DRAFT MINUTES
of
PARTNERSHIP FOR OBSERVATION OF THE GLOBAL OCEANS
(POGO-4)

22 – 24 January, 2003

Wrest Point Casino Hotel, Hobart, Tasmania, Australia

Wednesday, January 22

Opening
Chair: Nan Bray

Dr. Nan Bray, the outgoing Chief of CSIRO Marine Research welcomed the participants to Hobart, and introduced the incoming Chief, Dr. Tony Haymet. Dr. Kennel then called for the adoption of the agenda, which was passed with minor modifications. The minutes of the Third Meeting of POGO were approved without any changes.

In his opening remarks, Dr. Howard Roe, the new Chair of POGO, noted that POGO had just completed the first cycle of a POGO Chair in office: Dr. Kennel was stepping down, and Dr. Roe was taking over from him. He noted that POGO had come a long way since its beginning five years ago in Paris. At that meeting, the participants felt that there was room for an organisation with a difference, which would provide a forum to unite oceanographic institutions with the capability to implement an ocean observation system. A couple of years later, Dr. Sathyendranath joined POGO as executive director. POGO has had regular meetings since its inception, and has had some influence on the implementation of GOOS. POGO has initiated capacity-building activities, and has been building an international reputation. He mentioned that the WSSD documents from the Johannesburg meeting made reference to POGO, and a POGO initiative. All this was achieved under the chairmanship of Dr. Kennel, and these were achievements of which Dr. Kennel should be justly proud. He thanked Dr. Kennel, and said he was grateful that Dr. Kennel would stay on the Executive Committee of POGO for the next two years.

Dr. Roe noted that on the last day of the meeting, there was an agenda item to discuss possible themes for POGO-5. As possible themes, he proposed evaluation of the progress of ocean observing systems and discussion of avenues for the future, or the implementation of coupled biological and physical observations. Regional foci might be the Pacific Ocean, the polar oceans or the deep ocean. He requested POGO members to consider these and other agenda items for POGO-5.

Chair: Nan Bray
Main Themes: Regional Focus: Indian Ocean

Argo in the Indian Ocean; climate observations: Susan Wijffels
In this session, which was chaired by Dr. Nan Bray, the first presentation was by Dr. Susan Wijffels (CSIRO), who spoke about the Argo programme and climate observations in the Indian Ocean. She highlighted the scientific background and the factors that differentiate the Indian Ocean from the other oceans: dominant

intraseasonal variability in the tropical Indian Ocean, correlation between rainfall anomalies in equatorial eastern Africa and oceanic conditions, and relationships with ENSO. Interannual and decadal time scale phenomena also set apart the Indian Ocean from other regions. She emphasised the need for observation systems to capture such phenomena. Salinity shows freshwater anomaly in deep waters. Predictions of greenhouse gas-induced changes in ocean properties along 32^{o} S in the Indian Ocean have been consistent with observations. She noted that the Indian Ocean was a particularly good place to look for climate-change signals.

Dr. Wijffels then emphasised the inadequacy of existing *in situ* observing systems, which has large gaps in space and time. In particular, salinity shows great variability. Use of climatological Temperature – Salinity plots, in the absence of local measurements, could produce large errors in computed dynamic heights, which in turn could impact extrapolation of satellite altimeter information through the water column. Argo should help eliminate some of these errors. Existing Argo coverage (including the French FLOSTRAL Cruise) in the Indian Ocean is intermittent, at about 50% of the desired coverage. Planned deployments should improve the status, but reaching 100% requires a further effort. Sustained funding is also an issue. POGO might be helpful at advocating the need at government level. POGO could also facilitate awareness and applications of Argo and GODAE products in member countries and institutions to ensure that Argo has a strong user base.

With respect to moorings, Dr. Wijffels noted that there were prospects for a pilot tropical mooring array, with participation from India, USA, Japan and France. Plans exist for 40 deep-ocean moorings in the North Indian Ocean. At the Mauritius meeting in November 2002, an IO-GOOS Working Group was formed for Moorings. Initial priorities identified by this working group are to work on the scientific design of a mooring array and coordination of planned efforts. Access to ship time is critical, and perhaps POGO could be of help there. She noted that XBT arrays were a cost-effective way to cover gaps in observations. There is a need for new line between Australia and Africa.

One of the major challenges is lack of awareness. There is a perception that the Indian Ocean is not as important to global climate as other regions. Regional impacts are large, but not global impacts. Scientific case required further development. Regional nations do not have the necessary resources. North-South co-operation is needed and POGO could help. The map of deep-ocean observatories produced by the Time Series Working Group shows north-south disparity, favouring waters of the Northern Hemisphere. Some basins do not have planned time-series stations. EEZ is another issue, and potentially a real disincentive to working in the Indian Ocean region. Problem is that the UNCLOS mechanism is cumbersome, and there is lack of trust between institutions and governments. The IO-GOOS is a start to addressing some of these problems. Lack of access to some of the regional governments, logistics and lack of partners from the region are also part of the problem. Solution might lie in stronger north-south institutional partnership.

During discussions, Dr. Kennel mentioned the experiment that focused on the Asian “brown cloud”. Seasonal winds blow clouds from the Indian subcontinent towards the sea. These particles, which contain a high proportion of carbon, absorb about 10% of the light reaching the sea surface. The seasonal signal has been building up since 1980, and the trend was expected to continue. Oceanographic consequences might be worth considering in the future. Evaporation rates might be affected, and hydrological changes might bear some relationship to this effect. Regional impact on droughts, for example in Pakistan, merit further study. Climatic

effect probably occurs over the Pacific. Addressing this question would require collaboration with atmospheric scientists.

Dr. Malone enquired about the ideal coverage of Argo, and the rationale behind the recommended coverage. Dr. Wijffels replied that the design phase of Argo included a simulation phase, on which the recommendations were based.

Dr. de Leeuw noted that NIOZ was involved in implementing a mooring array off Mozambique in collaboration with many partners. Dr. Sathyendranath drew attention to the report of the IO-GOOS Working Group on Moorings, which was made available to the participants.

CLIVAR: Howard Cattle

Dr. Howard Cattle began his presentation on CLIVAR with some background material. It is a programme within the World Climate Research Programme (WCRP). CLIVAR focuses on variability and predictability of the slowly-varying components of the climate system. Physical and dynamic variability at various time scales (seasonal, interannual, decadal and centennial) are studied within CLIVAR. It is also concerned with anthropogenic effects on the system. Principal research areas cover topics associated with the monsoons, tropical modes, extra-tropical modes, thermohaline circulations and anthropogenic climate change. Climate change detection, prediction and attribution are amongst the goals. CLIVAR has several panels and working groups, including panels for the Atlantic, Pacific and Southern Oceans. As yet, it has no Indian Ocean panel, but establishment of one is under discussion. The existing basin panels are intended to help implementation of CLIVAR. The CLIVAR Ocean Observations Panel and its relation to the Ocean Observation Panel for Climate (OOPC) are under discussion. There are other working groups, including one on coupled modelling,

Dr. Cattle then spoke about CLIVAR and ocean observations. WOCE came to an end in December 2002, with a final conference held in San Antonio, USA, in November. The Joint Scientific committee for WCRP has requested that CLIVAR take on within WCRP the objective of understanding the role of ocean on climate and long-term ocean variability, as a follow up to WOCE. CLIVAR has a clear need for sustained ocean observations. Observations on physical, carbon and other biogeochemical properties are required. The last two will be important as biogeochemical cycles begin to be included more in predictions of anthropogenic impact on climate change.

