the Harmful Algae Event Data Base (HAE-DAT). The main purpose of creating HAE-DAT is to develop a structure for data storage that allows easy integration of data, efficient search tools, and the possibility of conducting powerful data analysis.

Several steps were necessary to develop HAE-DAT. As a first step, an analysis of National Reports was conducted to understand the nature of the information included. Although information was clearly divided in different areas, it was demonstrated that the subdivision of information had to be more detailed. For that purpose a new Harmful Event Data Input Form has been proposed to improve the flow of information as well as to allow data analysis.

This new format has been designed to respond to the interests of managers and scientists working in the different areas related with harmful algae. It is also intended to facilitate the task of professionals reporting the events. The information requested will be introduced in "boxes" that are clearly defined. In addition, it is possible to complement the report with additional information in the form of text, files (Graphs, maps, etc.) and web-links.

The HAE-DAT input form, together with instructions and a practical example are available at the IOC web site: http://ioc.unesco.org/hab/data33.htm

HAE-DAT has been available at its website since October 1999. It runs currently under Microsoft Access and must be downloaded from the Internet. The work of transforming HAE-DAT into a appropriate software platform has taken much longer than anticipated. This is due to resource and manpower constraints at the IOC secretariat. The new platform will allow on-line searches and inputs, and most importantly a direct coupling between records and maps, which so far have been two separate products. The objective is to have HAE-DAT in a GIS type system. However, this requires resources and expertise not at present available in the IOC Secretariat. Pending clarification of extra-budgetary funds available in 2005, it is the plan to complete the work soonest.

There is an open invitation and encouragement to countries and regions to joint HAE-DAT. In October 2004 the Pacific International Council for Exploration of the Sea (PICES) formally joined HAE-DAT and will systematically submit records as from 2004. PICES has committed to enter records prior to 2004. The two IOC regional groups, FANSA and ANCA, have specifically been encouraged to join HAE-DAT in an attempt to expand HAE-DAT and make it the unifying global data base on harmful algal events. Other countries from the Mediterranean area, as Italy and Greece, as well as the members of the Harmful Algae of North Africa Network, has also agreed to join HAE-DAT.

3.8 IOC HAB INTERNET SITE

The IOC HAB site at ioc.unesco.org/hab contains information on all ongoing activities under the IOC HAB Programme, including various data bases, access to publications, announcements etc. The site had an average of 40 visits/week day in the period June 2002-February 2005 (Netstat). This only includes visitors that entered through the default page. The GEOHAB site (www.geohab.info) is monitored separately and had an average of 10 visits per day in the same period. The sites are maintained by the IOC HAB Centre in Copenhagen, and are updated on daily to weekly basis. Of the regional groups WESTPAC/HAB has a portal for the South East Asia and FANSA is 2004-2005 building the FANSA Portal. HANA has similar plans for 2005-2006.

4. TRAINING

4.1 HAB TRAINING AND CAPACITY BUILDING PROGRAMME

The HAB Training and Capacity Enhancement Programme as adopted by IPHAB-VI is composed of 4 main modules on species identification, toxin chemistry and toxicology, design of monitoring, and management. See Document IOC/IPHAB-VII/Inf.6 for an overview of courses implemented between 1993 and 2004.

Courses implemented 2003-:

4.1.1. IOC Training Course on Qualitative and Quantitative Determination of Algal Toxins. Wattenmeerstation Sylt, Alfred Wegener Institut für Polar- und Meeresforschung, List/Sylt, Germany, 22 February to 3 March 2005.

4.1.2 IOC Advanced Training Course on the Biology and Taxonomy of Harmful Marine Microplankton, IOC Science and Communication Centre on Harmful Algae Copenhagen, University of Copenhagen, Denmark, 19-31 July 2004.

4.1.3. IOC Distant Learning Course in Harmful Algae for South East Asia. Universities of the Philippines, Tokyo, Tasmania, and Copenhagen and the IOC Science and Communication Centre on Harmful Algae Copenhagen, September-December 2003. Final workshop Hue University of Sciences, 6-13 January 2004

4.1.4. IOC Distant Learning Course in Harmful Algae for South East Asia. Universities of the Philippines, Tokyo, Tasmania, and Copenhagen and the IOC Science and Communication Centre on Harmful Algae Copenhagen, January-May 2003. Final workshop University of the Philippines, Manila 5-12 August 2003

4.1.5. IOC-IEO Science and Communication Centre on Harmful Algae. Instituto Español de Oceanografía, Vigo (Spain), 2003-2004: Individual training visits under the supervision of one expert from a Galician Institution.

4.1.6. The 7th IOC/WESTPAC Training Course on Species Identification of Harmful Microalgae, March 17-22, 2003, Sabah, Malaysia.

4.1.7. IOC-NAUTA-COPEMED Course on Identification of Harmful Algal Blooms, INSTM, Tunisia, 1-10 December 2003.

4.1.8. The 6th IOC/WESTPAC Training Course on Advanced Techniques on Characterization of Harmful Algal Species , May 13-18 2002, Manila, Philippines

4.2 PLANNED COURSES:

4.2.1 Taxonomy of Harmful Microalgae, Faculdade Ciências Universidade Lisboa (Portugal), Facultad de Ciencias Naturales y Museo (Argentina), Fundaçãoo Universidade Federal do Rio Grande (Brazil), Instituto de Botânica (Brazil), Instituto Nacional de Investigación y Desarrollo Pesquero (Argentina), Universidade de Taubaté (Brazil), and the IOC Science and Communication Centre on Harmful Algae, University of Copenhagen (Denmark). Co-organised with the Brazilian Phycological Society (Sociedade Brasileira de Ficologia). March May 2005, microscope course 16-27 May 2005 in Brazil.

4.2.2. IOC-IEO Science and Communication Centre on Harmful Algae. Instituto Español de Oceanografía, Vigo (Spain), 2005-2006: Individual training visits under the supervision of one expert from a Galician Institution.

4.2.3. IOC Advanced Training Course on the Biology and Taxonomy of Harmful Marine Microplankton, IOC Science and Communication Centre on Harmful Algae Copenhagen, University of Copenhagen, Denmark, June 2006 and August 2007.

4.2.4 WESTPAC/HAB Training Through Research Project 2006-2007.

4.2.5. Regional Course for the Black Sea/Aegean Sea (Turkey)
4.2.6 Regional Course for the Indian Ocean (India), Central Indian Ocean and Gulf region proposed.

4.2.7 Regional Course for North Africa ((HANA) .

4.3 WORLD SUMMIT ON SUSTAINABLE DEVELOPMENT PARTNERSHIP INITIATIVE

As part of the World Summit on Sustainable Development, Johannesburg 2002, so called 'partnership initiatives' have been established. One of these is a project on 'Application of Nuclear and non Nuclear Techniques for the Monitoring and Management of Harmful Algal Blooms in the Benguela Coastal Region'. This capacity building project will be implemented from 1 January 2003 to 31 December 2005. The partners are the governments of Angola, Namibia, South Africa, and the International Atomic Energy Agency (IAEA), IOCand AFRA.

The objectives are (i) to transfer identification/quantification capacity for toxic phytoplankton, the receptor binding assay (RBA), and related assays technologies for algal toxins, and (ii), to establish the capability to monitor toxic phytoplankton and to perform receptor assay methods for algal toxins in the Member States laboratories.

The expected results includes (i) equipped laboratory facilities and trained personnel in toxic phytoplankton identification/quantification & Receptor Binding Assay and related assays in participating Member States;(ii) incorporation of the toxic phytoplankton quantification method and the Receptor Binding Assay technology in national monitoring programmes; (iii) and harmonized approach among national HAB monitoring programmes in the Benguela region. The available resources are US $ 366,000 for laboratory equipment, training and expert services from IAEA and training materials, manuals and guides, lecturers, and technical backstopping from IOC. The capacity building activities that involved IOC were implemented and completed in 2004.

SCIENTIFIC ELEMENTS

5. OCEANOGRAPHY AND ECOLOGY

5.1 ICES-IOC WORKING GROUP ON THE DYNAMICS OF HARMFUL ALGAL BLOOMS- WGHABD

The WGHABD (Chair: Dr J. Martins, Canada) The WGHABD met March 2003 in Aberdeen, Scotland, hosted at the FRS Marine Laboratory. The report is included in Document IOC/IPHAB-VII/Inf.15.

The WGHABD met March 2004 in Corsica, France, hosted at the STARESO Station of University of Liege (Belgium). The Report is included in Document IOC/IPHAB-VII/Inf.15.

The WGHABD will meet April 2005 in Flødevigen, Norway, hosted at the Institute of Marine Research. The Terms of Reference are included in Document IOC/IPHAB-VII/Inf.15.

Of particular importance in 2005 is the organization of a inter-comparison work shop on 'New and Classic Techniques for the Determination of Numerical Abundance and Bio-volume of HAB-species' to be held at the Kristineberg Marine Biological Station, Sweden in August.

5.2 IOC-SCOR INTERNATIONAL SCIENCE PROGRAMME ON THE GLOBAL ECOLOGY AND OCEANOGRAPHY OF HARMFUL ALGAL BLOOMS - GEOHAB

GEOHAB is a plan for co-ordinated scientific research and co-operation to develop international capabilities for assessment, prediction and mitigation**.** The approach of the GEOHAB Programme is comparative, from the cellular to the ecosystem level. GEOHAB fosters research that is interdisciplinary, focusing on the important interactions among biological, chemical, and physical processes. GEOHAB also fosters research that is multifaceted as the problems are complex and interactions and processes occur on a broad range of scales. Finally, GEOHAB research should be international in scope to encompass the global issues of HAB events.

The efforts of the SCOR-IOC Working Group 97 on the Physiological Ecology of Harmful Algal Blooms, resulted in a NATO-SCOR-IOC Advanced Study Institute on the Physiological Ecology of Harmful Algal Blooms, which was held at the Bermuda Biological Station, 27 May-6 June 1996. The deliberations and recommendations of the WG 97, together with the work of the ICES-IOC Working Group on the Dynamics of Harmful Algal Blooms, provided the basis for formulation of Recommendation IPHAB-IV.2 which Recommendation IPHAB-IV.2 instructed the IOC to develop an international science programme on the Global Ecology and Oceanography of Harmful Algal Blooms jointly with an appropriate organization. Partnership in the development of the new programme was agreed upon with the Scientific Committee on Oceanic Research (SCOR).

The initial development of GEOHAB received support from IOC, SCOR, The Maj and Tor Nessling Foundation (Finland), US National Aeronautics and Space Administration, US National Oceanic and Atmospheric Administration, US National Science Foundation, and IFREMER (France).

In 2003-2004 the SSC organised three open science meetings (OSM) to involve the scientific community in the detailed planning of GEOHAB Core Research. For details see the documents listed below.

For the 2005 composition of the Scientific Steering Committee and its ToR please see Document IOC/IPHAB-VII/Inf.12.

A major issue is the ongoing search for a home for the GEOHAB International Programme Office (IPO).

A considerable amount of work was mad to try to place the GEOHAB IPO in Bergen, Norway after the Joint Global Ocean Flux Study (JGOFS) IPO located there closed. IOC and SCOR met with staff and officials at the University of Bergen and communicated with the Research Council of Norway about funding. There was considerable interest by the university,

which offered to pay for an interim executive officer for the IPO for several months, but the Research Council eventually declined funding. We briefly explored having Norway, Denmark, Finland, and Sweden co-fund the IPO in Bergen (about US$50,000 each), but after informal contacts to relevant funding agencies through our contact persons it was concluded that it was not likely that they were interested in providing so much funding for an IPO located in another country. Also, the possibility of expanding the IOC Centre in Copenhagen to include the IPO has been explored, but the required funding has not been found so far.

Latest SCOR and IOC are investigating an indication of interest from China to host the GEOHAB IPO. However, the issue of the salary of a foreign executive officer remains unresolved. It has also been investigated to locating a full or partial GEOHAB IPO together with GLOBEC IPO in Plymouth or with the IMBER IPO in Brest (France), but this solution has not show feasible either. If a permanent IPO in one location is not an option, there is another model used by some other projects, that it, to split the costs of the IPO among nations participating in the project and rotate the office among sponsoring nations, as done by IMAGES and INTERRIDGE where national contributions typically range between 5 and 25.000 USD /year.

GEOHAB Science Plan, see GEOHAB Report No. 1

GEOHAB Implementation Plan, see GEOHAB Report No. 2.

GEOHAB Open Science Meeting on Upwelling Systems see GEOHAB Report No. 3

GEOHAB Open Science Meeting on Fjords and Coastal Embayments see GEOHAB Report No. 4 (in prep).

GEOHAB Open Science Meeting on HAB's in Eutrophied Systems see GEOHAB Report No. 5 (in prep).

Specifications of GEOHAB IPO requirements see Document IPHAB-VII/Inf. 13.

5.3 ICES/IOC/SCOR STUDY GROUP ON GEOHAB IMPLEMENTATION IN THE BALTIC SEA

The Study Group met first time in Dublin, Ireland, from 12 – 13 March 2001 under the chairmanship of Dr K Kononen (Finland), to create a plan for the implementation of GEOHAB in the Baltic Sea, and to plan coordinated multi-ship field experiments in support of GEOHAB in the Baltic. Next meeting of the Study Group was in Stockholm, Sweden, 24 November 2001, where the terms of reference were to (i) continue the planning of GEOHAB implementation in the Baltic, (ii) plan a meeting combined with an open workshop for the spring 2002 to discuss and finally develop the Baltic project, including the co-ordination of field experiments to be implemented 2002-06; (iii) prepare application to the GEOHAB SSC for endorsement of the Baltic project and the planned workshop; (iv) and to estimate the biomass and impacts of the *cyanobacteria* blooms in the Baltic Sea, and assess the ecosystem effects of this. As from 2003 Prof. Markku Viitasalo from the Finnish Marine Institute (markku.viitasalo@fimr.fi) has taken over as chair of the study group.

The Study group will meet 7-8 April 2005 at Flødevigen Marine Station, Institute of Marine Research, Norway, to report and discuss new findings on HABs and HAB modelling in the Baltic; report observations on 2004 distribution of HABs in the Baltic; prepare the HAEDAT reports for ICES use; update the checklist of the harmful species of the Baltic Sea; compile existing observations on concentrations of nodularin and other HAB toxins in different compartments of the Baltic ecosystem; summarize observed toxicological effects in the Baltic biota; review existing information on long term trends in HABs in the Baltic; continue planning

an open sea field study and workshop for summer 2005; review and update the GEOHAB implementation plan for the Baltic.

The reports of the SGGIB are available as Document IOC/IPHAB-VII/Inf.14.

5.4 ICES/IOC/IMO WORKING GROUP ON BALLAST AND OTHER SHIP VECTORS

IPHAB-II requested the IPHAB Chair and the Programme Office to further investigate the possibilities and need for interaction with the activities of IMO and ICES. IPHAB-III adopted Recommendation IPHAB-III.3 on a Working Group on Transfer of Phytoplankton by Ballast of Ships. In response to this recommendation a Joint ICES-IOC-IMO Study Group on Ballast Water and Sediments was established. The ICES/IOC/IMO Study Group on Ballast Water and Sediments [SGBWS] was later been renamed the "ICES/IOC/IMO Study Group on Ballast and Other Ship Vectors [SGBOSV] and is now the ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors (WGBOSV).

WGBOSV will in 2005 meet in Norway 14-18 March. The Chair is Dr. Stephan Gollasch (GoConsult), Bahrenfelder Str. 73 a, 22765 Hamburg, Germany, E-mail: SGollasch@aol.com.