With respect to the Indian Ocean, Dr. Cattle noted that an improved observational network was required in the region to support understanding and prediction of the Asian – Australian monsoon system and variability of African climate. Key aspects of Indian Ocean CLIVAR are the role of air-sea interaction and land surface processes for the annual variability of the Asian monsoon. The CLIVAR Implementation Plan includes discussion of the Indian Ocean observational needs of CLIVAR. A key issue is the need for sustained observations. With respect to CLIVAR requirements for hydrographic resurvey, he noted that there was room for more commitment for reoccupation of WOCE survey lines across the Indian Ocean. POGO could play an important advocacy role with respect to Indian Ocean observations, as well as help with instrument deployment and with capacity building efforts in the region.

Global Climate Observation System: Neville Smith

Dr. Neville Smith (BMRC), on behalf of Dr. Ed Harrison, presented a talk on the OOPC (Ocean Observations Panel for Climate), which met last in Kiel on June 5 – 9, 2002, under his Chairmanship. A comprehensive report "Observing the oceans in the 21st Century (600 pages) was published in December 2001. A strong emphasis of OOPC projects has been on the need for real-time, high-quality data availability, for a global ocean time-series observatory system, for a more comprehensive programme for ocean carbon monitoring (pCO_2 , ocean colour, hydrography). OOPC activities include regional workshops. UNFCCC/GCOS Adequacy Report 2002 – 2003 (review and assessment of the climate observing system), data and information management through GOOS. With respect to the Adequacy Report, the emphasis in oceanography is on investing in, and sustaining, a global observing system. Argo is a major advance. There is also a need for sustained hydrography, for an integrated approach to enhance effectiveness, for high-quality data systems. He noted that there were increasingly productive interactions with coastal observations (links with "common variables" identified by the COOP Panel, modelling). POGO's role with respect to data management is important.

Southern Ocean Observations: Steve Rintoul

Dr. Steve Rintoul (CSIRO) focused his presentation on the state of the art in Southern Ocean research, highlighting exciting results, the way forward, and what POGO could do to help.

The Antarctic Circumpolar Current (ACC) links all three of the major oceans. There are two circumpolar fronts. During WOCE years, major progress was made in observing the Southern Ocean. SST gradients from ATSR reveal multiple filaments and branches, which merge and split. Observations are different from earlier concepts. There are surprising results regarding the heat transport by ACC: repeat sections show heat transport south of Australia varies greatly.

Southern Ocean impacts world oceans though formation of the bottom water mass. Not much progress has been made in this study since Sverdrup and colleagues decades ago: the magnitude of the transports is still unknown. High-quality tracer data help quantify total amount of bottom water formation, and to identify new sources. Studies in polynia help understand some of these processes further. Air-sea fluxes drive water mass transport in the Southern Ocean, which close the loop of the global overturning circulation cells. Climate models suggest that Southern Ocean overturning would slow down as a result of global warming. Verification of model results require observations. Waters subducted in the southern hemisphere make the dominant contribution to the equatorial Pacific thermocline. Testing links to ENSO variability also require observations. The Southern Ocean is the largest zonally-integrated sink of anthropogenic CO_2.

Ice in the Southern Ocean is a key element of climate. One of the concerns is that the extent of sea ice would decrease, which could have a major impact on the marine ecosystem. Dr. Rintoul then discussed why it was essential to make observations in the oceans of the southern hemisphere. One is the new realisation of the role of the Southern Ocean in closing the overturning circulation. Southern Ocean plays an important role in the uptake of carbon. It is a useful place for detection of climate change; climate variability in SH nations; constraining basin-scale heat and freshwater budgets; global temperature response to greenhouse gas; sea level rise; decadal variability of ENSO; marine resource management; and biodiversity.

It is not easy to make measurements in the Southern Ocean (remote, inhospitable). But new technology is emerging. Dr. Rintoul recommended sustained observations in the Southern Ocean. Repeat hydrography and XBT lines are desirable. Australian plans to deploy a significant array of floats are underway. Argo deployments are crucial in the Southern Ocean.

POGO could help by continuing to drive home the message of the São Paulo Declaration. POGO could help with meeting the need for Argo, time series and repeat sections. POGO could facilitate north-south partnerships to initiate, maintain, and utilise the SH observations. It could also enhance the coordination, communication and synergy between physics and biology programmes (e.g., GLOBEC and CLIVAR).

Chair: Jan de Leeuw
Regional Focus: Indian Ocean

Direction of IOGOOS: Bill Erb

Dr. Erb (IOC) gave credit to Dr. Gary Meyers, who was one of the organisers of the SOCIO meeting on the Indian Ocean, which was instrumental in identifying priorities. The New Delhi summit on Indian Ocean GOOS called for an implementation plan. Subsequently, the Mauritius meeting took place in November 2002. Several smaller meetings took place within this umbrella, on ocean climate, coastal observations, data, remote sensing, and the various regional GOOS initiatives around the Indian Ocean (GOOS Africa, Western Australia GOOS). There were 170 participants from 24 countries and they were very enthusiastic. It was a unique opportunity for participants from the region to interact. The Coastal GOOS participants developed some pilot plans. Capacity building is recognised as being very important, especially for data management and networking, and use of products from observing systems. The Indian Ocean is very much like the South Pacific, in that the South Pacific is expected to be more of a user than a deployer of observing systems.

The IO-GOOS has a secretariat in Hyderabad in India. Dr. K. Radhakrishnan, Director of the National Centre for Ocean Information System, is the Chairman. IO-GOOS has a web site. The Indian government has pledged to support the Secretariat for 6 years. The Indian Ocean GOOS strategy was adopted at Mauritius. The IO-GOOS organisation called for participation from institutions from within and outside the region. The idea came from early scientific expeditions in the Indian Ocean region, in which international participation played an important role.

Capacity building and awareness building are recognised to be very important. Need for making inventories for the region for data, network and communications is identified. There was a call for workshops, for example for the use of satellite data. POGO institutions were invited to participate. The response had been very good.

Dr. Erb noted that the IO-GOOS Secretariat needed support from the outside, especially with communication and building contacts. As an example, he invited POGO participants to inform IO-GOOS about plans for observations in the region, through the web site. The Report of the Mauritius meeting was expected to be available soon. POGO members could get copies of the report.

It would be beneficial to develop POGO links between POGO members and institutions of the region. He urged POGO members to develop collaboration in the region and to formalise such collaboration through MOU's. POGO members have good connections to funding agencies, which could be very useful. Sharing of data is important, as is demonstrating that the efforts provided benefit to region.

Dr. Roe noted the desirability of establishing links between the IO-GOOS working groups and a potential CLIVAR Indian Ocean Panel.

The Coastal GOOS Perspective: Tom Malone

In his talk, Dr. Malone noted that the COOP design plan was ready. The coastal module of GOOS design considerations and conceptual design was ready for printing. The needs for coastal observation system are very different from those of global scale observations. The need is for a grass roots approach. Most of the phenomena of interest to COOP are local expressions of larger systems. The drivers of these phenomena are people, airsheds, coastal drainage basins and ocean basins. Coastal GOOS is a major user of open-ocean GOOS. Coastal phenomena and activities of interest include marine operations/natural hazards, health, public health, ecosystem health and living marine resources. Observing systems have to address a series of issues.

Design considerations account for diverse scales of variability; local expressions of global scale forcings and ecosystem theory. Priorities vary among nations and regions. Regional bodies are the most effective avenue for product development and interfacing with user groups. Many building blocks of GOOS already exist. Operational capabilities are most developed for marine services, natural hazards and climate. Capacity to contribute varies between nations. Regional observing systems are best be developed by stakeholders in the respective regions. A global coastal network is needed to measure and manage variables required by most regions.

Coastal module has two components: GOOS regional alliances (GRA), and global coastal network. Implementing the coastal module is envisioned through a global federation of GRA's.