WGBOSV reports are available at http://www.ices.dk/reports/ and as Document IOC/IPHAB-VII/Inf.16

The IPHAB Paper prepared, as a follow-up to IPHAB-VI is available as Document IOC/IPHAB-VII/Inf.17

6. TAXONOMY AND GENETICS

6.1 IPHAB TASK TEAM ON ALGAL TAXONOMY

The Task Team was established through Resolution IPHAB-II.1. The Terms of Reference were updated by IPHAB-III, IV, and VI. Chair is Prof. O. Moestrup. The Progress Report will be submitted to IPHAB-VII. Document IOC/IPHAB-VII/Inf.15.

7. TOXICOLOGY AND TOXIN CHEMISTRY

7.1 IPHAB TASK TEAM ON AQUATIC BIOTOXINS

The IPHAB Task Team on Biotoxin Regulation was shortly after IPHAB-VI merged with a WHO and FAO initiative to provide scientific advice to the Codex Committee of Fish and Fisheries products (CCFFP) . The Chair of the IPHAB Task Team was assigned to chair a joint FAO/IOC/WHO Workshop held in Dublin in April 2003 and subsequently one of three working groups at a Joint FAO/IOC/WHO *ad hoc* Expert Consultation in Oslo to address the following specific questions posed by the CCFFP:

- Provide scientific advice to the CCFFP to enable the establishment of maximum levels in shellfish for shellfish toxins;
- Provide guidance on methods of analysis for each toxin group
- Provide guidance on monitoring and management of biotoxin forming phytoplankton and bivalve molluscs.

In relation to the establishment of maximum levels, the Expert Consultation categorised the biotoxins into 8 distinct groups based on chemical structure. Risk assessments were then

carried out, including hazard identification, hazard characterisation, exposure assessment and risk characterisation. Based on the available information, the Expert Consultation derived provisional acute reference doses for 4 of the toxin groups – azaspiracid, okadaic acid, saxitoxin, yessotoxin and domoic acid. The database provided insufficient data to establish doses for brevetoxins, cyclic imines and pectenotoxins.

In relation to methods of analysis, the Expert Consultation made recommendations for each of the respective toxin groups. Most methods currently available do not strictly meet the criteria for CODEX Type II or III methods. The implementation of a marker compound concept to address complex toxon groups was recommended.

In relation to monitoring and management, the Expert Consultation agreed that decisions on ther safety of shellfish can only be based on the direct measurement of toxins in shellfish flesh. However, an integrated shellfish and micro-algal monitoring programme is highly recommended to provide expanded management capability and enhanced consumer protection. For early warning purposes, it is recommended to have a programme to monitor growing areas for species of toxin-producing micro-algae. It was also recommended that sample size and sampling frequency be adequate to address spatio-temporal changes in micro-algae and toxins in shellfish.

The Expert Consultation also mage recommendations on the management of new toxins and new analogues/metabolites of existing toxins.

The detailed Report is found in Document IOC/IPHAB-VII/Inf.19.

OPERATIONAL ELEMENTS

8. MONITORING

8.1 HARMFUL ALGAE MANAGEMENT AND MITIGATION

In 2004 APEC, with the co-sponsorship of SOA (China), IOC, International Ocean Institute, Qingdao Municipal Government and the WHO, published *Harmful Algae Management and Mitigation*, by S. Hall, S. Etheridge. D. M. Anderson, J. Kleindienst, M. Zhu and Y. Zou (eds.) . APEC Publication # 204-MR-04.2, the 268-page report provides compilation of papers developed from the first two conferences on Harmful Algae Management and Mitigation, held 10-14 May 1999 in Subic Bay, Philippines, and 12-16 November 2001 in Qingdao, China. The publication can be ordered from APEC and from the IOC Science and Communication Centres on Harmful Algae.

8.2 IOC-ICES META DATA BASE ON DESIGN AND IMPLEMENTATION OF HAB MONITORING PROGRAMMES: MON-DAT

The MON-DAT meta-data-base contains information on the design and implementation of harmful algae monitoring and management systems from all over the world. MON-DAT includes data from countries that have responded to the questionnaire circulated by the Secretariat.

The initial compilation of information was carried out within the ICES-IOC Working Group on the Dynamics of Harmful Algal Blooms, and the establishment of the database was

made possible through the financial support of the Danish agency for development assistance, DANIDA. The first survey for information on HAB monitoring was made in 1995/96 and a summary of the result was published as IOC Technical Report No. 44. The base was updated in 2000/01.

MAN-DAT should be updated in 2005 pending availability of resources. It is the intention to integrate MON-DAT with HAE-DAT as to have one comprehensive data source for information on harmful algal events, geographical distribution and descriptions of the monitoring systems that generate the event data.

MON-DAT is available at http://ioc.unesco.org/hab/data2.htm#1 where the questionnaire for up dating can also be found.

8.3 WHO GUIDELINES FOR DESALINATION OF SEAWATER

Desalination of sea water as a source of drinking water is a growing industry and WHO and UNEP have taken initiative to assess the risks of transfer from seawater to drinking water of various contaminants, one group being bio-toxins of algal origin. The IOC Secretariat took part in a WHO/UNEP/ROPME Consultation on Planning the preparation of water quality guidelines for desalination, which took place in Manama, Bahrain from 28-31 May 2001. The 2001 consultation resulted in the establishment of a Technical Committee for the WHO Guidance on Desalination for Safe Water Supply: Health and Environmental Aspects Applicable to Desalination. The Committee held its first meeting in Irvine, California USA from 22-24 October, 2004.

The Committee Report is available as Document IOC/IPHAB-VII/Inf.20.

8.4 IMPLEMENTATION OF HAB MONITORING WITHIN THE GLOBAL OCEAN OBSERVING SYSTEM (GOOS)

Through Recommendation IPHAB-VI.3 IPHAB acknowledged that the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) is the vehicle for the collection, archiving, distribution and utilization of ocean and meteorological data, and that their Terms of Reference allow for the coastal module of GOOS to include non-physical variables. IPHAB therefore recommended that it cooperate with JCOMM to develop effective systems for the monitoring of harmful species at the appropriate functional level, which would allow detection of changes in marine systems to be made in order to understand and manage coastal ecosystems.

The Strategic Implementation Plan for the Coastal Module of the Global Ocean Observing System has been developed and will this year be presented to GOOS Steering Committee of I-GOOS for endorsement. The vision for the implementation of the coastal module of GOOS is that it will happen through GOOS Regional Alliances [GRA], National GOOS programmes, global elements (e.g. GLOSS, GCRMN etc) and existing global programmes (e.g. LOICZ, GLOBEC, IMBER, GEOHAB). The JCOMM Management Committee is presently discussing how JCOMM can begin global implementation of non-physical variables under GOOS.

JCOMM is proposing as the next step to establish an ad hoc joint JCOMM-POCO Task Team to work in collaboration with GOOS Regional Alliances and National GOOS Programmes (perhaps through a global body of GOOS Regional Alliances and National GOOS Programmes

such as the GOOS Regional Forum or its Council) to establish requirements and mechanisms for implementation of the Global Coastal Network [GCN].

JCOMM concluded that it was premature to act until the GRAs have reacted to the draft implementation plan. Also, the variables required by the coastal module of GOOS have not been established firmly yet nor have they been prioritised and a COOP follow-on panel (tentatively named Panel for Coastal Observations - POCO) has not been formed yet. When these actions are taken, it will be feasible for JCOMM to work in collaboration with GRAs and National GOOS programmes toward implementation of the GCN.

JCOMM has noted that, as with the global (basin-scale) module of GOOS, the specifications of techniques and protocols for the observations, data management and products should be demonstrated by pilot projects. Such projects might be carried out independently by the GRAs or jointly with JCOMM.

Document IOC/IPHAB-VII/Inf.21.

8.5 HABWATCH

IOC co-sponsored a GEOHAB endorsed 'Workshop on real-time coastal observing systems for ecosystem dynamics and harmful algal blooms', in Villefranche, France, 11-21 June 2003. The proceedings are available via the IOC HAB web site, including recorded oral presentations, posters, and tutorials. Furthermore, the material is now edited into a manuscript for a new title in the UNESCO series, Monographs on oceanographic methodology. The volume is expected to be published early 2006.

8.6 FORUM FOR HAB MONITORING

At the XIth International Conference on Harmful Algae, Cape Town South Africa, November 14th-19th 2004, a round table discussion was held on 'Detection and Monitoring of HABs'.

A summary of the round table discussions and recommendations is available as Document IOC/IPHAB-VII/Inf.22

The summary document gives after a brief description of the strategy of the design, implementation and role of HAB monitoring in management programmes, a discussion of the development of innovative methodologies and their potential for implementation into HAB monitoring programmes. This includes innovative approaches for the qualitative and quantitative analyses of HAB species, such as molecular methods (real-time PCR assays, FISH automated protocols, DNA – Micro-arrays), remote-sensing, *in situ* optical buoys, and HAB maps. An issue that was emphasized by the Round Table was that monitoring and research programmes should have a mutually symbiotic role. Research activity primarily serves to develop methodologies and systems, derive models and ask questions. Monitoring programmes can benefit from these innovations and developments, but also often provides a historical dataset and validation for research applications.

The co-conveners of the Round Table, Antonella Penna (Italy), Joe Silke (Ireland), Jorge Diogene (Spain), have on behalf of the participants passed the conclusions of the Round Table to IPHAB-VII and requests the assistance of IPHAB to " *organize a working-group that will establish a forum for the end users and research institutions on the relevant advancements of practical applications of these innovative techniques and to keep monitoring programme*

managers informed on selected innovative technologies implemented with monitoring situations".

APPENDICE I

Resources available to the IOC for development and implementation Of the IOC harmful algal bloom programme 2003-2004

IOC-UNESCO REGULAR PROGRAMME	US Dollars
IOC HAB programme Regular Budget	124.000
UNESCO Cross Cutting Project, HABSEA and FANSA Portals	136.000
EXTRA-BUDGETARY CONTRIBUTIONS TO THE IOC:	
Denmark: -DANIDA:IOC Science and Communication Centre on Harmful Algae, activities and cost of one IOC Staff:	340.000
Japan: -WESTPAC/HAB TTR project:	34.000
Spain: -Spanish Institute of Oceanography: Support for the IOC Science and Communication Centre at the Oceanographic Centre in Vigo, Spain 2003-2004	73.000
USA: Contribution 2004 for implementation of activities:	24.000
SPONSORSHIP OF ACTIVITIES AND FUNDS ADMINISTERED AT THE SCIENCE AND COMMUNICATION CENTRES:	
Denmark: -National Environmental Research Institute, Support for the IOC Science and Communication Centre 2003 contribution: -DANIDA: Survey of Potentially Harmful Algae in Vietnamese Waters (training through research and provision of equipment) 2002-2004. University of Copenhagen: IOC Science and Communication Centre on Harmful Algae, Copenhagen, staff, operation and activities:	8.000 609.000 121.000
Japan: WESTPAC/HAB Training Courses and TTR:	21.000
Spain: -Spanish Institute of Oceanography: IOC-IEO Science and Communication Centre on Harmful Algae, Vigo, 2 staff, operation and activities: -AECI (Spanish Agency for International Cooperation), Scholarships for participants in training activities at Vigo Centre 2003-2004: -AECI (Spanish Agency for International Cooperation), Scholarships for the participants in training activity for North Africa.	247.000 41.500 13.250 1.325
FAO-COPEMED: Support for training activity for North Africa (local expenses) USA: National Science Foundation: support for GEOHAB SSC via SCOR France: Ifremer support for GEOHAB SSC	59.300 15.000

APPENDICE II

Implementation of IPHAB-VI Resolutions and Recommendations

Code	Title	Implementation
Resolution IPHAB-VI.1	Task Team on Algal Taxonomy	Partly implemented: Taxonomic Reference List maintained and updated,; images not added, guidelines not provided
Resolution IPHAB-VI.2	Task Team on Biotoxin Regulation	Implemented
Resolution IPHAB-VI.3	IOC HAB Training and Capacity Building Programme	Implemented- ongoing
Resolution IPHAB-VI.4	IPHAB operation regarding GEOHAB	Implemented?
Recommendation IPHAB-VI.1	Regional HABP Development	Implemented for North Africa. No major progress re Benguela and the Indian Ocean
Recommendation IPHAB-VI.2	Development of GEOHAB	No interaction with GE-BCDMEP. Some interaction with National Representatives re GEOHAB IPO.
Recommendation IPHAB-VI.3	Implementation of HAB Monitoring within the Global Ocean Observing System	Implemented (partly)
Recommendation IPHAB-VI.4	ICES-IOC Working Group on the Dynamics of Harmful Algal Blooms	Implemented. WGHABD continued, workshop to be implemented 2005
Recommendation IPHAB-VI.5	Long Term Effects of Human Exposure to Low Concentrations of Algal Toxins	Literature review completed. WG not established,
Recommendation IPHAB-VI.6	HABP Publications	Partly implemented. Sponsorships continued.
Recommendation IPHAB-VI.7	HABP Emergency Response and Development of Institutional Capacity	Not implemented.

Code	Title	Implementation
Recommendation IPHAB-VI.8	Ciguatera Fish Poisoning	Not implemented re WESTPAC/HAB as no ToR for WESTPAC/HAB yet. To be included in ANCA ToR.

ANNEX IX

REPORT ON WESTPAC/HAB 2003–2004

Report on IOC/WESTPAC (to be presented for approval to the WESTPAC Session May 2005)

1. HAB OCCURRENCE IN WESTPAC

Recent HAB condition in WESTPAC region is characterized as "Increase in frequency, variety of types, geographical distribution and severity". We notice the occurrence of ciguatera in the Philippines, cyanobacterial poisoning in the Philippines, *Phaeocystis* in China and Vietnam, *Heterocapsa* in Japan and Hong Kong (China) and *Cochlodinium* in Japan, Korea and China, Malaysia and Indonesia.

Region shares same HAB problem in areas having similar environmental condition by similar mechanism (eutrophication, upwelling, organism transport, etc.)

One of the most serious problems is lack (or insufficiency) of monitoring systems in each country to protect peoples. Development of fisheries using coastal waters is accelerating to meet growing population and society. It is obvious that Asian countries need an assistnace of IOC to establish management system of HABs.

2. TOR OF WESTPAC-HAB PROGRAMME FOR 2003-05 PROPOSED AT WESTPAC-5 (AUSTRALIA 2002)

1. To organize strategic planning workshops (Leader: Y. Fukuyo)
2. To conduct one Training Course (TC) in each year (Leader: Dr. Ann Anton (Malaysia))
3. To implement HABSEA Portal (Leader: Dr. Rhodora Azanza (Philippines))
4. To implement a project entitled "Red tide Monitoring using Satellite Image" (Leader: Dr. Ken Furuya (Japan))
5. To publish HAB reference materials in CD (Leader: Y. Fukuyo)
6. To establish a network of national focal points (Leader: Y. Fukuyo)
7. To disseminate activities of GEOHAB (Leader: Y. Fukuyo)
8. To seek interaction with other Projects on HAB (Leader: Y. Fukuyo)

3. PAST AND FUTURE ACTIVITIES

1. STRATEGIC PLANNING WORKSHOPS

Two meetings were held during the 10th International Conference on Harmful Microalgae (October 2002, USA) and DINO 7 Conference (September 2003, Nagasaki, Japan) with some leading scientists in the region. The main topic of the discussion is capacity building of the region, especially revision of TC activity.

HAB Programme is waiting for suggestion on reformation of WESTPAC Session to be held in May 2005 in Vietnam. As there is no budget for this project, it is better to work by correspondence through Internet.

2. TC AND TTR

WESTPAC conducted the Seventh Training Course on "Advanced Techniques in Identification of Harmful Microalgae" on 23-30 March 2003 at Kota Kinabalu, Malaysia. The leader was Dr. Ann Anton of Univ. of Malaysia Sabah. There were 8 participants from WESTPAC member countries and additional 8 from Malaysia.

At the WESTPAC-IV Session there was a suggestion from the Chair of WESTPAC, Dr. Keisuke Taira, to reform TC in order to strengthen capacity building of member countries. Therefore HAB Programme reformed and developed the TC to TTR (Training through Research) project. The TTR has three components;

1. Technical standardization meeting / Research planning
2. Cooperative field survey / laboratory analysis
3. Presentation of result at scientific meetings and journals

There is the Executive Committee for TTR, and there are several RGs (Research Groups) for different research subject. As it includes research implementation, WESTPAC should cooperate external funding organization such as ORI-HAB project funded by JSPS (Japan Society for Promotion of Science).

2.1 TTR RG "DINOFLAGELLATE CYST MAPPING"

The Technical Standardization and Planning Meeting for TTR Project "Dinoflagellate Cyst Mapping" were held in Nagasaki, Japan, 21-27 August 2004 with support from IOC/WESTPAC, JSPS of Japan, Nagasaki University and University of Tokyo. There are 16 participants from Korea, China, Vietnam, Philippines, Thailand, Malaysia, Indonesia, and Japan.

The RG aims to clarify mechanisms and expansion routes of harmful microalgae such as *Pyrodinium*, resting cysts settled on and embedded in sediment is observed on its vertical distribution together with their age (years after sedimentation). The activities planned at the meeting are;

1st Cooperative Field Survey at Kota Kinabalu (February 2005)

2nd Cooperative Field Survey in the Philippines (August 2005)

3rd Cooperative Field Survey in the Philippines (2005)

Presentation at JSPS International Symposium (Tokyo 2005), etc.

2.2. TTR RG "HA CHARACTERIZATION" (PROPER TITLE WILL BE DECIDED BY THE RG)

The Technical Standardization and Planning Meeting will be held in Tokyo or Tsukuba, Japan, October 2005, using support from IOC/WESTPAC, JSPS of Japan and University of Tokyo. There will be about 10 participants from the region. Possibility of participation of scientists from outside of the region such as India is sought by the Programme Coordinator.

The RG aims to compare biological characters of harmful algae blooming at various places in WESTPAC, morphological and genetic features will be compared. The results will be

used to clarify recurrence and expansion mechanism of harmful microalgae such as *Pyrodinium*. Details of TORs will be decided by the TG after its establishment.

The first cooperative laboratory work is expected to be held in 2006 using support of JSPS of Japan, University of Tokyo and other potential donors. The results achieved by the RG are expected to be presented at JSPS International Symposium (2007) and other opportunities with support form JSPS of Japan, University of Tokyo and other donors.

2.3 TTR RG ON TOXICOLOGY WILL BE ORGANIZED AS THE THIRD GROUP OF TTR.

3. HABSEA PORTAL (PROJECT OF IP-HAB FOR 2002-2003) (PLEASE REFER IOC/IPHAB-VII/INF.6)

Establishment of Portal site was completed (http://www.portal.unesco.org/habsea). But maintenance and development of contents of the site have often encountered technical difficulty. Requests of emendation and addition of data from editors were not easily appeared in the sites. Therefore there is discussion for establishment of another Portal site in WESTPAC or other sites to make, aiming transfer the contents to the original site after completion.

4. RED TIDE MONITORING USING REMOTE SENSING

It is important for management of HAB problems to detect harmful algal blooms and to transfer its information to countries, which may be affected by the blooms. The project aims to develop capability for detection of red tide using remote sensing tools in WESTPAC Area.

The first planning workshop to create network for information exchange between *in situ* red tide observers and satellite image analysts was held March 2003, Tokyo, Japan.

The second workshop entitled “Remote Sensing for Integrated Costal Area Management” will be held also in Tokyo in March 2005.

5. PUBLISH HAB REFERENCE MATERIALS IN CD

Establishment of mechanism for acquisition of permission from copy-right holders was made by IOC Secretariat.

Printing and distribute CDs to scientists in WESTPAC was planned, but it stopped temporary, mostly because of lack of maintenance of list of distribution points.

6. ESTABLISHMENT OF A NETWORK OF NATIONAL FOCAL POINTS WITH LIST OF SCIENTISTS IN EACH MEMBER COUNTRY

This activity will be continued after consultation of IOC/WESTPAC Secretariat on maintenance of the list.

7. GEOHAB INFORMATION DISSEMINATION

8. INTERACTION WITH OTHER PROJECTS ON HAB

NOWPAP/UNEP (China, Japan, Korea, Russia)
- HAB reference publication database
- Web site on *Cochlodinium*
- International Symposium (June – July 2005)

PICES (China, Japan, Korea, Russia, Canada, USA)
- HAB WG
- Invasive species WG
- Annual meeting (October 2005)

ORI-HAB (Indonesia, Japan, Malaysia, Philippines, Thailand, Vietnam)
- Scientists exchange for field and lab works
- International symposium (August 2005)

DRAFT TOR of WESTPAC-HAB Programme for 2006–07

To be proposed at WESTPAC-VI (Nha Trang, May 2005)

1. To organize strategic planning workshops. Leader: Y. Fukuyo

2. To implement the WESTPAC-HAB TTR Project. Leader: Dr. Rhodora Azanza (University of the Philippines

3. To further develop the HABSEA Portal to be useful to WESTPAC Leader: Dr. Rhodora Azanza (Univ. of Philippines)

4. To develop red tide monitoring network on usage of remote sensing. Leader: Dr. Ken Furuya (Univ. of Tokyo)

5. To publish and distribute HAB reference materials in CD. Leader: Y. Fukuyo

6. To establish a network of national focal points and update a WESTPAC-HAB membership list of scientists and managers in the region. Leader: Y. Fukyo

7. To disseminate activities of GEOHAB. Dr. Ken Furuya (Univ. of Tokyo)

8. To seek interaction with other Projects on HAB and interact with the other IOC regional networks or groups on HAB. Leader: Y. Fukuyo

ANNEX X

IMPLEMENTED CAPACITY ENHANCEMENT ACTIVITES 1993–2004
(for overview, complete details not included)

MODULE: ***TAXONOMY OF HARMFUL MARINE MICROPLANKTON***	**LEVEL no. of part.:**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**NEED IDENTIFIED WHERE:**	**FUNDING IDENTIFIED:** in US $
Course name: IOC-Danida Training Course on the Taxonomy of Harmful Marine Phytoplankton **Organizer:** Prof. O. Moestrup, University of Copenhagen	M.Sc, Ph.D. 15	Global, developing countries	University of Copenhagen, Denmark	16-28 August 1993	HABP Plan, Pilot Course	Danida-IOC-TF: 42K IOC: 10K Total: 52K
Course name: IOC-Danida Training Courses on the Taxonomy and Biology of Harmful Marine Microplankton **Organizer:** IOC Science and Communication Centre on Harmful Algae, (Moestrup, Larsen,Fukuyo, Matzuoka,Enevoldsen	Advan. M.Sc. Ph.D. 15-18	Global, developing countries	University of Copenhagen, Denmark	August **1995** **1996** **1997** **1998** **1999** 2000 2001 2004.	HABP Plan BMTC WS HAB Survey 1st IOC-Danida Training Course. Survey 1999 IPHAB 2003	Danida-IOC-TF: 50 K/course
Course name: MAST-ONR-IOC 6th Advanced Phytoplankton Course **Organizer:** Dr. A. Zingone, Zool. Sta. A. Dorhn, Napoli, Italy	Advan. M.Sc, Ph.D. 20	Global, self paying	Zoological Station Anton Dorhn, Napoli, Italy	24 Sep.-14 Oct. 1995		MAST, ONR

MODULE: ***TAXONOMY OF HARMFUL MARINE MICROPLANKTON***	**LEVEL no. of part.:**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**NEED IDENTIFIED WHERE:**	**FUNDING IDENTIFIED:** in US $
Course name: IOC-SAREC-Danida Training Course on the Taxonomy and Biology of Harmful Marine Microplankton **Organizer:** IOC Science and Communication Centre on Harmful algae, Cph.(Dr. Larsen), Dr. F.R.J. Taylor. Univ. of British Columbia	Basic M.Sc. 15	IOCINCWIO	University of Mauritius	5-14 Feb. 1996	IOCINCWIO-III Implementation Plan	IOC: 30K NAI 4K TEMA 6K SAREC: 20K Danida: printed material, equipment Total: 30K
Course name: IOC-IEO-AECI Training Course on Toxic Phytoplankton **Organizer:** IOC Science and Communication Centre on Harmful Algae, Vigo	M.Sc./ Ph. D 12	Latin America, developing countries	Centro Oceanográfico de Vigo. Instituto Español de Oceanografía, Vigo, Spain	13-28 Feb 1996	IPHAB	IOC:16K AECI:10K IEO: 10K
Course name: IOC/WESTPAC Training Course on Species Identification of Harmful Microalgae **Organizer:** Dr. Yasuwo Fukuyo, Asian Natural Environmental Science Center, the University of Tokyo, Tokyo, Japan	M.Sc./ Ph.D, 10	WESTPAC	Asian Natural Environmental Science Center, the University of Tokyo, Tokyo, Japan	28 February - 8 March, 1997	WESTPAC-HAB	Funded by Japan
Course name: IOC-FURG-DANIDA Training Course on the Biology and Taxonomy of Harmful Marine Microplankton	M.Sc, Ph.D.	South America	University of Rio Grande, Rio Grande,	3-14 March 1997	COI-FANSA	FURG and national Brazillian : 27 K

MODULE: ***TAXONOMY OF HARMFUL MARINE MICROPLANKTON***	**LEVEL no. of part.:**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**NEED IDENTIFIED WHERE:**	**FUNDING IDENTIFIED:** in US $
Organizer: Dr. Clarisse Odebrecht, Ubiversity of Rio Grande (FURG); IOC Science and Commiunication Centre on Harmful Algae, Copenhagen.	20		Brazil			IOC: 8K WESTPAC/ HAB-Japan:4K DANIDA:10 K
Course name: IOC-NorFa Training Course on the Taxonomy and Biology of Harmful Marine Microplankton **Organizer:** IOC Science and Communication Centre on Harmful Algae, Copenhagen	Advanced M.Sc./Ph. D. 18	Baltic Sea	Tvärminne Zoological Station, Finland	16-22 Aug. 1997	NorFa	Nordic Research Academy (NorFa):18K IOC: 2K Total: 20 K
Course name: IOC/WESTPAC Training Course on Species Identification of Harmful Microalgae **Organizer:** Asian Natural Environmental Science Center, the University of Tokyo	M.Sc, Ph.D. 10	WESTPAC	Asian Natural Environmental Science Center, the University of Tokyo, Tokyo, Japan	22-30 Aug. 1997	WESTPAC-HAB	Funded by Japan
Course name: IOC-APEC Training Course on the Indentification and Monitoring Harmful Marine Microplankton **Organizer:** IOC Science and Communication Centre on Harmful Algae, Copenhagen	Basic M.Sc. 12	APEC	University of Copenhagen, Denmark	11-19 Oct. 1997	APEC	APEC: 10K IOC: 10K Self paying participants Danida: printed

MODULE: ***TAXONOMY OF HARMFUL MARINE MICROPLANKTON***	**LEVEL no. of part.:**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**NEED IDENTIFIED WHERE:**	**FUNDING IDENTIFIED:** in US $
						material, equipment
Course name: 7th advanced Phytoplankton Course on Taxonomy and Systematics **Organizer:** Dr. A. Zingone, Zool. Sta. A. Dorhn, Napoli, Italy	Advan. M.Sc, Ph.D. 20	Global, self paying	Stazione Zoologica A. Dohrn di Napoli, Italy	10-30 May 1998		MAST, ONR, IOC-UNESCO
Course name: IOC-NorFa Training Course on the Taxonomy and Biology of Harmful Marine Microplankton **Organizer:** IOC Science and Communication Centre on Harmful Algae, Copenhagen	Advanced M.Sc./Ph. D. 18	Baltic Sea	Vörtsjärv Limnological Station, Estonia	1-9 Sept. 1998	NorFa	Nordic Research Academy (NorFa):18K IOC: 2K Total: 20 K
Course name: IOC-IEO-AECI Training Course on Toxic Microalgae and Marine Phycotoxins **Organizer:** IOC Science and Communication Centre on Harmful Algae, Vigo	M.Sc./ Ph. D 12	Global, developing countries	Centro Oceanográfico de Vigo. Instituto Español de Oceanografía, Vigo, Spain	June 1998 1999 2000 2001	IPHAB	Funded by Spai IOC TF 35K/course
Course name: IOC Distant Learning Course in Harmful Algae for South East Asia.	M.Sc./ Ph. D 18	SE Asia	Universities of the Philippines, Tokyo, Tasmania, and Copenhagen and the IOC Science and	September -December 2003., 6-13 January 2004	IPHAB	UNESCO Cross Cutting Project: 35K

MODULE: ***TAXONOMY OF HARMFUL MARINE MICROPLANKTON***	**LEVEL no. of part.:**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**NEED IDENTIFIED WHERE:**	**FUNDING IDENTIFIED:** in US $
			Communication Centre on Harmful Algae Copenhagen, Final workshop Hue University of Sciences			
Course name: IOC Distant Learning Course in Harmful Algae for South East Asia.	M.Sc./ Ph. D 18	SE Asia	Universities of the Philippines, Tokyo, Tasmania, and Copenhagen and the IOC Science and Communication Centre on Harmful Algae Copenhagen, Final workshop University of the Philippines, Manila	January-May 2003. 5-12 August 2003	IPHAB	UNESCO Cross Cutting Project: 35K

MODULE: ***TOXIN CHEMISTRY AND TOXICOLOGY***	**LEVEL no. of part.:**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**NEED IDENTIFIED WHERE:**	**FUNDING IDENTIFIED:** in US $
Course name: IOC-UNEP-WHO-FAO Training Course on Qualitative and Quantitative Determination of Algal Toxins **Organizer:** Prof. B. Lukas Univ.of Jena,Germany	Advan. M.Sc., Ph.D. 12	Mediterranean, global	Friedrich-Schiller University of Jena, Germany	Oct. 1994	HABP Plan BMTC WS HAB Survey	UNEP: 15K IOC: OSLR 5K TEMA 8K Univ. Jena: equipment + accom. Japan: equipment Total: 45K
Course name: IOC-UNEP-WHO-FAO-Italy Training Course on Toxin Chemistry and Toxicology related to Harmful Algae **Organizer:** Prof. R.D. Loggia, Dr. A. Tubaro	Advan. M.Sc., Ph.D. 10	Developing countries, East Med., Black Sea	University of Trieste	3-12 Sep. 1995	HABP Plan BMTC WS HAB Survey	IOC: 8.4K MAP: 1.6K FAO: 7 K Univ. of Trieste: 22K Japan: equipment Total: 39K
Course name: IOC-AECI-IEO Training Course on Analytical Methods for the Detaection of Marine Toxins **Organizer:** IOC Science and Communication Centre on Harmful Algae Vigo (Reguera)	Basic M.Sc, Ph.D. 10	Latin America	IEO, Vigo, Spain.	25 June-6 July 1997	IOC-FANSA	Funded by Spain IOC TF 36K/course
Course name: IOC-UNEP Training Course on Qualitative and Quantitative Determination of Algal Toxins	Advan. M.Sc., Ph.D.	Global	Friedrich-Schiller University of Jena, Germany	2-12 March 1999	HABP Plan BMTC WS HAB Survey	UNEP: ?K IOC: HAB 8K