Turning his attention to the Indian Ocean region, Dr. Malone noted that, at the first conference on IOGOOS, a 2-day coastal session was held. The goals were to promote interactions among coastal scientists; to achieve consensus on two or three priority phenomena of interest; and to initiate a process to develop Indian Ocean GRA's and pilot projects. Seventy-five participants from 15 countries attended the coastal session. The high priority phenomena of interest identified were coastal erosion and flooding and habitat, and biodiversity. Sustainable fisheries also emerged as being very important. An IO-GOOS development committee for COOP was established at this session, as well as working groups to take forward the pilot projects. Interaction between coastal and open-ocean components of IO-GOOS was begun. Such links are necessary for the success of the open-ocean component. Capacity building (data management) was identified as being of the highest priority.

One of the major challenges is sustaining the momentum generated at the meeting. The development of ocean-climate pilot projects in the region has to be linked with coastal pilots. Funding is a huge issue. Networking coastal laboratories could be an effective mechanism for addressing many issues, for example those related to exchange of data and information.

The selection of common variables for COOP observations was based on identification of the minimum set of variables required to address the maximum number of phenomena of interest and to satisfy the needs of a maximum number of users. The analysis undertaken to identify these common variables highlighted the need for regional supplement to enhance the global observing elements.

Dr. Knap highlighted the links between COOP and the POGO Biology initiative. Dr. Ausubel noted that sound in water, whether it be from natural sources,

scientific instruments, or generated by man, could be used successfully as an important element of coastal observations.

Dr. Kennel enquired whether a filter was applied to the selection of common variables for economic and security considerations. Dr. Malone responded that there was no capacity in the panel to do such an analysis. Dr. Kennel remarked that it would be easier to establish data exchange mechanisms if the list of variables were non-controversial. Dr. Malone responded that the objective approach was used in an effort to minimise controversy.

Issues in Biodiversity: Keith Sainsbury

Dr. Sainsbury (CSIRO) then spoke about high-seas biodiversity of the Indian Ocean. The topography, biogeochemical provinces and the Exclusive Economic Zoned of the Indian Ocean provided the general setting on which he analysed the information. Dr. Sainsbury noted that all major ocean habitats were represented in the Indian Ocean. But they are very poorly known. For example, there are only three locations of scientific sampling of sea mount fauna to date. He gave an overview of what is expected and known of biodiversity of the abyssal plain (low abundance, but exceptional diversity). The sea mounts, ridges and plateaux of the Indian Ocean provide greatly varying habitats, many coral species, hard coral beds and a diverse range of associated organisms. Any new survey led to the discovery of new species. He emphasised French work in the description of these species. Deep-ocean species are of limited spatial coverage, long-lived, and hence at threat if disturbed. Human activities (shipping and pollution, exploration and development of poly-metallic nodules, and fishing) are among the main threats. Mid-water fishing (tuna and billfish) is very large and rapidly growing. By-catch is not recorded or monitored, and biodiversity impacts are essentially unknown. Bottom trawl catch from the high seas is in rapid development in the last few years (involving EU vessels). Local impact is very severe. An internationally co-ordinated, in-depth review of the Indian Ocean high-seas biodiversity, including quality-assured sampling from fisheries, is needed to establish a baseline map and database of biodiversity for risk assessment of the impact of human activities.

Dr. Kennel asked if we knew enough to identify some marine conservation areas. Dr. Sainsbury said there was enough information to make a good attempt to identify some key habitats worthy of protection. There has been a lot of discussion lately. The problem is that no international mechanism existed to establish and maintain such areas. Well-placed islands should be encouraged to set an example.

JAMSTEC time-series observation for biogeochemistry: Makio Honda

Dr. Honda (JAMSTEC) then presented the JAMSTEC time-series observations for biogeochemistry. The programme is intended to study the carbon biological pump. Sediment trap experiments in various oceanic regions have shown the dominant role of the biological pump in the North Pacific. Ocean-colour satellite data have been used to evaluate the global primary production, from which new production (export flux) was derived. However, many uncertainties remain, and JAMSTEC has initiated a new programme (called HiLATS) using newly-designed instrumented moorings, deployed from the *RV Mirai*, likely the largest research vessel in the world (this vessel has been converted from military naval force). Preliminary results were encouraging.

Mr. Chijiya (Executive Director of JAMSTEC) indicated that, though this programme was not in the Indian Ocean, JAMSTEC was willing to work with POGO to extend such activities in the global ocean.

Chair: Jean-Louis Fellous
Data Issues

The meeting continued after lunch. The session was on Data Issues, and was chaired by Dr. Jean-Louis Fellous (IFREMER).

Ocean Biogeographical Information System (OBIS): Jesse Ausubel
Jesse Ausubel (Sloan Foundation) presented an update on the activities of the Census of Marine Life, focusing on the Ocean Biogeographical System of CoML. The CoML Steering Committee had just met in Hobart prior to the POGO meeting. He expressed his appreciation of the co-operative spirit that existed between POGO and the CoML program. He reviewed the history and status of the OBIS, which aimed at providing the next generation of information infrastructure for ocean biodiversity studies. Initial ideas were developed in 1997, a demonstration Web site was built in 1998, an international workshop took place in 1999, and OBIS started to develop through pilot projects in 2000. OBIS is a relational data base, providing biogeographical data services, and new services are becoming available. A brief demonstration of the capabilities offered was given: on-line specimen mapping (abundance, tracks, etc.) at global or regional level, superimposed onto bathymetric maps, temperature and salinity data, chlorophyll concentrations, surveys, stations, etc. OBIS works as a federation of experts stratified into taxonomic groups or into regional or global habitats. Challenges for OBIS are to gather information on more taxonomic groups, more habitats (including, e.g., Indian Ocean), and to improve governance (management, funding, ownership). POGO institutions might be a major force in ensuring maintenance, archiving and access to data.

Dr. de Leeuw raised the issue of microbial life. The issue of exclusive rights was also mentioned.

Report of POGO Working Group on Data Issued: Shubha Sathyendranath
Shubha Sathyendranath (POGO Secretariat) reported on the activities regarding data issues since last meeting. An *ad hoc* working group was formed with Roy Lowry, Savi Narayanan, and Shubha Sathyendranath as members. The approach to the main issues (data archiving, institutional data policy, data dissemination, exchange of data) had been to investigate the practices within the members through a questionnaire. Responses varied strongly from one agency to the next. Some (e.g., IFREMER) have a well-established policy, while others only follow loose guidelines. She summarised the major concerns expressed throughout about data archiving, management and distribution. POGO institutions could help each other in many ways to improve the situation. The survey did not obtain any significant feedback on biological data issues, so a study had been conducted by Mr. Roy Lowry, and a set of recommendations was derived, and presented.

The issue of data policies versus existing legislation was raised. Dr. Fellous drew the attention of the participants to the Sea Data Net proposal, submitted as an Expression of Interest to the EU 6th Framework Project, which provides a useful reference (flyer was made available).

Current Efforts and Issues in Data Management: Neville Smith
Dr. Neville Smith (BMRC) talked about a new project called the Ocean Information Technology Pilot Project. He reminded the delegates of the rationale that he had

already presented at POGO-2 (the need for effective telecommunications, requirement for common standards, practices and protocols, need for data and products matched for users, innovative data enquiry, access and delivery mechanisms, need for interoperability). Improved telemetry, metadata management, data assembly, quality control, archive, interfaces, etc were taking place. A meeting took place in Brussels on November 29, 2002. The OIT (Ocean Information Technology) pilot project was unanimously approved, as long as it remained focused, and works in co-ordination with JCOMM, GOOS and IODE. Some building blocks are already in place, and OIT is to take advantage of existing relevant national and international activities. Initial questions (developing an agreed vocabulary, complete, consistent, searchable metadata, etc.) were discussed briefly. An OIT metadata management project has been initiated, with a goal to reach an agreement on a standard within a year. Concerning data circulation and services, the accent is on timeliness and efficiency. The US IOOS model was exemplified for reference. GODAE is an example of projects where real time data availability was prominent. Concerning data assembly, quality control, data set integrity, ARGO (or GOSUD) offers good reference models. The OIT project would not include activities on archive (already dealt with elsewhere), nor on user interface, biological data, or instrument standards. In conclusion, Dr. Smith noted that the project was well received. The government of Flanders has offered to host an Ocean Information Technology Centre in Oostende.