MODULE: ***TOXIN CHEMISTRY AND TOXICOLOGY***	**LEVEL no. of part.:**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**NEED IDENTIFIED WHERE:**	**FUNDING IDENTIFIED:** in US $
Organizer: Prof. B. Lukas University of Jena, Germany	12					Univ. Jena: equipment, Total: 40K
Course name: IOC Training Course on Phycotoxins **Organizer**: Dr. Kevin J. James, Director, Ecotoxicology Res. Unit,Chemistry Dept, Cork Inst of Techn., Cork, Ireland	Advan. M.Sc., Ph.D. 14	Global	Cork Institute of Technology, Cork, Ireland	1-14 Sep., 2000	IPHAB	CIT: 13,5K **IOC: 12,5K requested** EU and WHO subject to application
Course name: IOC Training Course on Qualitative and Quantitative Determination of Algal Toxins **Organizer:** Dr. Matlte Elbraechter, Senckenberg Museum, Germany	Advan. M.Sc., Ph.D. 16	Global	Wattenmeerstation Sylt, Alfred Wegener Institut für Polar- und Meeresforschung, List/Sylt, Germany	22 February to 3 March 2005	IPHAB	IOC: HAB 7K German partners: 12K Total: 19K excl airfare for all

MODULE: ***RISK ASSESSMENT, CONTINGENCY PLANNING AND MANAGEMENT OF HARMFUL ALGAL EVENTS***; ***DESIGN AND IMPLEMENTATION OF MONITORING PROGRAMMES***	**LEVEL no. of part.:**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**NEED IDENTIFIED WHERE:**	**FUNDING IDENTIFIED:** in US $
Course name: IOC-Japan Training Workshop on Monitoring of PSP Plankton and Shellfish Toxicity **Organizer:** Dr. Y. Fukuyo, Univ. of Tokyo, Dr. M. Kodama,Kitasato Univ	Basic, M.Sc., Ph.D. 15	WESTPAC	Kitasato University	17-21 July 1995	HABP Plan BMTC WS HAB Survey WESTPAC WS	IOC: 11K Japan: 30K Kitasato Univ: 5K Total 46K
Course name: IOC-APEC Symposium: Harmful Algal Mmanagement **Organizer:** IPHAB Task Team and APEC	Managers, Administrators, Scientists 40-60	Global	Subic Bay, Philippines	9-14 May 1999	HABP Plan, BMTC WS,	Danida funds for prep. of WS: 15K IOC: 15K APEC : remainder 30K
Course name: VI IOC-AECI-IEO Training Course on Toxic Phytoplankton and Marine Phycotoxins: Monitoring programmes on Toxic Phytoplankton and Marine Phycotoxins according to European Union Directives	Advanced 10	Latin America	IOC-IEO Science and communication Centre on Harmful Algae. Instituto Español de Oceanografía, Vigo, Spain.	10-26 June, 2002.	IPHAB	25K Spain TF Spain: 8K AECI: 7K IEO: 10K

MODULE: ***THEME WORKSHOPS, AND REGIONAL INTERDISCIPLINARY WORKSHOPS***	**LEVEL no. of part.:**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**NEED IDENTIFIED WHERE:**	**FUNDING IDENTIFIED:** in US $
Course name: WESTPAC - LIPI - P30 Seminar on HAB **Organizer:** Mr. D.J. Praseno, P30 LIPI	Basic, Admin.and Scientists 30	WESTPAC	Research and Development Centre for Oceanology, LIPI, Indonesia.	8 Nov. 1993	WESTPAC-II	Japan: 5K Indonesia: 3K Total: 8K
Course name: WESTPAC - China Workshop on HAB **Organizer:** Dr. Qi Yuzao, Jinan University	Basic M.Sc. 10	WESTPAC	Guangzhou, China	21-26 Nov. 1993	WESTPAC-II	Japan: 5K China: 3K Total: 8K
Course name: WESTPAC - PAMS - Thailand Workshop on HAB **Organizer:** Dr. R.A. Corrales, Univ. of the Philippines, Dr. A. Marasigan, Univ. of the Phil. in the Visayas.	Basi, admin., tech., scientists 20	WESTPAC	Iloilo, Philippines	May 1994	WESTPAC-II	Japan: 3K Indonesia: 1K CIDA: ?K
Workshop name: IOC Regional Science Planning Workshop on Harmful Algal Blooms **Organizer:** Dr. Silvia Mendez, INAPE, Uruguay	M.Sc., Ph.D. 22	Scientists South America	INAPE, Montevideo, Uruguay	May 1994	IPHAB-II	IOC: MTD 4K Total: 4K
Workshop name: Second IOC Regional Science Planning Workshop on Harmful Algal Blooms **Organizer:** Dr. Jose I. Carreto, INIDEP, Argentina	M.Sc., Ph.D.	Scientists South America	INIDEP, Mar del Plata, Argentina	Oct. 1995	1st Workshop	IOC: 10K

MODULE: ***THEME WORKSHOPS, AND REGIONAL INTERDISCIPLINARY WORKSHOPS***	**LEVEL no. of part.:**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**NEED IDENTIFIED WHERE:**	**FUNDING IDENTIFIED:** in US $
Workshop name: Third IOC Regional Science Planning Workshop on Harmful Algal Blooms (COI-FANSA-III) **Organizer:** Leonardo Guzman	M.Sc., Ph.D.	Scientists South America	Instituto Fomen Pesquero, Puenta Aremas, Chile	28-30 July 1997	2nd workshop	IOC
Course name: International Seminar on Red Tides, risks for human health and development **Organizer:** Raul Koch	M.Sc., Ph.D.	Scientists South America	Puerto Varas, Xa Region, Chile	3-5 August 1999	IOC FANSA	Health Ministry, Regional Government, IOC
Course name: Regional S-American Course on HAB, metodologies for marine biotoxins **Organizer:** Karim Keisser	M.Sc., Ph.D.	Scientists South America	Public Health Institute, Santiago, Chile	8-12 November 1999	III IOC FANSA	FURG IOC Ministry of Sciemce and Technology
Course name: IV Regional Working Meeting on Harmful Algae Blooms in S-America (COI/FANSA) **Organizer:** Virginia Garcia	M.Sc., Ph.D.	Scientists South America	FURG, Rio Grande University, Brazil	Jan. 2000	III IOC FANSA	IOC 10 K + local sponsorship
Course name: WESTPAC-LIPI-P30 Red Tide training CourseCanada Training Workshop on Harmful Algae **Organizer:** Mr. D.P. Praseno, P30 LIPI, Dr. Yasuwo Fukuyo, Univ. Tokyo	Basic, M.Sc. 10	WESTPAC ASEAN	LIPI, Ambon, Indonesia	13-18 Nov. 1995	WESTPAC-II	IOC: Japan: 5K Indonesia 3K
Course name: IOC/WESTPAC In-Country Training Courses:	Basic M.Sc.					

MODULE: ***THEME WORKSHOPS, AND REGIONAL INTERDISCIPLINARY WORKSHOPS***	**LEVEL no. of part.:**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**NEED IDENTIFIED WHERE:**	**FUNDING IDENTIFIED:** in US $
IOC/WESTPAC-Philippines: Dinoflagellate Identification	9	WESTPAC	BEFAR, Manila, Philippines	6-19 Dec. 1995	WESTAPC-II	Japan 3K BEFAR 10K
IOC/WESTPAC-Vietnam: Phytoplankton Monitoring and Identification in Eastern Indonesia	8	-	Inst of Ocean., Haiphong Vietnam	12-15 Nov. 1996	WESTPAC-III	Japan 15K Vietnam 3K
IOC/WESTPAC-Indonesia: Phytoplankton Monitoring and Identification in Eastern Indonesia	15	-	Res.andDevelop. Centre for Oceanology,Jakarta, Indonesia	18-22 Nov. 1996	WESTPAC-III	Japan 15K Indonesia 3K
IOC/WESTPAC-Malaysia:Identification of PSP Plankton **Organizer:** Asian Natural Environmental Science Center, the University of Tokyo, Tokyo, Japan	15	-	Univ.of Malaysia Saba, Kota Kinabalu, Malaysia	9-11 December, 1996	WESTPAC-III	Japan 15K Malaysia 5K
Course name: IOC/WESTPAC In-Country Training Courses:	Basic M.Sc.	WESTPAC				
IOC/WESTPAC-UPV: Red Tide Seminar Workshop	20	-	Univ.Phil.in the Visayas, Philippines	17 May 1996	WESTAPC-II	Japan 5K Phil. 10K
IOC/WESTPAC-PSU: Seminar on HAB	20	-	P.of Songkla Univ., Hat-Yai,	12-16 Dec. 1997	WESTPAC-III	Japan 25K Thailand 5K

MODULE: ***THEME WORKSHOPS, AND REGIONAL INTERDISCIPLINARY WORKSHOPS***	**LEVEL no. of part.:**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**NEED IDENTIFIED WHERE:**	**FUNDING IDENTIFIED:** in US $
IOC/WESTPAC-UPV: Red Tide Seminar Workshop	20	-	Thailand Univ.of the Phil.in Cebu	17-21 Nov. 1998	WESTPAC-III	Japan 35K Philippines 5K
IOC/WESTPAC-Chinese Taipei: Red Tide Seminar Workshop	13	-	National Taiwan University, Taipei	3-7 April 1999	WESTPAC-III	Japan 5K C. Taipiei 50K
IOC/WESTPAC-Hong Kong: Red Tide Seminar and Training Course **Organizer:** Asian Natural Environmental Science Center, the University of Tokyo, Tokyo, Japan.	20	-	Agriculture and Fisheries dept, Hong Kong	6-10 Dec, 1999	request	Japan 5K Hong Kong 50K
Course name: IOC/WESTPAC Training Course on PSP Toxin Monitoring **Organizer**: Dr. Y. Fukuyo, Asian Natural Environmental Science Center,University of Tokyo, and Dr. M. Kodama, School of Fisheries Sciences, Kitasato University	M.Sc/ Ph.D.	9	School of Fisheries Sciences, Kitasato University, Iwate, Japan	24-30 August 1998,	WESTPAC-HAB	Japan 16K
Course name: 5th IOC/WESTPAC/HAB Training Course on Ecology and Physiology of Harmful Algae **Organizer:** Asian Natural Environmental Science Center, the University of Tokyo, Tokyo, Japan.	M.Sc/ Ph.D.	9	Chulalongkorn University and Burapha Unviersity, Thailand	19 – 24 March 2001	WESTPAC/HAB	Japan FiT
The 6th IOC/WESTPAC Training Course on		9	Manila,	May 13-18	WESTPAC/HAB	Japan FiT

MODULE: ***THEME WORKSHOPS, AND REGIONAL INTERDISCIPLINARY WORKSHOPS***	**LEVEL no. of part.:**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**NEED IDENTIFIED WHERE:**	**FUNDING IDENTIFIED:** in US $
Advanced Techniques on Characterization of Harmful Algal Species **Organizer:** Asian Natural Environmental Science Center, the University of Tokyo, Tokyo, Japan. The 7th IOC/WESTPAC Training Course on Species Identification of Harmful Microalgae, **Organizer:** Asian Natural Environmental Science Center, the University of Tokyo, Tokyo, Japan.	M.Sc/ Ph.D. M.Sc/ Ph.D.	9	Philippines Sabah, Malaysia	2002 March 17-22, 2003	WESTPAC/HAB	Japan FiT, 16K
Course name: IOC Training course on HAB for the Caribbean Countries **Organizer:** Arturo Sierra	Basic M.Sc., 10	Caribbean	Mexico. CIBNOR (Centro de Inv. Biologicas del Noroeste)	2001	IOC Rep.of Gov. and Major Subsidiary Bodies No. 67, Dec. 1995	IOC 10K
Course name: IOCEA Workshop on Harmful Algal Blooms **Organizer**: IOC Science and Communication Centre on HAB, Copenhagen	M.Sc/ Ph.D	10	University of Accra, Ghana	29 October 2 November 2001	IPHAB	Danida 10K IOC budget 20K
Course name: IOC-NAUTA-COPEMED Course on Identification of Harmful Algal Blooms, INSTM, Tunisia **Organizers:** Monica Lion, Jacob Larsen, Souad Turki (INSTM)	M.Sc/ Ph.D	11	INSTM, Tunisia	1-10 December 2003	IPHAB	IOC HAB: 1,7K AECI-Nauta: 13,5K IEO: 10,5K Danida TF:

MODULE: ***THEME WORKSHOPS, AND REGIONAL INTERDISCIPLINARY WORKSHOPS***	**LEVEL no. of part.:**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**NEED IDENTIFIED WHERE:**	**FUNDING IDENTIFIED:** in US $
						8K FAO-COPEMED: 1,5K Total: 35,2K

MODULE: ***INDIVIDUAL TRAINING***	**LEVEL no. of part.:**	**TARGET GROUP/ Region:**	**WHERE:**	**WHEN:**	**NEED IDENTIFIED WHERE:**	**FUNDING IDENTIFIED:** in US $
IOC-IEO Science and Communication Centre on Harmful Algae. Individual training visits under the supervision of one expert from a Galician Institution.	2002: 2 2003: 1 2004: 5 2005: 10 Advanced	Latin America and North Africa	Instituto Español de Oceanografía, Vigo (Spain)	2002-2005	IPHAB	Spanish TF 2002: AECI: 2,5 K, IGACI: 2,5 K, IEO: 2 K 2003: AECI: 2,5 K, IEO: 1 K 2004: AECI: 12,5, IEO: 5 K 2005: AECI: 26,5 K
IOC Science and Communication Centre on Harmful Algae. Individual training visits/PhD under the supervision of expert from University of Copenhagen	5 Advanced	Developing countries	Department of Phycology, Institute of Biology, University of Copenhagen, Denmark	2001-2004	IPHAB	Danish TF ~6K/year

ANNEX XI

**SIXTH IOC REGIONAL SCIENCE PLANNING WORKSHOP ON HARMFUL ALGAL BLOOMS IN SOUTH AMERICA
GUAYAQUIL, ECUADOR, 22-24 OCTOBER 2003**

Recommendations, Election of chair and next meeting venue.

Identification of priorities in the region and of multidisciplinary activities to be carried out in the future were discussed. Recommendations were given on the following topics:

GEOHAB and its Open Science Meetings:

The group IOC-FANSA will consider the scientific and technical framework and the implementation of the GEOHAB programme for the planning and development of international research under a multidisciplinary comparative ecosystem approach. The IOC-FANSA group declares its interest to support and participate in the scientific gatherings linked to the region and promoted by the GEOHAB programme.

Expectations from other Projects:

There is an interest to know the taxonomy and distribution of harmful species resting stages in accordance to the peculiarities of each country of the IOC-FANSA group.
It is necessary to carry out studies to evaluate and develop molecular probes against toxic phytoplankton species.

Toxin standards (including those of emerging toxins):

The IOC-FANSA group recommends that to secure commercial availability of reference material for toxin standards should be promoted.

Ocean Portal and web page:

The IOC-FANSA group recognizes the need to organize a training course on the taxonomy of harmful phytoplankton species and proposes to use the capacities available in the region for that purpose.

Capacity Building:

The IOC-FANSA Group recognizes the need to build capacities within regional members, by means of individual visits to local or foreign competitive institutions, on:

- Detection methods for harmful phytoplankton and phycotoxins
- Emerging technologies for real time and remote sensing.

IOC and FANSA:

Considering that the reports from the last three meetings of the IOC-FANSA Group have not been disseminated, the group demands that the IOC gives priority to the recommendations given at the IOC scientific planning workshops and that its reports get published in electronic format and printed after a short period of time.

Other agreements:

The IOC-FANSA group agreed to propose a committee for the organization of a Latinamerican HAB Conference. It was proposed to celebrate this conference at Santa Catarina (Brazil) in the spring of 2005. The local organizer would be Luis Antonio Proença, Brazilian delegate at the IOC-FANSA group. The IOC-ANCA group would be invited to participate in the planning and development of this event.

The IOC-FANSA group agrees to evaluate the feasibility of the planning and organization of an international postgraduate programme on harmful algal blooms with the support of the different countries that belong to the group.

It was agreed that the national representatives at IPHAB should present and require support from the panel to the agreements adopted by the IOC-FANSA.

Election of Chair of the IOC-FANSA:

The current chair, Dr Leonardo Guzmán, from the *Instituto de Fomento Pesquero* (Chile) was re-elected for a new term of four years.