The meeting broke up for coffee, after which participants reconvened in breakout sessions. There were three breakout sessions, with chairs as listed below:

Southern Ocean: Chairs: Steve Rintoul and Howard Roe
Indian Ocean: Chairs: John Field and Ian Poiner
Data Issues: Chairs: Neville Smith and Edward Hill

The meeting adjourned at 18:00, after which there was an Informal Reception hosted by CSIRO in the Exhibition Foyer of Wrest Point Conference Centre.

Thursday, January 23
Chair: Charlie Kennel
Capacity Building

Fellowship Programme and SEREAD: Shubha Sathyendranath
Shubha Sathyendranath reported briefly on the program implemented jointly with IOC and SCOR. The priorities for 2002 remained unchanged. Some 22 applications were received from developing countries, out of which 13 were selected. For 2003 it was proposed to keep the same priorities (ARGO floats, fixed point time series, biological observations, emerging technologies), plus one on data management and distribution, with regional focus on the Indian Ocean and targeted fellowship for trainees to embark on the JAMSTEC *R/V MIRAI* Southern Hemisphere cruise. She reported that the IOCCG was willing to be partners in the *Mirai* training programme, for those trainees interested in bio-optical measurements. The members felt that the *Mirai* Southern Hemisphere cruise was a golden opportunity not to be missed. The members approved the action.

Dr. Sathyendranath also reported on the SEREAD programme, which is aimed at developing resource material and training for primary schools teachers for

introducing oceanography (emphasising the Argo programme) at school levels. The programme had made great progress in the last year, under the stewardship of Dr. Julie Hall. The first teacher-training workshop had been held in Cook Island, and the response from teachers was excellent. The resource material was being revised based on feedback received from teachers. She recommended that the POGO support of the programme continue.

The GOOS Capacity Building Initiative: Tom Malone

Dr. Malone gave a brief summary of the first meeting of the GOOS capacity building panel. He informed the participants of the major action items that emerged from the meeting, and requested POGO participation in the initiatives.

JAMSTEC *Mirai* Cruise in the S. Hemisphere: Yasushi Yoshikawa

Dr. Yasushi Yoshikawa (JAMSTEC) elaborated on the plans for a Southern Hemisphere cruise of the *R/V Mirai*. The cruise is to begin on August 7, 2003 and terminate on February 13, 2004. It would consist of 6 legs, including CTD transects, paleo-oceanographic measurements, moorings visits, and deployment of floats, The cruise is to start from Brisbane, and will proceed to Tahiti, Valparaiso, Sao Paulo, Cape Town, Port Louis, and Fremantle. Collaboration with many institutes (CSIR Australia, BIO Canada, SOC UK, US ARGO program, and institutes from Chile, Brazil, Namibia, South Africa, Mozambique, Madagascar, Mauritius) is planned. There are provisions for participation of observers from bordering countries, and of trainees. It is planned to send up to three POGO trainees on each leg of the cruise.

SA Biodiversity Workshop, Austral Summer Institute, Primary Production Training Course: Victor Ariel Gallardo

Dr. Gallardo (University of Concepción) spoke of a series of successful events (workshop, summer school, training course) which took place in Chile in 2002, with support from POGO.

In organising the workshop on biodiversity, South American country co-ordinators were first selected. They were assigned the task of producing a synthesis of what was known, what is unknown and what is unknowable. At the workshop, which was organised jointly by POGO and CoML, there were plenary presentations from POGO, CoML and from participating countries. The participants then split into two working groups: one group focused on developing research ideas and the other on data issues.

Research ideas discussed included expanding pre-existing CoML projects into South America, and new project ideas. Participation in NAGISA, HMAP, FMAP and TOPP were discussed. New projects discussed included a regional biodiversity project, a major river plumes project, a study of the upwelling zones, and of the oxygen minimum zone. The ideas were to be developed by the South American committee on CoML. A South American CoML Steering Committee was formed at the workshop. The participants agreed on a SA-OBIS, a SA_NAGISA, a SA_BASIC biodiversity project, and on the development of new ideas.

Speaking next of the Austral Summer Institute (ASI), which was funded by a South American private foundation, Dr. Gallardo mentioned that the project was carried out jointly with WHOI. The third ASI was happening at the same time as the POGO meeting. The second ASI took place in January 2002 in Dichato. POGO financed international participation of trainees in the ASI. The subject matter of the 2003 summer institute was ocean observations. POGO had financed 10 students from

South American countries (other than Chile). Two more summer institutes are planned. They are looking at ways to continue the programme afterwards.

A course on Primary Production Course was also organised at UdeC in 2003 with support from POGO and several other organisations. In all, twenty-eight students participated.

Dr. Kennel congratulated UdeC on their activities in capacity building. Dr. de Leeuw asked whether the role of benthic communities was discussed at the biodiversity meeting. Dr. Gallardo responded that there were some benthic studies were being carried out in Chile. Furthermore, the NAGISA project focused on benthos.

Strategic Framework for Ocean Capacity Building: Thomas Ajayi

Dr. Ajayi in his presentation referred to the written document in the handout to participants, which dealt with capacity building. He noted that POGO was now the bible for ocean observations. The talk highlighted the importance of oceans: the future climate, weather and threat to resources. Ocean governance, stewardship and management are important. Ocean management requires many inputs, and hence the need for capacity building. There is a lack of ocean observation capacity in most third-world countries. There are differences in tradition and approach and momentum that separated north and south. There is a need to start human resource development. Help from POGO is needed.

For ocean capacity building IOC has TEMA (Training, Education and Mutual Assistance). TEMA capacity building included several elements. IOC is the competent UN agency for ocean matters. IOC-TEMA has a good track record of providing capacity building. The training through research (TTR) programme includes the floating university programme and chairs in oceanography. There is a need to discuss elements of ocean capacity necessary in developing countries. This includes the legion of developing countries; lack of university programmes; and dearth of post-graduate level ocean specialists. Critical mass of ocean professionals is essential. He noted that developing countries had jurisdiction over 80% of all EEZ. Management of EEZ requires capacity building. IOC plays the role of a catalyst in some instances. Ocean concerns in developing countries include the full range of subjects. Exploitation of ocean resources leads to pollution, and political conflicts. Coastal disturbances (erosion, floods and storm surge) and climate change are major concerns. Water is a scarce resource. There are major changes in fisheries resources: and there is a need for ocean observations to address those issues.

Turning his attention to Nigeria, De. Ajayi noted that Lagos had scientists working to address local issues. He drew the attention of participants to the University of Concepción. Collaboration between Chile and California led to major development of oceanography in Chile. Similar success stories existed elsewhere: for example in China and West Africa. Higher education of people who returned to their countries could change the situation. Pondering the path forward, he noted that an innovative system was needed. Partnerships (e.g., POGO and IOC) could make a difference in the world. POGO spoke through the São Paulo Declaration.

He quoted from GOOS documents: “oceanographers have not yet studied the flow of useful information in the ocean”. POGO is committed to a network of integrated global ocean observations. This calls for educational exchanges and joint research.

POGO and TEMA strategic framework should target the development of a cohort of ocean specialists in developing countries, and support the educational component of capacity building. TEMA is asking IOC for co-ordination, and for a secretariat.