Venue for the VII IOC-FANSA meeting:

It was agreed that the next meeting of the IOC-FANSA group will be hosted by the *Instituto del Mar del Perú* (IMARPE) during July 2005. The commitment of the biologist Patricia Villanueva on behalf of IMARPE to organize the next workshop in Lima (Perú) in July 2005 was accepted. It will be the first time this meeting is held in this country.

FANSA PORTAL PROJECT WORKPLAN

UNESCO Cross Cutting Project: www.algasnocivas.net

Project pertaining to the cross cutting theme "The contribution of information and communication technologies to the development of education, science and culture and the construction of the knowledge society".

Drafting Workshop I, 2-6 June 2004, UNIVALI, Itajaí, Brazil

1 BACKGROUND

The UNESCO/IOC Regional OceanPortals provide access to information and data on all aspects of ocean/coastal research and management for the benefit of various communities such as decision makers, the private sector, the research and education community and the general public. The development of regional portals provides for increased ownership of the portal by the target audiences and enables a more targeted focus on national and regional issues. This Work Plan concerns the second phase of the OceanPortal Project and the development of a topic specific portal on harmful algae in South America and includes a strong capacity building component.
The Project is implemented via the IOC Regional Working Group on Harmful algae in South America, FANSA.

The first training, planning and drafting workshop was held at University of Vale do Itajaí (UNIVALI), Itajaí, Brazil 2-6 June 2004. The Agenda is included herein as Annex 1, and the List of Participants as Annex II.

2. TARGET AUDIENCES

The OceanPortal's main objective is *to provide a communication forum for all layers of society with an intellectual, economic or political interest in the oceans and coastal areas*. The OceanPortal takes into consideration the need to provide a targeted, personalized communication and information provision service for a wide variety of target audiences/stakeholders using both pull (enabling users to locate information for themselves) and push (suggesting information to users based on their preferences) technology.

The core stakeholders are:

- Research Community
- Decision Makers & Managers
- Private Sector
- Education Sector
- General Public & NGO

The OceanPortal technology allows 'members' to be both knowledge users and knowledge providers.

3. OBJECTIVES

Elements of the FANSA Portal – outputs:

A. An information and documentation space with including regional scientific documentation of 1. The occurrence and toxicity of HAB and other noxious blooms; 2. Regional scientific documentation for the human health and economic and social impacts of HAB; 3, general information for a diverse audience like decision makers, planifiers, kids and youngsters, physicians, nurses, tourism guides, educators, fishermen and public in general.

B. An education space providing tools for educational and participatory activities in formal and non-formal settings: 1. A web based HAB learning module with complementary printed training material.

C. A best practice space, presenting worldwide best practices on HAB management, including access to international and national legislation texts related to HAB management and seafood safety;

D. Science space to targeting other professionals or technicians from sectors like medicine, toxicology, pharmacology, chemistry, education, sociology, economy, and facilitating early detection of symptoms by practitioners; and the dissemination of the information through a multidisciplinary audience. A media space to demonstrate and develop modules for media instruments to HAB public awareness.

E. A glossarry for better understanding the texts included.

F. Bibliographic information which will include regional publications and documents, in the original languages besides the international scientific publications.

G. Information about the Regional Working Group IOC FANSA on Harmful Algal Blooms in South America.

4. LANGUAGE

In order to reach all layers of target audiences, the regional portal on harmful algae is multilingual. Content can be submitted in Spanish, Portuguese, or English.

5. DOMAIN NAME AND RELATION TO PORTALOCEANICO

The domain name is www.algasnocivas.net . The Portal is an element with its own identity within the www.portaloceanico.net implying systematic cross referencing.

In the planning of the work careful attention is paid to the lessons learned 2002-2003 in the Portal Oceanico and in the HABSEA Portal:

- Define very well target audiences
- Establish general policy and procedures for Editors.
- Consider for languages the native language of editors.
- Establish multiple ways to access information (geographical and by subject)
- State the principles and the goal of the HAB Portal.
- Consider scientific contents and general contents, Portal can include both.
- Consider a training workshop to potential editors of the region, where they can be recruited depending of their interest, institutional support and Internet capabilities.
- Identify topic editors trying to cover entire region.
- Avoid contents of short life (e.g News)
- Try to include always contents with graphic information.
- Work very hard on awareness.
- Keep a monitoring of visitors.
- Editorial work is not just for scientists, is mainly for enthusiastic people with the necessary knowledge to understand what is really important to be posted.
- Establish a sustained amount of contents by editor by month.

6. STRUCTURE

The following structure is agreed upon as the initial structure of the portal. It is subject to modifications as work progresses but serves as the basis for distribution of work responsibilities.

PORTAL ALGAS NOCIVAS

Introducción (300 palabras incluyendo información general sobre el tema y el objetivo del portal, esto es, contribuir a la construcción de una base de información en el tema de las algas nocivas en Sudamérica

A) CONCEPTOS CLAVES SOBRE ALGAS NOCIVAS PARA

- Ejecutivos del Estado y del Sector Privado

ESTATAL: Como proteger la salud pública y las actividades productivas (monitoreo, planes de contingencia, difusión de la información, campañas educativas, etc)
PRIVADO: Como mantener e impulsar las actividades productivas o como debo enfrentar los eventos de algas nocivas.

- Profesionales y técnicos

Que se debe debo saber y cual es el estado del conocimiento para proteger la salud de las personas y disminuir los impactos sobre las actividades productivas

- Niños y jóvenes

Conocimiento del fenómeno y del entorno (Conducta responsable)

- Educadores

Generalidades, ciencias naturales, ciencias sociales, contenidos transversales

- Pescadores y acuicultores

(Control de calidad, responsabilidad, monitoreo)

- Público en general

Cuales debieran ser las conductas de las personas (ama de casa, consumidor, vecinos)

B) FAN EN SUDAMERICA
íPaíses (monitoreo, ciencia, educación, instituciones, otros)

C) CIENCIA Y TECNOLOGÍA
Especies (ítaxonomía, distribución, ciclo de vida, ecología)
Toxinas (tipo, estructura química, vectores, ísíndromes)
Técnicas de muestreo
Técnicas de detección de especies y toxinas, variables ambientales en tiempo real
Otras floraciones nocivas no tóxicas
Productos tecnológicos

D) GESTIÓN
Técnicas de mitigación
Legislación

E) EDUCACIÓN Y CAPACITACIÓN

F) NOTICIAS Y EVENTOS

G) GLOSARIO
H) REFERENCIAS BIBLIOGRÁFICAS

I) FANSA

7. RESPONSIBILITIES

ROLE	NAME	SPECIFIC TASKS
FANSA CHAIR, FANSA PORTAL SUBJECT EDITOR	LEONARDO GUZMAN (LG)	TOPICS IN PORTAL:
FANSA PORTAL SUBJECT EDITOR	LOUIS PROENCA (LP)	TOPICS IN PORTAL:
FANSA PORTAL SUBJECT EDITOR	SILVIA MENDEZ (SM)	TOPICS IN PORTAL:
FANSA PORTAL SUBJECT EDITOR E-LEARNING	MARTHA FERRARIO (MF)	TOPICS IN E-LEARNING:
FANSA PORTAL SUBJECT EDITOR E-LEARNING	MARIA CELIA VILLAC (CV)	TOPICS IN E-LEARNING: .
FANSA PORTAL SUBJECT EDITOR E-LEARNING	RUT AKSELMAN (RA)	TOPICS IN E-LEARNING:
FANSA PORTAL SUBJECT EDITOR E-LEARNING	CLARISSE ODEBRECHT (CO)	TOPICS IN E-LEARNING:
FANSA PORTAL SUBJECT EDITOR E-LEARNING	ANA AMORIM (AM)	TOPICS IN E-LEARNING:
FANSA PORTAL SUBJECT EDITOR E-LEARNING	CÉLIA SANT'ANNA (CA)	TOPICS IN E-LEARNING:
FANSA PORTAL SUBJECT EDITOR E-LEARNING	JACOB LARSEN (JL)	TOPICS IN E-LEARNING:
E-LEARNING TECHNICAL SUPPORT	PIA HEACKEY (PH)	Assembly of input from e-learning editors in LUVIT and training of e-learn editors
PORTAL TECHNICAL SUPPORT	BEN SIMS (BS)	Technical guidance and back-up re Portal software and administrative issues.
PORTAL SUPPORT	MONICA LION (ML)	Assistance to Portal Editors, TOPICS IN PORTAL:
PORTALOCEANICO EDITOR	RODNEY MARTÍNEZ GÜINGLA (RM)	Cross referencing
IOC-UNESCO FANSA PORTAL COORDINATOR	HENRIK ENEVOLDSEN (HE)	Coordination, advice and administrative issues

*at the beginning the group decided to work horizontally and if necessary to show a chief editor, the tree subject editors will rotate during this project, until the chief editor be elected by the IOC FANSA group.

FANSA PORTAL EDITOR:

i. General supervision of the regional portal;

ii. Quality control of content submitted by subject and topic editors;

iii. Provide assistance to subject and topic editors;

iv. Liaise with IOC project leader, PortalOceanico Editor, and distribute relevant information to subject and topic editors;

v. Attend project management meetings.

vi. Assist in the identification of subject and topic editors.

SUBJECT EDITORS:

i. Actively seek material within the subject area under his/her responsibility;

ii. Convert the material into knowledge objects and enter them into the relevant sections of the Portal, including the identification of relevant keywords/terms;

iii. Supervise the content submitted by topic editors, including reviewing their submitted knowledge objects.

iv. Assist in the identification of topic editors.

TOPIC EDITOR: To be identified as required:

i. Submit material for a topic of his/her interest;

ii. Convert the material into knowledge objects and enter them into the relevant sections of the Portal, including identification of relevant keywords/terms.)

8. E-LEARNING

The course will build on the template developed for the international IOC course and for the regional Course for South East Asia.

1. the written teaching material will be in English and it will be adjusted to regional issues (species that are important in the region, inclusion of bibliography and of a glossary in Spanish/Portuguese of taxonomic terms)
2. the teaching part (e-learning and practical classes) will be done in various languages depending on the instructor (English, Spanish or Portuguese)
3. the course will be provided to students from Latin America and Caribbean region (FANSA and ANCA)
4. the practical part of the course will be in Brazil (still to be determined, depending on costs)

All e-course teachers except Ana Amorim and Celia Sant'anna received training in using the LUVIT e-learning platform.

Course Resources	**Celia V.**	**Clarisse**	**Martha**	**Rut**	**Célia S.**	**Ana**
IOC UNESCO HAB Manual	+	-	-	-	-	+
Anderson et al 2001	-	-	-	-	-	+
Graham & Wilcox 2000	-	-	+	-	-	+
FANSA Manual	+	+	+	+	-	-
Tomas 1997	+	+	+	+	-	+

IOC will provide the course teaching material by mail as indicated above. '+' indicate that person already has the book in question.

Ana Amorim knows Luvit already from her participation in the IOC Course summer 2004. Celia Villac will meet with Célia S. to show/train her in Luvit. Celia Sant'anna and Ana

Amorim will be assigned a password to Luvit. Celia Villac will make Celia Sant'anna copies of the material already received (the CDs).

Structure of the course:

Announcement and call for applications by all FANSA and ANCA members by early August 2004. Applications due by November 25. Application form in English, to be send to the IOC Centre in Copenhagen (for a pre-selection), selection and information of participants by 15 December 2004. Notification will be given to participants during the second half of January 2005.

An introductory workshop will be considered for the trainees when the budgetary implications have been assessed. The e-learning course will run March-April 2005. The practical laboratory course is tentatively scheduled for May 2005. Possible venues: Univali, Cebimar (Sao Paulo), C. Villac to explore feasibility of the two options.

Part I - Distant learning

Course programme, part I, duration 64 hours

Course module	**Duration (hours)**		
I. Introduction to phycology	2	CV	Dead-line for modules 1 October, modules to be circulated to everyone Final version: 1 November
II. Harmful diatoms	10	MF, CV	
III. Harmful dinoflagellates	30	RA, CO, JL	
- Introduction	4		
- Prorocentrales	2		
- Dinophysiales	2		
- Gymnodiniales and Noctilucales	2		
- Gonyaulacales	8		
- Cysts	4	AA	
- Exercises	8		
IV. Harmful raphidophytes	4	CO, CV	
V. Harmful haptophytes	4	CO, MF	
VI. Harmful marine cyanophytes	6	CS	
VII. Harmful algal blooms	8	CV, CO, MF, RA	

Part II- Microscopy course, tentative programme

	Morning session	**Afternoon session**
Day 1	Welcome address introductory lecture presentations by the participants	Presentations by the participants
Day 2	Harmful diatoms	
Day 3	Harmful haptophytes and raphidophytes	Cultures
Day 4	Cyanobacteria	
Day 5	Harmful dinoflagellates: Dinophysis	Harmful dinoflagellates: unarmoured species
Day 6	Excursion	
Day 7	Harmful dinoflagellates: Alexandrium, Pyrodinium	
Day 8	Cysts	

	Morning session	**Afternoon session**
Day 9	Harmful dinoflagellates: Prorocentrum, benthic dino's	
Day 10	Cell counts, statistics etc.	
Day 11	Microscopy of own samples	

Annex 1

IOC-UNESCO OCEANPORTAL
FANSA PORTAL DRAFTING WORKSHOP
UNIVALI, ITAJAÍ, BRAZIL, 3-6 JUNE 2004

Day	**Activity**	**Participants**	**Trainer/speaker**
Thursday 3 June 13.00-17.00	Pre-meeting among editors of E-learning	JL,RA,CO,CV,MF	
Friday 4 June 9.30	A. Welcome B. Introduction to the IOC OceanPortal C. Introduction to e-learning D. Definition of FANSA Portal focus and objectives E. Drafting of e-learning course structure	All LG, LP, SM, RM JL, RA, MF, CO, CV	A. HE & LP B. BS & RM & HE C. PH & JL D. LG
Saturday 5 June 9.00	F. Design/drafting of portal & e-learning module G. Training in Tomoye and LUVIT software	All All	- BS & PH
Sunday 6 June 9.00	H. Design/drafting of portal & e-learning module, I. Preparation of detailed workplan	All All	

Names and initials
BS: Benjamin Sims
RA: Rut Axelman
MF: Martha Ferrario
HE: Henrik Enevoldsen
JL: Jacob Larsen
PH: Pia Haecky
RM: Rodney Martínez Güingla
LG: Leonardo Guzman
SM: Silvia Mendez
ML: Monica Lion
CV: Celia Villac
LP: Luis Proenca
CO: Clarisse Odebrecht

Annex 2

LIST OF PARTICIPANTS: IOC OCEANPORTAL: FANSA PORTALPROJECT 2004-2005

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ANNEX XII

ANCA-IOCARIBE WORKING GROUP ON HARMFUL ALGAL BLOOMS (ANCA-IOCARIBE), CHAIR, J. ERNESTO MANCERA

SUMMARY

1. RESULTS 2000 – 2004

The Third Session of the ANCA IOCARIBE-HAB Working Group was held in Cumaná – Venezuela from 16 to 18 July, 2003. The Meeting was attended by representatives of Colombia, Costa Rica, Cuba, Mexico, El Salvador, Guatemala and Venezuela. The work of the Group was reinforced and a review of main events occurred in the region were presented by each participating country.

Six training courses in topics like sampling, taxonomy, quantitative enumeration of phytoplankton, has been offered in ANCA region: Mexico (3), Costa Rica (1), Colombia (1), Guatemala (1).

Regional experts published in Revista de Biologia Tropical (vol.52 (Suppl.1) 2004), an especial issue on HAB in the Caribbean. (Annex 9.1).

2. PRIORITIES AND REQUESTS 2005 - 2007

During the III ANCA session it was concluded that for a better understanding of HAB in the Caribbean region, it is necessary to enhance the research capacity of the countries of the region, and to implement a regional monitoring programme. The Group recognised the lack of information about sources and potential consequences of HAB available in the region. This lack of information is evident at all levels including governmental, scientific, academic, and society in general. Therefore, no much attention is addressed to this potential problem and non-significant financial support is allocated for HAB research and monitoring. Moreover, there are only a few research groups, and most of them need logistic support. At the same time, the group noted with concern that only some countries have national monitoring programmes.

The ANCA Working Group decided to focus their Action Plan in the implementation of three main activities: 1. Capacity Building, 2. Research, and, 3. Communication.

1. Capacity Building:

Taking advantage of the regional capabilities, convene at least two (2) basic training courses to address technical elements for the assessment of red tides in the Caribbean region. A manual on Standard Operative Procedure (SOP) for HAB monitoring purposes should be prepared.

The first course should cover sampling, identification, and quantification techniques of potentially toxic phytoplankton. It will be directed to technicians involved in monitoring plans. The second training course should cover toxin assessment. It should be directed to technicians involved in monitoring plans.

2. Research:

Ciguatera, Ballast water, and massive-growth organisms such cyanobacteria, are the major priorities. Venezuela, Mexico, and Cuba are working together to prepare a proposal to

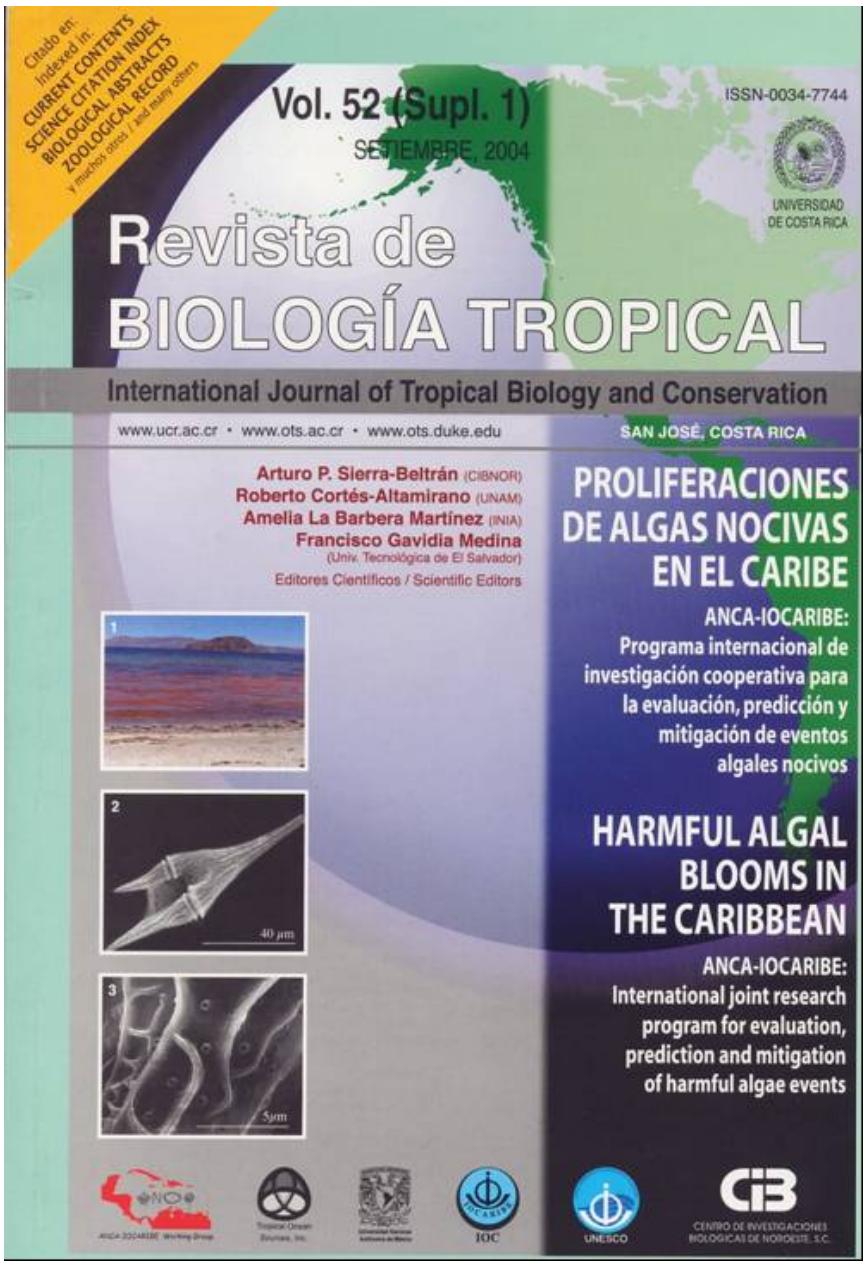
study the distribution of benthonic species that may cause ciguatera. Colombia and Cuba are also willing to prepare a proposal to study ballast water.

The Group suggested convening a workshop to design methods to assess the socio-economic impacts of HABs.

3. Communication:

In this respect, the Group stressed the need to increase the awareness on this issue at different society levels. The creation and development of a "marketing document" to disseminate all about HABs programmes in the Caribbean region and the role of ANCA was proposed.

During the IOCARIBE eighth session (Recife, Brazil, April 2004) a draft recommendation (SC-IOCARIBE-VIII.3) was approved, with financial implications. Regular Budget = us $50,000. Extra Budgetary Sources = us $100,000.



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CONTENIDO

ANNEX XIII

DECLARATION OF SALAMMBÔ

HANA - Harmful Algae in North Africa

The Participants at the "Regional Training Course on Harmful Algae" organised by IOC of UNESCO in cooperation with the AECI, NAUTA, IEO, COPEMED and DANIDA, from 1 to 12 December 2003 at the INSTM, Salammbô, Tunisia;

Recalling fruitful discussions initiated and guided by Professor Y. Halim regarding the worldwide problem of HAB that is of concern, in particular, along the North African coasts;

Recalling the serious impacts of this problem on the marine resources and on aquaculture;

Noting the desirability of combining efforts and means and of cooperation at the regional scale towards a better management of this problem;

Underlining the importance of a multidisciplinary approach to this problem;

Declares the establishment of a network " Harmful Algae of North Africa " HANA, open to all interested scientists, and express their strong wish to see this network affiliated to and supported by IOC.

By establishing the IOC-HANA network, the undersigned wish to promote scientific research and cooperation between North African countries concerning monitoring and management of the problem of harmful phytoplankton blooms.

More specifically, the IOC-HANA network aims at:

i) Improving scientific knowledge of the physical, biogeochemical and physiological factors governing HABs,

ii) Creating a data-base relative to the incidence of HABs in the region,

iii) Establishing a directory of the personnel involved in HABs, their area of specialization and their level of expertise,

iv) Compiling an inventory of regional publications relevant to HABs,

v) Promoting the exchange of information through regular working groups, workshops and otherwise,

vi) Promoting capacity building for scientists and managers involved in HABs,

vii) Developing an identification guide book for harmful species from the region.

Salammbô, Tunisia, 12 December 2003.

LIST OF PARTICIPANTS

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ANNEX XIV

TERMS OF REFERENCE AND RULES OF OPERATION GEOHAB SCIENTIFIC STEERING COMMITTEE (AS OF NOVEMBER 1999)

The international programme on the Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB), is cosponsored by the Scientific Committee on Oceanic Research (SCOR), and, the Intergovernmental Oceanographic Commission (IOC). The programme will be developed and implemented by a Scientific Steering Committee (SSC) with the following terms of reference discussed at its first meeting (November 1999):

- To oversee the development of a Science Plan for the international SCOR/IOC programme on the Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB) and to submit it within one year for the approval of the sponsors of the programme and subsequent publication. The SSC should ensure that the Science Plan has input from the international HAB scientific community.
- To develop a detailed Implementation Plan for GEOHAB taking into account input from the scientific community, for presentation and approval by the sponsors and publication within two years.
- To coordinate and manage the resulting activities in accordance with the GEOHAB Science and Implementation Plans.
- To collaborate, as appropriate, with organizations such as ICES, PICES, etc. and related programmes such as GLOBEC, LOICZ, and the emerging Global Ocean Observing System.
- To ensure effective communication between related national and regional HAB research efforts.
- To report regularly to SCOR and IOC, and to other bodies as needed, on the state of planning and accomplishments of GEOHAB.

The GEOHAB SSC, its Officers, subsidiary groups and International Project Office shall operate in accordance with the guidelines established by SCOR and IOC.

OPERATING PROCEDURES FOR THE SSC

The Scientific Steering Committee of GEOHAB (henceforth referred to as SSC), is sponsored by the Scientific Committee on Oceanic Research (SCOR) and the Intergovernmental Oceanographic Commission (IOC). The two Organizations are jointly responsible for the appointment of the Chairperson, Vice-Chair and Members. .

The primary functions of the GEOHAB SSC are to:

- provide scientific guidance to and oversee the development, planning and implementation of the program;
- encourage publication of results with an appropriate form of acknowledgment of SCOR and IOC support and that of other agencies and organizations as appropriate;
- encourage the promotion and wide awareness of GEOHAB in the science community;
- demonstrate progress and achievements of the project through the definition and monitoring of milestones and results;
- provide on request, scientific advice and assistance to the international community in

the planning of national and regional HAB research, which is designed to contribute to the overall goals of the international GEOHAB program.

- encourage national governments, regional and international funding agencies to support the implementation of the GEOHAB programme and the achievement of GEOHAB goals through the provision of adequate support to the necessary national, regional and international research activities with the help of the IOC Intergovernmental Panel on HABs and other relevant bodies;
- encourage collaboration between GEOHAB and other international programmes and agencies concerned with the scientific study and assessment of harmful algal blooms; and
- recommend to SCOR and IOC:
    - a Chairperson for appointment by SCOR and IOC;
    - Members for appointment to the committee by SCOR and IOC;
    - a Vice-Chair for appointment by SCOR and IOC; and,
    - such amendments to these terms of reference as may prove necessary from time to time.

In undertaking these responsibilities the SSC shall collectively:

- meet at least once a year, to review progress in the development and implementation of the GEOHAB and to advise the Chair, Vice-Chair and programme staff on the scientific developments which should be initiated or undertaken between meetings;
- prepare plans and guidelines for the conduct of meetings, workshops, and conferences designed to assist the SSC in executing its functions;
- prepare and revise, as necessary, criteria for the identification of national and regional research which contributes to the goals of GEOHAB;
- develop guidelines for the preparation, publication and distribution of substantive and technical reports resulting from GEOHAB research; from the work of the GEOHAB Programme Office; and, from related activities of GEOHAB;
- develop and devise a methodology for monitoring and assessing progress;
- advise the programme office staff on the necessary actions required of the office in support of the work of the SSC and,
- consider such other matters as are brought to the attention of the SSC by individual members, the programme staff, or the sponsors.

The Chairperson and Members of the Scientific Steering Committee are selected for their expertise and serve in their individual capacities. They will be appointed for three-year terms and may, with justification, be invited to serve a second term. They are expected to:

- attend in full, the meetings of the Scientific Steering Committee. Members who fail to attend two SSC meetings will normally be asked to retire from the SSC;
- be willing to expend considerable effort between SSC meetings;
- provide the best possible scientific information and advice concerning their field of expertise as it relates to the goals elaborated in the Science and Implementation Plans for the GEOHAB program;
- provide scientific advice to the Chairperson and programme officers on the development and implementation of the GEOHAB program;
- represent the interests of the programme at relevant scientific meetings;
- provide a written report to the International Programme Office within one month of attendance at a meeting at the expense of the IPO;

- provide a two-way channel of communication between the Scientific Steering Committee and the national and where possible, regional and international research communities;
- organize, convene and conduct meetings as shall be agreed by the SSC;
- keep the IPO and Chairperson of the SSC fully informed of all actions directly or indirectly related to the program; and
- assist in securing financial and other support for the execution of GEOHAB research, adopted and approved by the Committee.

The Chairperson of the Scientific Steering Committee is expected to:

- chair the meetings of the Committee;
- undertake advocacy on behalf of the project and enlist wide international participation in the project;
- work closely with the IPO in implementing agreed activities between meetings of the Committee;
- report periodically to SCOR and IOC on the progress of GEOHAB and seek their assistance in addressing difficulties encountered in its implementation.

The Vice-Chair of the Scientific Steering Committee is expected to:

- chair the meetings of the committee in the absence of the Chairperson;
- undertake advocacy on behalf of the project and enlist wide international participation in the project; and
- assist the Chair and the programme staff in implementing agreed activities between meetings of the Committee.

RESPONSIBILITIES OF THE INTERNATIONAL PROGRAMME OFFICE:

The International Programme Office (IPO) will assist the GEOHAB SSC in planning and carrying out new scientific research; it will also serve as a much-needed channel of communication between scientists working in different countries on various scientific aspects of harmful algal blooms. An important early task of the IPO will be to assist the SSC in collecting information on national and regional programmes of HAB research relating to ensure that the project makes effective use of existing activities and assists in the identification of areas of unnecessary duplication of effort.

The general tasks of an International Programme Office are as follows:

- administering the project on a day-to-day basis, under the long term guidance of the SSC
- coordinating research efforts, and planning and coordinating research campaigns and field programmes;
- providing project advocacy and promotion, enlisting wide international participation in the project;
- maintaining needed connections with relevant national and regional projects;
- ensuring effective coordination with other international research programmes;
- disseminating information and research results through the Harmful Algae News and other appropriate publications;
- monitoring and assessing the progress of the project and the activities of the SSC;
- securing support for the operation of the Office; and

- coordinating the development of a GEOHAB Data System Plan. This should address issues of data quality, data set creation, metadata and catalogues, data archiving, data standards, external cooperation and linkages to data agencies, networking and distribution of data, and future instrumentation needs.

In addition, the IPO is expected to

- provide day-to-day support to the work of the Committee both individually and collectively; and
- provide the technical Secretariat for the meetings of the SSC and other meetings convened by the SSC within the framework of GEOHAB.

GLOBAL ECOLOGY AND OCEANOGRAPHY OF HARMFUL ALGAL BLOOMS SCIENTIFIC STEERING COMMITTEE FOR GEOHAB 2004/05

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ACTIVITIES 2003-2005

I. Workshop on real-time coastal observing systems for ecosystem dynamics and HABs

This workshop was held in Villefranche sur Mer, France from 11-21 June 2003. The workshop was convened by Marcel Babin a member of the GEOHAB SSC and John Cullen. The meeting served to review real-time sensing systems applicable for observation, modeling and prediction of plankton dynamics in coastal waters including HABs. The meeting objective therefore coincided with the goal of GEOHAB to improve prediction of HABs through enhanced observation and modeling systems and was therefore endorsed by GEOHAB. The workshop was attended by approximately 90 participants, which included several members of the GEOHAB SSC. The proceedings of this meeting are available at: http://www.HABWATCH.org.

II. Publication of Implementation Plan

The GEOAHB *Implementation Plan* was published in November 2003. This document provides both an introduction and overview of implementation and a summary of implementation actions. A formal invitation to participate is also provided, accompanied by a description of the procedure for application and associated obligations and benefits. GEOHAB will encourage combined experimental, observational, and modeling approaches, using current and innovative technologies in a multidisciplinary approach that is consistent with the multiple scales and oceanographic complexity of HAB phenomena.

For the purposes of implementation, the GEOHAB SSC adopted a three-category system for defining and endorsing GEOHAB research:

Core Research is comparative, interdisciplinary, international, and directly addresses the overall goals of GEOHAB as outlined in the *GEOHAB Science Plan*. Core Research will directly address Programme Element 4 on Comparative Ecosystems and thus will cross-cut the other Programme Elements. Core Research will involve scientific co-ordination by the SSC and comprises: Oceanographic field studies conducted in, and application of models to, comparable ecosystems, supported by identification of relevant organisms, and measurements of the physical, chemical, and biological processes that control their population dynamics.