Partnership responsibilities require donor agencies to make long-term commitment. The commitment from developing countries has to guarantee job placements at home after training. The trainees have to be committed to working in the home countries after the training. He said that POGO would be an invaluable partner in developing such plans. He said that the situation in Africa was "educate or perish". He asked POGO to commit to supporting capacity building efforts in Africa.

Dr. Kennel raised the question of whether POGO could or should play a constructive role in promoting graduate studies. Dr. Tomczak remarked that POGO capacity building activities had a gap in providing help in higher education. Africa should be considered as a special case requiring special help. Putting teaching material on web is a useful way to proceed. His teaching material is used by third world universities. But his own experience was that Africa did not make much use of web-based teaching material. Not many requests from African countries were received through IOC for his teaching material on CD. Dr. Bernal remarked that POGO partners had huge manpower resources. IOC was in the final phase of recruiting an officer for capacity building. Resources today in the system are insufficient to take up many initiatives. Fundraising is needed to make them a reality. Dr. Roe raised a question about practicalities of awarding degrees, and agreement with universities and added that POGO had a role in advocacy and training. Another problem is that fees of Open University degrees are prohibitive. POGO needs to develop links with universities. Dr. Kennel spoke of a panel of experts in physics who interviewed and reviewed students from China to promote education prospects in USA for Chinese students. Dr. Knap remarked that financial requirements for graduate students were huge. POGO could play an advocacy role, but lacks resources to take up graduate education. Dr. Owens noted that lack of IT infrastructure inhibited some of these training efforts.

Action: Capacity Building

1. **To continue to the Fellowship Programme in 2003, with regional emphasis this year on the Indian Ocean. Furthermore, a part of the Fellowship budget is to be set aside to support the JAMSTEC *R/V Mirai* cruise trainees.**
2. **The POGO support for the SEREAD Programme is to continue.**

Links to other Agencies and Programmes

New NOAA Initiatives: Stan Wilson

Dr. Wilson then spoke about new initiatives in NOAA. The focus is on building and sustaining an ocean observing system for climate. They have reviewed what is needed to build and sustain such a system. NOAA has an administrator who has a strong interest in global observing systems for climate. He had initiated an internal review of NOAA and was acting on recommendations from that review. NOAA's Deputy Administrator chaired the US Interagency Climate Change Science Programme. Studies had been initiated to design observing system architecture and the transition from research to operations. Unlike weather, the payoffs from operational observations to support climate might have to wait for a decade at least.
The NOAA administrator had raised the issues related to the desired improvements to the International Global Observing system for climate at the WMO and IOC Executive Councils.

Dr. Hill asked what the strong argument was, to convince funding agencies that this was how it should be handled. Dr. Wilson responded that the telling argument was the feedback between having the data and showing progress. It is inherently a scientific problem, but it is not possible within the funding cycle of normal research programmes. Long-term funding (decades long) is essential. Sustained support and partnership with scientific community are required, along with operational discipline. The project has to live regardless of the investigator.
Dr. Hill commented that the US position on climate change had lost some credibility in the world arena, and that an observing system was no substitute for limiting CO_2 emissions. Dr. Wilson replied that scientists had to provide politicians with basic information coming from observations. This would provide the underpinning for scientific decisions with the potential to influence political decision. Dr. Roe enquired whether NOAA got a consensus view from the visits of the Administrator abroad. Dr. Wilson remarked that consensus existed for the principle of the way forward, but less on the specifics. Dr. Pugh remarked that meteorological agencies had a plan for including developing countries in their plans for observations, but that oceanography had yet to develop such plans.

Chair: Tony Knap
World Summit on Sustainable Development

POGO-IOC Partnership within WSSD: Shubha Sathyendranath
The session on WSSD began after coffee, with a small presentation from Shubha Sathyendranath. She reported on an initiative taken jointly by POGO, IOC and SCOR to promote intelligent and sustainable use and management of the oceans, through promotion of collaboration and coordination among major oceanographic institutions, development of capacity in weaker countries to monitor and manage the oceans under UNCLOS, and advocacy for sound use and management of the oceans. The initiative was approved and included in WSSD.

WSSD and the Oceans: Patricio Bernal
Dr. Bernal (IOC) recalled the broad context of the UN development agenda and the WSSD. The outcomes from WSSD included a Political Declaration, an Implementation Plan, "Type-II initiatives" and Partnerships. The Implementation Plan is the most serious document, and most important issues related to oceans, islands and coastal areas are dealt with in a comprehensive manner. It dealt with issues such as improving scientific understanding, expanding ocean-observing capabilities, building capacity in marine science, information and management; building national and local capacity in marine science; building and enhancing scientific and technological capabilities in the context of climate change; promoting the systematic observation of the earth's atmosphere, land and oceans; and strategies for integrated global observations. Biodiversity and marine protected areas network, and biodiversity of seamounts are endorsed. Though not a binding document, it represented an important commitment by all participating countries. He mentioned that the UN General Assembly Resolution 1 (December 10, 2002) endorsed WSSD Implementation on ocean issues, and designated IOC to act as a focal point to lead the linking of UN organisations with interested parties (such as regional fisheries and environmental organisations).

Discussion: Patricio Bernal

This was followed by a discussion on POGO response to WSSD, led by Dr. Bernal. Drs Kennel, Bray and others inquired about the real content of the opportunity offered to POGO in the context of WSSD. From the science point of view (e.g., assessment of our capabilities to observe and monitor the ocean – physical, chemical, biological) it is obviously an important opportunity, but there is also an equally great area of risk in terms of credibility.

Dr. Kennel noted that the 1992 Rio Convention did not call for an assessment of biodiversity due to lack of a rigorous assessment body. IPCC (International Panel on Climate Change) has developed tremendous influence in the context of climate change. Climate change calls for continual re-assessment. Attention has been given to balance of nations. Most of the controversies do not centre on the scientific assessment itself. It is the advance of science in the climate-change field that moved the political system. There are useful lessons to be learned from that. Undoubtedly, oceanographic institutions are likely to be involved in the science-based evaluation of the state of the oceans.

Dr. Bernal responded that Iceland, USA and UK had been promoting an IPCC-like organisation for the oceans. The ocean problems are very different from those of climate. Ocean assessment is a multiple-assessment issue. Independent scientific review of the problem is a very effective tool. Other bodies are trying to implement similar approaches, but extrapolation to multiple problems is not a trivial task. UN meetings have led to technical reports on how to do this. Strong regional participation is recommended, but a strong science team should be leading the effort and peer review is a requirement. The report on the state of the oceans is done about every four years or so. To be effective, assessment has to be linked to an appropriate governing mechanism. The loop of accountability has to be closed.

Dr. Malone noted that another aspect was importance of linking the development of GOOS to a quantifiable assessment. Dr. Bernal replied that this was a big opportunity as well as a big challenge. Assessments are to be science-based. This calls for development of instruments and tools to address the need for observations. Interactions with pertinent bodies and agreements have to be developed. Regional-seas initiatives might see GOOS as competition for resources, or in some cases, as an asset.

Dr. Knap mentioned that the COOP implementation plan hoped to establish mechanisms for regional assessment of the health of the oceans. Dr. Bernal pointed out that GOOS needed to be very sensitive to this opportunity, especially for the coastal component. The complexity of the coastal systems, and the complex issues of jurisdiction make this much more difficult than the climate issue.

The discussion then turned to issues regarding data management. Responding to a query from Dr. Roe, Dr. Bernal mentioned that there was to be an adequacy report on data management as well. Data management is much advanced for physical oceanographic observations. It is less advanced for bio-geochemistry. There is a great need for assessment of carbon fluxes; yet, assessment still remained a major problem. Measurements are at a 30 year lag, compared with SST.