A major objective of Core Research is the integration achieved by the application of coupled biological/chemical/physical models to HAB dynamics in geographically distinct ecosystems sharing common features. Modelling activities within Core Research Projects may include the application of specified models to different ecosystems, testing and validation of different models within given ecosystems, and modification of existing models to fit current, emerging or hypothetical data sets. The extent to which HAB species respond in a similar way in

ecosystems with similar characteristics will assist in defining the oceanographic processes that influence their population dynamics and community interactions. Interpreted via models, this comparative approach is ultimately expected to lead to an enhanced capability for HAB prediction.

The GEOHAB *Implementation Plan* specifies the formation of Core Research Projects (CRPs) related to four ecosystem types—upwelling systems, fjords and coastal embayments, eutrophic systems, and stratified systems. These CRPs are to be initiated through small, focused open science meetings.

Targeted Research addresses specific objectives outlined in the *GEOHAB Science Plan*. Targeted Research may be solicited by the SSC as the need arises from Core Research Projects. Targeted research differs from Core Research in scope and scale. Whereas Core Research must be comparative, integrative and multi-faceted, Targeted Research activities may be more tightly focussed and directed to a research issue or element. It is expected that such studies of specific processes and mechanisms will facilitate the wider and larger-scale Core Research studies.

Regional/National Research is coordinated at a regional or national level rather than by the SSC, but may be endorsed by GEOHAB. For endorsement by GEOHAB, Regional/National Research activities must share objectives with GEOHAB in furthering the understanding of the ecological and oceanographic mechanisms underlying HAB population dynamics, but may have other overall objectives.

Included in the Implementation Plan are Framework Activities that are not research, but will facilitate the implementation of GEOHAB. They serve to enhance the value of research by ensuring consistency, collaboration, and communication among researchers, and include scientific networking and co-ordination of resources, data management, specification of protocols and quality control, capacity building, interaction with other programmes and projects, and resources and funding.

III. Open Science Meeting: HABs in Upwelling Systems

The open science meeting on HABs in Upwelling Systems was hosted at the Instituto Nacional de Investigação Agrária e das Pescas (INIAP-IPIMAR), in Lisbon, Portugal from 17-20 November 2003. The meeting planning committee was co-chaired by Grant Pitcher – South Africa and Teresa Moita – Portugal, and included Francisco Figueiras – Spain, Raphael Kudela – USA, Trevor Probyn – South Africa, and Vera Trainer – USA.

The CRP – HABs in Upwelling Systems is built on the premise that understanding the ecology and oceanography of HABs in upwelling systems will benefit from a comparative approach, which is the method of choice when controlled experimentation is not practical. To the extent that experimental control in the study of marine ecosystems is problematic, comparison presents a potentially powerful alternative for drawing scientific inference. Comparisons with respect to HABs will incorporate the grouping of species from upwelling systems. Assessment of the extent to which these HAB species respond in a similar way within these systems will allow the oceanographic processes that influence HAB population dynamics and community interactions to be established. Equally important will be identification of upwelling systems that have dissimilar HAB species or groupings. In addition, understanding the response of harmful algae to perturbations within upwelling

systems will assist in prediction, and identification of divergences from predicted responses will also be informative.

The OSM served to identify interested participants and research regions and to bring together the international community to design core research. The meeting provided a general overview of HABs in the designated upwelling systems and meeting participants discussed a wide variety of research topics related to HABs in upwelling systems, which were distilled into 8 high priority research activities:

1 An ecologically based classification of the different harmful species based on their adaptation to the multiple sub-habitats characteristic of upwelling ecosystems. Included in this classification of HAB species in upwelling systems will be the functional role of morphological, physiological, behavioural and life-history characteristics, at the cellular level.

2 Identification of the seed strategies employed by HAB species within upwelling systems. Establishment of the sites of HAB initiation and characterisation of environmental influences on the life history stages of HAB species in upwelling systems is considered a priority in developing a predictive capability.

3 Determination of the influence of small-scale physical processes on the growth and dispersion of HAB species. Turbulent mixing determines much high-frequency environmental fluctuation and in so doing can control nutrient, irradiance, and phytoplankton patchiness, and is also known to affect plankton growth rates. Varying responses in terms of the succession of species within and among upwelling systems will allow inferences of the properties of the upper water column regulating species succession and the development of HABs.

4 An investigation of the nutritional physiology of target species as related to the natural variation in nutrient signals. Although time series, field measurements of nutrient concentrations can provide valuable insight to nutrient dynamics, provided that trans-boundary fluxes are quantified, direct measurements of regeneration and assimilation rates need also to be performed using isotope tracer methodology. These measurements will serve to provide meaningful input to biogeochemical models that can be employed in a predictive manner when coupled with the primary hydrodynamic forcing typical of upwelling ecosystems.

5 An assessment of genetic predisposition versus environmental conditions in the toxin production of target species in different upwelling systems. Variability in toxin production is likely caused by a combination of genotype and environmental conditions and elucidation of these respective roles in toxigenicity is critical in developing a predictive capability. Differences in the absolute toxicity of a given species in separate upwelling regions may be exploited to allow characterization of genes important in toxin synthesis.

6 Determination of the importance of coastal morphology and bathymetry on the dynamics of HABs in upwelling systems. These influences are responsible for creating alternating patterns of active and passive upwelling circulations along the coast which may serve in creating sites favouring bloom initiation, retention, dispersion, etc. Characterisation of these sites will assist in understanding their role in the dynamics of HABs.

7 Field based observations incorporating measurements of cross-shelf and along-shore advection and their role in the initiation, transport, accumulation and dispersion of HABs. These observations should be made with reference to both vegetative and resting stages of HAB species.

8 Identification of climate indicators as predictors of HAB events in upwelling systems. Evidence exists to suggest that variations in upwelling intensities and locations, and also ecosystems have occurred in concert with warming of the earth's climate. Research is required to relate the effects of climate change, and associated variation in the predominant physical and chemical forcing mechanisms, on HAB species and communities that typify coastal upwelling environments.

Our understanding of and ability to predict HABs in upwelling systems over the next 5-10 years will reflect the extent to which the above questions are answered. A report of the Open Science Meeting has been completed (GEOHAB 2005). An additional outcome of the OSM will be a manuscript comparing HABs in the Californian, Iberian and Benguela upwelling systems, based on our present knowledge. The manuscript will be submitted for publication in the journal Harmful Algae.

The GEOHAB Scientific Steering Committee (SSC) will help provide international coordination for the CRP – HABs in Upwelling Systems, through the establishment of a GEOHAB CRP Subcommittee. This Subcommittee will commit to the promotion of comparative research and the involvement of individuals from the Californian, Iberian and Benguela upwelling regions, and from other major upwelling systems. The subcommittee will be responsible for working with scientists involved in the CRP to ensure that they coordinate their research, using the same measurement protocols, sharing data, and contributing to observation and model development. One or two members of the CRP Subcommittee will be members of the international GEOHAB SSC, to ensure a strong linkage between the Subcommittee and the SSC.

IV. SCOR – IGBP Activity on Data Management for International Marine Research Projects

A meeting on Data Management for International Marine Research Projects was held at The Foresight Centre, University of Liverpool, United Kingdom, from 8-10 December 2003. The meeting objective was to produce a common strategy for managing and sharing marine data within and among IGBP and SCOR projects. GEOHAB was represented at this meeting by Wolfgang Fennel. A report of this meeting is posted on the Web [http://www.jhu.edu/SCOR/DataMgmt.htm] and includes the report of Wolfgang Fennel on data types and management within GEOHAB. A decentralized data management and distribution system with a centralized index is proposed for GEOHAB. The components, centralized under the supervision of an IPO, will include a comprehensive inventory of databases relevant to GEOHAB, as well as meta-data, with links to their locations and contact persons.

V. Open Science Meeting: HABs in Fjords and Coastal Embayments

The Open Science Meeting on Harmful Algal Blooms in Fjords and Coastal Embayments took place in Viña del Mar, Chile from 26-29 April 2004 under the co-direction of Allan Cembella (Alfred Wegener Institute, Germany) and Leonardo Guzmán (IFOP, Chile). The objectives of this meeting were fourfold: 1) to introduce the GEOHAB approach to Core

Research to the international community; 2) to foster the development of national and international links to GEOHAB, specifically to Core Research; 3) to review and assess existing knowledge and future prospects for research on HABs in coastal embayments, and 4) to initiate the development of an action plan for implementation of the Core Research on coastal embayments. An international panel of experts participated as the Core Research Project Co-ordinating Committee to plan the research agenda, in conjunction with several key members of the GEOHAB SSC.

The invitation to the OSM was issued to all prospective participants in the emerging international Core Research programme, however strong participation from Latin America was particularly noteworthy. More than 60 participants attended at least part of the meeting programmes, which featured 11 key lectures, more than 25 posters presented by participants and an extensive and lively discussion and question periods following each theme. To stimulate maximal scientific interaction, all posters were presented orally, several times in rotation.

The programme was opened with short welcome addresses from Chilean dignitaries, including representatives of the Comité Oceanográfico Nacional of Chile, the SCOR Executive Secretary and the IOC HAB programme Communication Centre in Copenhagen. After the conclusion of the plenary key lectures, theme break-out workshop groups were formed to discuss comparative approaches and integration of physical versus biological and chemical factors, and the incorporation of hydrodynamic and ecosystem models into this research framework. A series of recommendations and considerations emerged from these theme workshop groups, such as key importance of physical constraints in determining hydrodynamics and species outcomes in coastal embayments and the significance of benthic-pelagic coupling. The critical importance of water residence time was also noted.

On the day following the closure of the plenary meeting, the co-convenors met with the GEOHAB Chairman, the international Core Project Coordinating committee, and representatives of the GEOHAB SSC to plan the research agenda and to prepare the forthcoming summary report. Specific issues addressed included: 1) identification of key processes and mechanisms that must be studied in such ecosystems to define HAB dynamics; 2) determination of key questions and working hypotheses; 3) consideration of opportunities, differences and commonalities to be addressed in studies of coastal embayments; 4) discussion of potential key field study sites where research could be implemented; and 5) possibilities and constraints for national and international funding support for research initiatives. This information will be incorporated into a detailed OSM report to be delivered within the next few months.

At the request of participants, an *ad hoc* decision was made to include short summaries of the poster presentations in the OSM report. Invited speakers who presented key lectures were also invited to prepare a manuscript based upon their presentation, subject to peer review and publication in a special GEOHAB edition of the Elsevier journal *Harmful Algae*. The practical implementation of Core Research activities in coastal embayments is in the advanced planning stage and actual field work is anticipated by early 2005.

VI. SCOR Meeting on Coordination of International Marine Projects

Supported by the Sloan Foundation this meeting is scheduled for 23-24 September 2004 to bring together representatives of the major international ocean research and observation projects and programmes to discuss common opportunities, issues and problems. GEOHAB will be represented at the meeting by Grant Pitcher and Henrik Enevoldsen. Discussions on the interactions with GOOS will be of particular importance to GEOHAB. Mechanisms to

improve the way in which GEOHAB integrates with GOOS need to be addressed by establishing the measurements required from GOOS by GEOHAB and the potential for data from GEOHAB to enter GOOS data streams.

VII. XI International Conference on Harmful Algae

A GEOHAB stand for display was constructed at the XI International Conference on Harmful Algae in Cape Town, South Africa to promote the strategy, mission and achievements of GEOHAB.

VIII. SSC Meeting: Cape Town, South Africa

A Scientific Steering Committee meeting was held from 21-23 November 2004 following the XI International Conference on Harmful Algae in Cape Town, South Africa. The focus of this meeting was on the Core Research Projects and their implementation and future management, the development of targeted research projects [specifically those related to modelling and observation systems], data management, the development of standard measurement protocols within GEOHAB, and the establishment of an International Programme Office.

VIII. Open Science Meeting: HABs and Eutrophication

The OSM on Eutrophied Systems was held from 7-10 March 2005 in Baltimore under the leadership of Pat Glibert assisted by a planning committee of D. Anderson [USA], E. Graneli [Sweden], M. Zhou [China], J.I. Allen [UK] and M. Burford [Australia].

IX. ASLO meeting 2005

Two Special Sessions will serve to demonstrate and promote GEOHAB at the next ASLO meeting in Santiago de Compostela, Spain, in June 2005. A session on Eutrophication will be co-chaired by P. Glibert and E. Graneli and a session on Comparative Ecosystem Studies of Harmful Algal Blooms will be co-chaired by G. Pitcher, P. Gentien and A. Cembella.

X. Open Science Meeting: HABs in Stratified Systems

The OSM on Stratified Systems is scheduled for December 2005, in Paris, under the leadership of Patrick Gentien.

GEOHAB Finances

Income	**2002**	**2003**	**2004**	**2005**
Carry-over from previous year		$1,960.00	$18,231.14	-$4,268.86
NOAA (through SCOR)	$4,801.76	$0.00	$20,000.00	$0.00
NSF (through SCOR)	$20,000.00	$30,000.00	$30,000.00	$20,000.00
SCOR Support for LDC Travel		$5,000.00		
FLAD		$1,400.00		
IFREMER	$15,027.00	$6,933.00		
Registration Fees		$7,500.00	$22,500.00	
IOC	$14,050.00	$20,000.00	$20,000.00	$20,000.00
Total	$53,878.76	$72,793.00	$110,731.14	$35,731.14

Expenses	**2002**	**2003**	**2004**	**2005**
Publications		$10,000.00		
SCOR Administrative Expenses	$1,726.55	$50.42		
Subcommittees	$3,455.36			
Other Meetings	$6,776.57	$427.44		
SSC Meeting 1 IOC	$14,050.00			
SSC Meeting 1	$1,207.44		$25,000.00	$25,000.00
SSC Meeting 2 (SCOR and IOC)	$19,387.84			
SSC support and HABWATCH meeting	$5,315.00			
Editorial Committee		$6,933.00		
HABs in Upwelling Systems		$37,151.00		
HABs in Fjords and Coastal Embayments			$30,000.00	
HABs in Stratified Systems			$30,000.00	
HABs in Eutrophified Systems			$30,000.00	
Total	**$51,918.76**	**$54,561.86**	**$115,000.00**	**$25,000.00**
Remaining	$1,960.00	$18,231.14	-$4,268.86	$10,731.14

ANNEX XV

ICES-IOC WORKING GROUP ON HARMFUL ALGAL BLOOM DYNAMICS

The **ICES-IOC Working Group on Harmful Algal Bloom Dynamics** [WGHABD] (Chair: J. L. Martin, Canada) will meet in Arendal (Flødevigen Marine Research Station), Norway, from 4-7 April 2005 to:

a) review the dynamics of toxin-producing phytoplankton and associated toxins in shellfish, related to phytoplankton abundance, and phytoplankton community structure with reference to HAB population dynamics. In 2005 the focus will be PSP toxin producing phytoplankton and associated toxins in shellfish (Canada, Spain, Scotland, US, Denmark;

b) consider the status of knowledge concerning biologically active specific chemicals, their chemical nature, presence and production in algae and their effects on individuals and population dynamics, as well as their impacts on ecosystems;

c) discuss new findings that pertain to HAB dynamics, and define the main processes regulating the initiation, development and decay of individual HABs;

d) review planning progress for the proposed Workshop on New and Classic Techniques for the Determination of Numerical Abundance and Bio-volume of HAB-species;

e) prepare data on the distribution and number of harmful algal blooms in the North Sea for the period 1984 to 2004 (where available), and submit the data to the secure REGNS website in excel spreadsheet format in preparation for the for the REGNS Integrated Assessment Workshop to be held from 9-11 May 2005. The data should be averaged and presented in ICES grid spatial scale, indicating where no observations have been recorded.

f) collate and assess national reports and update the decadal mapping of harmful algal events for the IOC-ICES harmful algal database, HAE-DAT, on a regional, temporal and species basis;

g) review progress in computerised production of decadal maps from country reports, including the revision of reports already in the database covering the last 10 years and the web interface;

h) propose types of analyses that should be performed using the IOC-ICES HAE-DAT dataset and identify problems and gaps in this dataset that must be rectified before the analyses can be conducted.