Dr. de Leeuw said that the major problem was that we were still learning about major players in carbon cycles. New discoveries lead to rethinking. It is difficult to compare with physical oceanography, and goals in biogeochemistry have to be defined completely differently. In the POGO context, one of the goals is to extend observations to chemical and biological variables. Not much effort has yet been spent

on defining biological and chemical observations. It needs new rethinking, rather than an attempt to transplant physical observing systems.

Dr. Bray turned her attention to the larger question of POGO response to WSSD. There is an opportunity there, but not a very well-defined one. An opening of that scale iss harder to grasp than a more well-defined opportunity. She asked if it were possible to define the opportunities better, and to identify what could be done in the next few years. Dr. Bernal responded that one should differentiate global observing systems that are well taken care of (physical GOOS and physical GCOS) where POGO can link more easily, from other elements that were much less developed (e.g., carbon and biodiversity) and needed new science and research. The mission is research in that context. It is a fast-moving field where things are changing dramatically. POGO could play an important role in organising such new areas where we do not have a fully-developed mechanism for observations, POGO.

Dr. Bernal added that IOC had to respond to the need to provide assessments and adequacy reports. The target is to get GOOS operational. This calls for capacity building at a different scale.

Dr. Pugh noted that UK viewed WSSD as a great success. The ocean-related issues that came out of it to which UK gave priority are the establishment of an ongoing assessment system. There are questions about who should be doing that within the UN. Questions are raised about putting it in the hands of any single UN agency. UK preference is for a prominent role for the IOC. Once the assessment structure is in place, the role of POGO would become clearer. He asked if the structure and process are likely to be the same as IPCC. Dr. Bernal replied that they might not have the same structure. IOC builds its identity very much on the science and by providing services based on science. Global marine assessment requires more funds.

Dr. Pugh noted that sustainability was much more important in the UK today than the environment. Impact assessment was required. Dr. Owens added that we would be held to account and asked to report. Dr. Bernal replied that IOC and POGO had to respond to the appeals

Dr. Tomczak pointed out that the Law of the Sea, developed under a different world political scene (two super powers), did not address fisheries. Situation now is different, and biology has undergone a revolution. There is no political structure to take care of this. The IPCC is successful because it filled a political vacuum. IPCC is much better founded on science than the UNCLOS. If deep-ocean biodiversity was fascinating, who is in charge of governance? IPCC combines good science with addressing public concern. Dr. Bernal said that UNCLOS was negotiated for the third time. Negotiation rules are very special. Conventions have to be universal, and negotiation went to extremes to achieve universal consensus. Conventions have to be uniform: UNCLOS convention is one in which individual countries could not make exceptions. Developing countries are concerned that anything like UNCLOS could not be achieved at present.

Dr. Bernal added that many new people are now aware of POGO, after the WSSD. There was complete surprise in many quarters at Johannesburg to see the proposal. Dr. Kennel remarked that with every opportunity there was an equal risk. If the assessment process should merely globalise some practices that were in place today, there would be a grave risk. Without regular credible scientific assessment, we would not see how well we were doing.

Dr. Knap suggested that the idea of assessment of capability to monitor was something that POGO could take over. Periodic updating of the Dartington Report, and the TS working group, could be mechanisms to evaluate progress.

Chair: Ian Poiner
Institutional Reports

Chinese ocean observation and research in Indian Ocean and others: Sun Song
In the first presentation in the afternoon session, Dr. Song said that they used the compound eye of the krill as an indicator of environmental conditions. Body length to eye ratio is an indicator of growth conditions. Relationship between the body length and the eye diameter of the Antarctic krill remains constant. Each year, China's Antarctic expedition goes around the Antarctic continent as part of their Antarctic research programme. Krill samples are collected during cruise. The eye-body ratio was the same for all locations in some years. But in another year the relationship was different. The differences are an indicator of growth conditions. They had twenty years of samples, which they had used to establish the inter-annual change in environment.

POL and Southern Ocean Sea Levels: Edward Hill
This was followed by a presentation by Dr. Hill, who spoke about sea level measurements. Global sea level observing in the Southern Ocean is in the context of the larger global network. Sampling in the South is sparse. Access to data is through a variety of sources: monthly mean sea levels though PSMSL data base; SCAR, Australian National Tidal Facility, GLOSS Fast Centre, but few sites (except the Australian) have continuous GPS in the southern ocean. Antarctic sea level measurements provide important information, history of sea level measurements at Antarctic bases extend back almost 100 years. Bottom pressure records in Drake Passage (POL) provide another long-term data source. Bottom Pressure Recorders have been operating since early 1990s. It is important for monitoring Antarctic Circumpolar Current. Comparison with sea-level measurements indicated that BPR measurements could be scaled down in favour of coastal tide gauges. On this basis they are planning to scale down BPR measurements in Drake Passage, and use tide gauges instead. BPR measurements would continue to be used for process studies. Dr. Hill stressed the importance of collaboration in the Southern Ocean, especially in Antarctic sea level research. There is a need to exchange sparse sea level data, which are far more valuable within a network than in isolation. POL enjoys stimulating cooperation, especially with colleagues from Ukraine, Japan, France, USA, Australia and New Zealand.

Dr. Kennel raised a question about justification for making such expensive measurements. Dr. Hill replied that the system's influence on the world oceans was the primary reason for making those measurements. Tide gauges are also relatively cheap.

Reports of Working Groups, Action Items

The institutional reports were followed by reports from the working groups.

Report on Data Issues: Ed Hill

Dr. Hill summarised the outcome of the discussions in the data issues group. Four topics were tackled. First, it was noticed that a lot a data was at present being lost, for technical or organisational reasons. It was agreed to adopt GCOS principles adapted for institutions as opposed to programmes. A set of possible principles emerged: all POGO institutions should have a written data policy, the basis of which should be to prevent data loss. National data centres should be used wherever possible, and institutions should notify of intent to dispose of major data sets. Importance of attention to metadata was underlined. Second, the "cultural divide" between science and data management was discussed, and a series of "carrots" (recognition in career development, fellowships, prize, twinning, etc.) and "sticks" (enforce data management obligations by funding agencies, inverse of "carrots", etc.) were suggested. A third set of recommendations dealt with non-physical data. Although this seems difficult, there is now a lot of expertise and experience in this field (e.g., OBIS, JGOFS) and it should be possible to spread fairly well-established good practice for conventional hydrographic data into other areas, provided that appropriate tools had been developed. However, the specificity of data archiving in life sciences cannot be ignored. Finally, the key recommendations from the POGO WG report provide a way forward and were endorsed. In particular, it was suggested to extend the scope of POGO fellowships to include data management; to use the POGO Website to advertise existing sources of (non-physical) data; to form a small group to develop a proposal for POGO principles for data management; to ask POGO institutions to assess their rate of data loss; to propose a POGO prize for excellence in data management; to advocate the concept of citable peer-reviewed data products; and to consider the idea of twinning institutions for the purpose of spreading good data management practices.

There was some discussion on the value of old data on paper. Translation of this into electronic media was recognised as being potentially very expensive, but it was suggested that the data sheets should at least be scanned and saved in electronic format. The necessary investment had to be made to rescue valuable data (e.g., hurricane data from Miami). If old data were included in the analysis, one would recognise that the loss of old data was a huge problem. Projects such as HMAP within CoML aims at rescue and use of old data. IOC is also involved in rescue and archaeology of data since a few years ago. Museums preserve and maintain information on marine samples, and such data also have to be included in data archives. It was also noted that paper archives are relatively safe as long as no one throws the paper away. On the other hand, there is danger of losing data through saving them in obsolete electronic media formats that are no longer readable.