The ICES-IOC-SCOR SGGIB (Study Group on GEOHAB Implementation in the Baltic) meeting will be also be in Flodevigen, Norway, (April 7-8) 2005 and a joint session will be held on 7 April.

ANNEX XVI

ICES/IOC/IMO WORKING GROUP ON BALLAST AND OTHER SHIP VECTORS

2ACME05 The ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors (WGBOSV) (Chair: S. Gollasch, Germany) will meet in Norway 14-18 March 2005 to:

(a) consider the scientific aspects of risk management of ballast water [OSPAR 2005/5] by

i. comparing and evaluating existing risk assessment and management approaches applicable to ballast water and their interlinkages, as exemplified by GloBallast risk assessments, the Australian DSS, the EMBLA system being developed by Det Norske Veritas (Norway) and the Slovenian risk assessment approach,

ii. considering how to develop:

1. criteria for the ranking of risks, i.e. to enable the determination of the likelihood of organisms transferred from one marine area surviving if transferred to another marine area (e.g. from tropical waters to the North Sea), or the likelihood of organisms surviving in ballast water / ballast tanks (for the duration of a voyage or between exchanges of ballast water/ cleaning of ballast tank sediment). Ultimately this should provide criteria for identifying "high risk" ballast water;

2. techniques for the rapid detection of non-indigenous species and for the possible containment/eradication of organisms transferred through ballast water and by other vectors. In this respect consideration should be given to sampling techniques and strategies.

(b) prepare draft responses for the CONSSO Issue Group on Sustainable Shipping (IGSS) on

i. What is the most appropriate geographical approach for a Ballast Water Management Strategy (EU, ICES, OSPAR, HELCOM),

ii. Review and comment on a preliminary version of the Scoping Study prepared under IGSS,

iii. Draft scientific advice for ACME regarding the IGSS for the "post-scoping study" phase;

(c) draft a Code of Best Practice for Ballast Water Management;

(d) In the short term, to critically review and report on the status of ballast water research including:

1. the ballast water treatment and management, the limitations thereof,

2. risk assessment approaches dealing with ship mediated invasions.

WGBOSV will report by 8 April 2005 for the attention of the Marine Habitat Committee and ACME.

ANNEX XVII

GLOSSARY OF ACRONYMS AND SPECIAL TERMS

AOAC	Association of Official Analytical Chemists
APEC	Asia Pacific Economic Cooperation
ASEAN	Association of South East Asian Nations
DANIDA	Danish International Development Agency
DSP	Diarrhetic Shellfish Poisoning
ETI	Expert Centre on Taxonomic Identification
FAO	Food and Agriculture Organization of the United Nations
GEEP	Group of Experts on the Effects of Pollutants
GEF	Global Environment Facility
GEOHAB	Global Ecology and Oceanography of Harmful Algal Blooms
GOOS	Global Ocean Observing System
IAEA	International Atomic Energy Agency
ICES	International Council for the Exploration of the Sea
ICSU	International Council of Scientific Unions
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission
IOCARIBE	IOC Sub-Commission for the Caribbean and Adjacent Regions
IPHAB	Intergovernmental Panel on Harmful Algal Blooms
ISSHA	International Society for the Study of Harmful Algae
PICES	North Pacific Marine Science Organization
PSP	Paralytic Shellfish Poisoning
SCOR	Scientific Committee on Oceanic Research
UNCED	United Nation Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WESTPAC	IOC Sub-Commission for the Western Pacific
WHO	World Health Organization

In this Series *Languages*

Reports of Governing and Major Subsidiary Bodies, which was initiated at the beginning of 1984, the reports of the following meetings have already been issued:

1.	Eleventh Session of the Working Committee on international Oceanographic Data Exchange	E, F, S, R
2.	Seventeenth Session of the Executive Council	E , F, S, R,Ar
3.	Fourth Session of the Working Committee for Training, Education and Mutual Assistance	E, F, S, R
4.	Fifth Session of the Working Committee for the Global Investigation of Pollution in the Marine Environment	E, F, S, R
5.	First Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions	E, F, S
6.	Third Session of the *ad hoc* Task team to Study the Implications, for the Commission, of the UN Convention on the Law of the Sea and the New Ocean Regime	E, F, S, R
7.	First Session of the Programme Group on Ocean Processes and Climate	E, F, S, R
8.	Eighteenth Session of the Executive Council	E, F, S, R, Ar
9.	Thirteenth Session of the Assembly	E, F, S, R, Ar
10.	Tenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific	
11.	Nineteenth Session of the Executive Council, Paris, 1986	E, F, S, R, Ar
12.	Sixth Session of the IOC Scientific Committee for the Global Investigation of Pollution in the Marine Environment	E, F, S
13.	Twelfth Session of the IOC Working Committee on International Oceanographic Data Exchange	E, F, S, R
14.	Second Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions, Havana, 1986	E, F, S
15.	First Session of the IOC Regional Committee for the Central Eastern Atlantic, Praia, 1987	E, F, S
16.	Second Session of the IOC Programme Group on Ocean Processes and Climate	E, F, S
17.	Twentieth Session of the Executive Council, Paris, 1987	E, F, S, R, Ar
18.	Fourteenth Session of the Assembly, Paris, 1987	E, F, S, R, Ar
19.	Fifth Session of the IOC Regional Committee for the Southern Ocean	E, F, S, R
20.	Eleventh Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Beijing, 1987	E, F, S, R
21.	Second Session of the IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean, Arusha, 1987	E, F
22.	Fourth Session of the IOC Regional Committee for the Western Pacific, Bangkok, 1987	E only
23.	Twenty-first Session of the Executive Council, Paris, 1988	E, F, S, R
24.	Twenty-second Session of the Executive Council, Paris, 1989	E, F, S, R
25.	Fifteenth Session of the Assembly, Paris, 1989	E, F, S, R
26.	Third Session of the IOC Committee on Ocean Processes and Climate, Paris, 1989	E, F, S, R
27.	Twelfth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Novosibirski, 1989	E, F, S, R
28.	Third Session of the Sub-Commission for the Caribbean and Adjacent Regions, Caracas, 1989	E, S
29.	First Session of the IOC Sub-Commission for the Western Pacific, Hangzhou, 1990	E only
30.	Fifth Session of the IOC Regional Committee for the Western Pacific, Hangzhou, 1990	E only
31.	Twenty-third Session of the Executive Council, Paris, 1990	E, F, S, R
32.	Thirteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, New York, 1990	E only
33.	Seventh Session of the IOC Committee for the Global Investigation of Pollution in the Marine Environment, Paris, 1991	E, F, S, R
34.	Fifth Session of the IOC Committee for Training, Education and Mutual Assistance in Marine Sciences, Paris, 1991	E, F, S, R
35.	Fourth Session of the IOC Committee on Ocean Processes and Climate, Paris, 1991	E, F, S, R
36.	Twenty-fourth Session of the Executive Council, Paris, 1991	E, F, S, R
37.	Sixteenth Session of the Assembly, Paris, 1991	E, F, S, R, Ar
38.	Thirteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Baja California, 1991	E, F, S, R
39.	Second Session of the IOC-WMO Intergovernmental WOCE Panel, Paris, 1992	E only
40.	Twenty-fifth Session of the Executive Council, Paris, 1992	E, F, S, R
41.	Fifth Session of the IOC Committee on Ocean Processes and Climate, Paris, 1992	E, F, S, R
42.	Second Session of the IOC Regional Committee for the Central Eastern Atlantic, Lagos, 1990	E, F
43.	First Session of the Joint IOC-UNEP Intergovernmental Panel for the Global Investigation of Pollution in the Marine Environment, Paris, 1992	E, F, S, R
44.	First Session of the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms, Paris, 1992	E, F, S
45.	Fourteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Paris, 1992	E, F, S, R
46.	Third Session of the IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean, Vascoas, 1992	E, F
47.	Second Session of the IOC Sub-Commission for the Western Pacific, Bangkok, 1993	E only
48.	Fourth Session of the IOC Sub-Cornmission for the Caribbean and Adjacent Regions, Veracruz, 1992	E, S
49.	Third Session of the IOC Regional Committee for the Central Eastern Atlantic, Dakar, 1993	E, F
50.	First Session of the IOC Committee for the Global Ocean Observing System, Paris, 1993	E, F, S, R
51.	Twenty-sixth Session of the Executive Council, Paris, 1993	E, F, S, R
52.	Seventeenth Session of the Assembly, Paris, 1993	E, F, S, R
53.	Fourteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Tokyo, 1993	E, F, S, R
54.	Second Session of the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms, Paris, 1993	E, F, S
55.	Twenty-seventh Session of the Executive Council, Paris, 1994	E, F, S, R
56.	First Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Melbourne, 1994	E, F, S, R
57.	Eighth Session of the IOC-UNEP-IMO Committee for the Global Investigation of Pollution in the Marine Environment, San José, Costa Rica, 1994	E, F, S
58.	Twenty-eighth Session of the Executive Council, Paris, 1995	E, F, S, R
59.	Eighteenth Session of the Assembly, Paris, 1995	E, F, S, R
60.	Second Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1995	E, F, S, R

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61.	Third Session of the IOC-WMO Intergovernmental WOCE Panel, Paris, 1995	E only
62.	Fifteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Papetee, 1995	E, F, S, R
63.	Third Session of the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms, Paris, 1995	E, F, S
64.	Fifteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange	E, F, S, R
65.	Second Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1995	E only
66.	Third Session of the IOC Sub-Commission for the Western Pacific, Tokyo, 1996	E only
67.	Fifth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions, Christ Church, 1995	E, S
68.	Intergovernmental Meeting on the IOC Black Sea Regional Programme in Marine Sciences and Services	E, R
69.	Fourth Session of the IOC Regional Committee for the Central Eastern Atlantic, Las Palmas, 1995	E, F, S
70.	Twenty-ninth Session of the Executive Council, Paris, 1996	E, F, S, R
71.	Sixth Session for the IOC Regional Committee for the Southern Ocean and the First Southern Ocean Forum, Bremerhaven, 1996	E, F, S,
72.	IOC Black Sea Regional Committee, First Session, Varna, 1996	E, R
73.	IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean, Fourth Session, Mombasa, 1997	E, F
74.	Nineteenth Session of the Assembly, Paris, 1997	E, F, S, R
75.	Third Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1997	E, F, S, R
76.	Thirtieth Session of the Executive Council, Paris, 1997	E, F, S, R
77.	Second Session of the IOC Regional Committee for the Central Indian Ocean, Goa, 1996	E only
78.	Sixteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Lima, 1997	E, F, S, R
79.	Thirty-first Session of the Executive Council, Paris, 1998	E, F, S, R
80.	Thirty-second Session of the Executive Council, Paris, 1999	E, F, S, R
81.	Second Session of the IOC Black Sea Regional Committee, Istanbul, 1999	E only
82.	Twentieth Session of the Assembly, Paris, 1999	E, F, S, R
83.	Fourth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1999	E, F, S, R
84.	Seventeenth Session of the International Coordination Group for the Tsunami Warning System in the Pacific, Seoul, 1999	E, F, S, R
85.	Fourth Session of the IOC Sub-Commission for the Western Pacific, Seoul, 1999	E only
86.	Thirty-third Session of the Executive Council, Paris, 2000	E, F, S, R
87.	Thirty-fourth Session of the Executive Council, Paris, 2001	E, F, S, R
88.	Extraordinary Session of the Executive Council, Paris, 2001	E, F, S, R
89.	Sixth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions, San José, 1999	E only
90.	Twenty-first Session of the Assembly, Paris, 2001	E, F, S, R
91.	Thirty-fifth Session of the Executive Council, Paris, 2002	E, F, S, R
92.	Sixteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Lisbon, 2000	E, F, S, R
93.	Eighteenth Session of the International Coordination Group for the Tsunami Warning System in the Pacific, Cartagena, 2001	E, F, S, R
94.	Fifth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 2001	E, F, S, R
95.	Seventh Session of the IOC Sub-commission for the Caribbean and Adjacent Regions (IOCARIBE), Mexico, 2002	E, S
96.	Fifth Session of the IOC Sub-Commission for the Western Pacific, Australia, 2002	E only
97.	Thirty-sixth Session of the Executive Council, Paris, 2003	E, F, S, R
98.	Twenty-second Session of the Assembly, Paris, 2003	E, F, S, R
99.	Fifth Session of the IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean, Kenya, 2002 (* Executive Summary available separately in E, F, S & R)	E*
100.	Sixth Session of the IOC Intergovernmental Panel on Harmful Algal Blooms, St. Petersburg (USA), 2002 (* Executive Summary available separately in E, F, S & R)	E*
101.	Seventeenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Paris, 2003 (* Executive Summary available separately in E, F, S & R)	E*
102.	Sixth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 2003 (* Executive Summary available separately in E, F, S & R)	E*
103.	Nineteenth Session of the International Coordination Group for the Tsunami Warning System in the Pacific, Wellington, New Zealand, 2003 (* Executive Summary available separately in E, F, S & R)	E*
104.	Third Session of the IOC Regional Committee for the Central Indian Ocean, Tehran, Islamic Republic of Iran, 21-23 February 2000	E only
105.	Thirty-seventh Session of the Executive Council, Paris, 2004	E, F, S, R
106.	Seventh Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 2005 (* Executive Summary available separately in E, F, S & R); and Extraordinary Session, Paris, 20 June 2005	E*
107.	First Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Perth, Australia, 3–5 August 2005	E only
108.	Twentieth Session of the Intergovernmental Coordination Group for the Tsunami Warning System in the Pacific, Viña del Mar, Chile, 3–7 October 2005 (* Executive Summary available separately in E, F, S & R)	E*
109.	Twenty-Third Session of the Assembly, Paris, 21–30 June 2005	E, F, S, R
110.	First Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS), Rome, Italy, 21–22 November 2005	E only
111.	Eighth Session of the IOC Sub-commission for the Caribbean and Adjacent Regions (IOCARIBE), Recife, Brazil, 14–17 April 2004 (* Executive Summary available separately in E, F, S & R)	E*
112.	First Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions (ICG/CARIBE-EWS), Bridgetown, Barbados, 10–12 January 2006	E only
113.	Ninth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE), Cartagena de Indias, Colombia, 19–22 April 2006 (* Executive Summary available separately in E, F, S & R)	E S*

114.	Second Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Hyderabad, India, 14–16 December 2005	E only
115.	Second Session of the WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology, Halifax, Canada, 19–27 September 2005 (Abridged final report with resolutions and recommendations)	E, F, R, S
116.	Sixth Session of the IOC Regional Committee for the Western Indian Ocean (IOCWIO), Maputo, Mozambique, 2–4 November 2005 (* Executive Summary available separately in E, F, S & R)	E*
117.	Fourth Session of the IOC Regional Committee for the Central Indian Ocean, Colombo, Sri Lanka 8–10 December 2005 (* Executive Summary available separately in E, F, S & R)	E*
118.	Thirty-eighth Session of the Executive Council, Paris, 20 June 2005 (Electronic copy only)	E, F, R, S
119.	Thirty-ninth Session of the Executive Council, Paris, 21–28 June 2006	E, F, R, S
120.	Third Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Bali, Indonesia, 31 July–2 August 2006	E only
121.	Second Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS), Nice, France, 22–24 May 2006	E only
122.	Seventh Session of the IOC Intergovernmental Panel on Harmful Algal Blooms, Paris, France, 16–18 March 2005 (* Executive Summary available separately in E, F, S & R)	E*