There are differences in the approaches by various institutions and nations to data management. Scripps does not have a data manager or data curator, as a consequence of competition for finance. Linking the data management to extraction of new knowledge facilitates obtaining of funds. It was noted that oceanographers were relatively more fortunate in the UK. Data managers in the UK are seen to work in support of research activities, and not in competition with research funds. NERC has a requirement on grant applications to have a full data management component to the proposal. Separate funding streams for data and research would help address the issue of competition. For example, Australian government policy is such that time on ship guarantees funds for management of data acquired on ship. This could be a future model.

Report on Indian Ocean: John Field

This working group was chaired by Dr. Field and Dr. Poiner, and Dr. Field (University of Cape Town) reported on the discussion in the Indian Ocean Group, starting with a reminder of the main issues for IO-GOOS. The report reiterated that the Indian Ocean was under-sampled compared with other oceans. He emphasised the role for POGO in helping advance the objectives of IO-GOOS: build awareness in the North, help in advocating the biodiversity issue, and help in capacity building. It was noted that increased north-south co-operation was essential to improve the observations in the Indian Ocean. Climate change is an issue that interested both north and south and could provide a unifying theme on which to build improved Indian Ocean observations. Other unifying themes include concerns over marine biodiversity, monsoon variability, high-seas fisheries, and ecosystems. POGO could investigate opportunities to co-operate with other bodies such as CoML to achieve Indian Ocean goals. It was also suggested that POGO could help inform governments and senior officials that long-term funding was critical to address issues of the Indian Ocean, and also that increased investment was necessary in the Indian Ocean, for example for maintaining additional time-series stations. The JAMSTEC interest in maintaining a multi-disciplinary time-series station in the Indian Ocean was noted as an important positive note. It was requested that POGO encourage development of a GEF Large Marine Ecosystem Study for the Indian Ocean. POGO could help with setting up MOU's between leading institutions (North-South Partnership) for training in applications such as remote sensing and data assimilation. Help with capacity building and infrastructure development was also sought. Information on salinity is crucial for the Indian Ocean. The question was raised of the interest to get access to satellite measurements of salinity in the Indian Ocean, as expected from the ESA/CNES SMOS mission. The suggestion of a POGO letter of support to SMOS was put forward. Dr. Vaage suggested that perhaps POGO could get in touch with FAO to request that a Norwegian ship be sent to the Indian Ocean. There was also discussion on the potential availability of Polar Stern for work in the Southern Hemisphere. This is to be discussed with Dr. Jorn Thiede.

Report on Southern Ocean: Steve Rintoul

This working group was co-chaired by Dr. Rintoul and Dr. Roe. Dr. Rintoul reported on the discussion in the Southern Ocean subgroup. They reviewed the status of ARGO in the Southern Ocean. The working group observed that the Southern Ocean falls in the crack between SCAR (south of 60S) and SCOR (north of 40S?). It was suggested that POGO should establish relationships with SCAR. Training opportunities (national cruises, CLIVAR cruises) and fellowships should be pursued. Other issues (advocating for marine reserves in the Southern Ocean, Antarctic Treaty and EEZ, under-ice measurements, workshops) were discussed, for which no specific POGO action was identified, other than that of continued advocacy, and improved dialogue and information exchange. In particular, it was suggested that exchange of information regarding activities of POGO members and other participating organisations in the Southern Ocean (and the Indian Ocean) would be beneficial. For example, the POGO web site could be used to advertise information on cruises and other activities in the region. This would also be useful for CLIVAR. Dr. Roe pointed out that such an initiative would only be as useful as the information supplied to POGO, and urged participants to inform the POGO Secretariat of activities and

opportunities in the Southern Ocean and the Indian Ocean. CLIVAR and POGO would exchange such information with each other.

Recommendations for Action

Dr. Kennel began the discussion, in which several participants participated. Dr. Kennel noted that he was initiating a discussion which could be taken up in depth at the next POGO meeting, on where POGO was after five years of its existence, where were the strengths and weaknesses, what areas of progress could be isolated, and where further efforts should be directed. He remarked that scientists knew what to do and how to do it, but everything could not be done all at once. Other considerations outside of science and technology have to be brought to bear. POGO directors had decided to promote Argo right from the outset. The issue now is how to keep it going. Argo is a success to which POGO contributed. He noted that POGO had also been successful in raising issues such as the Southern Hemisphere in the international agenda, when it was low in any national agenda. The São Paulo Declaration serves as an effective spotlight to emphasise issues and to shift emphasis. One has to bear in mind that biological and chemical elements of ocean observation are also in the offing and a plan is needed for systematic observation of these types of variables. POGO has initiated addressing the biological issues. Dr. Koslow emphasised that POGO could play an important role with advancing chemical and biological technologies for ocean observation. Dr. Kennel suggested that the next major step in progress might be with time-series observations from moorings. The concept of ARGO should be extended to other observational systems. Dr. de Leeuw added that there was a recent increase in the awareness of the role of the deeper ocean in climate change and the importance of biodiversity. Dr. Ausubel added that Neptune and deep ocean observatories were discussed in POGO 1, but not since then. He suggested that POGO might want to look at the role of deep ocean observatories in the future. Dr. Kennel enquired whether there was interest in deep-ocean observatories in countries other than the USA, and Dr. Bernal mentioned activities led by Portugal in the Azores.

Data issues are important, but POGO has yet to be effective in addressing these issues. Further successes could still be achieved in the area of data management. Much discussion then ensued on what needed to be done with respect to data issues, and what POGO could do with respect to these issues. Dr. Owens suggested that having a set of guiding principles from POGO on setting up data policy would be helpful. Dr. Roe noted that conflicts between institutional wish and national policies were a problem, in that there were often differences between what institutes wanted to do and what they were allowed to do. Dr. Hill remarked that the US style model of free access was becoming more the norm, which gave cause for optimism. Dr. Bernal added that negotiations with national policies were difficult, and so there was a need to keep options open. There is a need to develop a public service policy regarding free data exchange of some key variables and information. Dr. Bailey remarked that consensus among members would help change national policies. Dr. Wijffels made an appeal to directors to provide incentives to scientists. Sometimes scientists like her felt that they were doing a public service by making data available, while other scientists wrote the papers. This was seconded by Dr. Wilson and Dr. Tomczak. They also advocated the need for POGO Directors to reward oceanographers who devoted their activities to public service. Professional recognition is important. Dr. Owens and Dr. Hill noted that some recognition was given in the UK to data-related services. Dr. Wilson also urged the directors to agree

on abandoning the period of exclusive use of their data, and to develop products for the community. Climate studies require data exchange. Data collection for general use is an underestimated service. Dr. Parslow remarked that national policies of data access had had a narrow perspective in the past. But these views are now changing. Dr. Kennel remarked that there often were people in institutions who developed technology for others. Such people have difficulty getting promoted, even though they are very valuable. Contribution to infrastructure is anonymous, and adjustment of value within the field is absolutely important. POGO could emphasise the value of technology development, planning and data management.

Dr. Parslow mentioned that in Australia, funding activities in the Indian Ocean required justification for national benefit, and suggested that POGO could try to encourage a view beyond narrow national perspectives. Dr. Roe remarked that the situation in the UK was better: the UK has had a ship in the Indian Ocean for the previous three years. Justification is based on good science. Dr. de Leeuw remarked that such restrictions were less within European nations than with European Commission regulations. Dr. Bernal clarified that the attitude was changing in Brussels also.

All these discussions led back to the need for assessing the state of the ocean observing system. Dr. Wilson's presentation had suggested that that there was consensus on the need for an effective system, but that there was less consensus on the particular elements needed within the system. There was general agreement based on the foregoing discussion that the appropriate theme for the next meeting would be an evaluation of the state of the marine observation system. The question is, after five years of POGO, where had it got to, and where it needs to get to. Dr. Cattle drew attention to the GCOS Adequacy Report. Dr. Roe remarked that the GCOS report could be taken as a starting point for discussions at POGO-5. Dr. de Leeuw remarked that data issues, long-term chemical and biological observations, and Argo should be part of the assessment process. The next major step could be the time-series stations, which could include biological and chemical observations as well as physical observations.

Argo, which is supported by POGO, is now in place, but the current issue is how to maintain it. Dr. Wilson mentioned that Argo was funded by research grants in 12 countries. Demonstrations of applications would be a great help to sustain Argo. Rationale has to be provided for continuing Argo. It merits discussion at the level of directors. Dr. Hill remarked that it would be useful to address the question of what would be lost if we stopped if the Argo Programme were stopped. Dr. Bernal noted that operational oceanography was seen as a threat to research. This has to be addressed by procuring new funds for operational oceanography. The scientific community is unaware of the clients, and POGO could do lobbying. Transition between research and operations and funding were sensitive issues. Dr. Hill said that science grew faster than money. He was of the opinion that going operational would accelerate research, and growth of research funds.

There was also discussion on the need for an ocean analogue of the IPCC, and who would be the appropriate body to carry out ocean assessment. Dr. Bernal said that a science-based, independent body was required to carry out assessment of the state of the ocean.

The action items that emerged during this session are summarised below.

Action Items: Data Issues

1. **Key recommendations from POGO-WG Report endorsed. e.g., scope of POGO Fellowships be extended to include Data Management**
2. **Use POGO website to advertise existing sources of (non-physical) data**
3. **Small WG be established (e.g. drawn from members of Breakout Group) with assistance of Secretariat to develop proposal for POGO Principles for Data Management**
4. **Do we know how much data we are losing from POGO-institutions Perhaps institute Directors could assess the rate of loss from their institutes**
5. **POGO to consider promoting the adoption of "good practice" – a POGO or IOC "prize" for excellence in Data Management is recommended**
6. **POGO to consider promoting/advocating the concept of "citable" peer reviewed data products such as held in Data Centres**
7. **POGO to consider the idea of "twinning" institutions for the purpose of spreading good Data Management practices**

Action: Indian Ocean

1. **POGO to request FAO for Norwegian ship time in the Indian Ocean region, if possible**
2. **POGO (through Dr. Howard Roe) to discuss the availability of Polar Stern for work in the Southern Hemisphere**
3. **Write a POGO letter in support of SMOS mission, if this would be helpful**

Action: Southern Ocean

1. **POGO members and other participating organisations are encouraged to keep the POGO Secretariat informed about activities and opportunities in the Southern Ocean. POGO and CLIVAR to share such information.**

The meeting adjourned at 18:00 and the day concluded with a dinner offered by CSIRO. The participants were regaled at an excellent dinner accompanied by Tasmanian wine and music by a jazz band.

At the dinner, Dr. Kennel, the first outgoing Chairman of POGO, made a moving speech on POGO and his experience in POGO. He spoke of his mixed feelings: his pride in being associated with POGO, his pleasure at having gotten to know the members, his sadness at stepping down, his confidence that POGO was in good hands. He recalled a conversation with Dr. John Shephard at SOC, which had led to the genesis of POGO eventually. SIO and BBSR were to celebrate their centennials in 2003, and NIOZ was now 126 years old. Institutions had a long life span, and POGO, which was an association of institutions, was also going to be a presence for the long-term. He opined that the secret of the success of POGO was in the creation of mutual trust among leaders of institutions with related missions and similar issues. It was in the recognition that trust required commitment, and that trust had to be earned and constantly renewed. POGO's greatest asset was it membership. He urged the members to continually cultivate new members, and to recruit them face-to-face, since trust was required. The quality of its membership gave POGO a significant power to convene and convey important messages. As directors, the members could only do as a group what they did everyday as individuals: advocate, facilitate, coordinate, and build institutional structures. Within POGO, the directors should

strive to do the same, but focusing on issues that could not be addressed individually: for example, bringing the spot light on the Southern Hemisphere or the Indian Ocean, and on capacity building. The long-term goal of POGO must be to transcend current understanding to achieve continuous overall health of earth systems; to learn how to govern society and environment together.

Friday, January 24

Chair: Masato Chijiya
POGO Business

The last day of the meeting was largely devoted to discussion of POGO business. Mr. Masato Chijiya chaired the session. He opened the session with warm thanks to CSIRO for the excellent dinner and music to which the participants were treated.

POGO Membership; Finance: Shubha Sathyendranath
Shubha Sathyendranath reported the provisional budget balance, which shows virtually no income or loss in 2002. The carry over from 2001 (nearly US$ 130,000) remained intact. This allowed the Secretariat some flexibility in the operations since the membership dues and other income come in at various times in the course of the year. The carry-over allows the Secretariat to begin activities each year without having to wait for the new year's income to reach the Secretariat.

In the proposed budget, there was a provision for a POGO financial support for an international training course on zooplankton identification to be held in Chile, and organised under the leadership of Dr. Annelies Pierrot-Bult. This is a follow-up action to the marine biodiversity workshop held in Chile and is consistent with the POGO biology recommendations. There was also provision for organising a marine biodiversity workshop in the Indian Ocean region. The workshop was to be jointly organised with CoML and IO-GOOS. The concept had been discussed at the CoML Scientific Steering Committee meeting, and it had been recommended that the activity be taken forward. It was also consistent with the recommendations of the Indian Ocean working group. There was also interest in the workshop from IO-GOOS, which had also promised some financial support. The proposal was to be submitted to the Sloan Foundation for funding, through Dr. Ausubel.

The projected income for 2003 showed a deficit of about US$ 15,000. There were efforts underway to approach the Nippon Foundation for a grant in capacity building. Of the various ideas on which they had been consulted, they appeared most receptive to the idea of a Nippon-POGO Visiting Professorship. The POGO financial base could be improved through contributions from new members. Another source to be explored is solicitation of grants from aid or development agencies and other private foundations.

Action: Capacity Building (Continued)

3. POGO to pursue jointly with CoML and IO-GOOS the organisation of a biodiversity workshop with focus on the Indian Ocean

4. **POGO to provide financial support for the international zooplankton identification course proposed to be held in Chile**

Report on Biology WG: Shubha Sathyendranath
Shubha Sathyendranath then reported on the POGO initiative to promote biological observations. Eight institutions (CSIRO, LDEO, BIO, IMR, SOC, PML, WHOI, SIO) had nominated contacts (additional names were welcome). Suggestions were made by this group on possible actions: advertise new available data and techniques, promote new techniques for measuring phytoplankton pigments or primary productivity, organize workshops on molecular oceanography, and on chlorophyll-a as a geophysical variable, promote new technologies for observation of large phytoplankton and zooplankton, accelerate generation of end-user products, among others. Drs. Owens and Knap offered their help with the organisation of the molecular oceanography workshop. Whereas it is understood that this is a long-term effort, there is consensus to pursue some of these initiatives, notably the workshops. With respect to the idea of having a workshop on emerging techniques and sensors in chemical oceanography, it was recommended that the appropriate organisation would be SCOR.

Action: Biology

1. **POGO to proceed with the organisation of a workshop on chlorophyll-a as a geophysical variable**

2. **POGO to proceed with the organisation of a workshop on molecular oceanography**

POGO Web Site: Shubha Sathyendranath then reported on the Web site. It had recently emerged that the POGO domain name had been bought by someone in Russia who had used it for a frivolous web site, and wanted to sell the domain name back to POGO at a high price. No negotiation was possible, nor considered desirable. POGO had therefore moved to a new Web site, at http://ocean-partners.org. Dr. Fellous drew attention to the difficulty in many countries to access large documents or using the latest version of visualization software, due to limited bandwidth.

Venue, Dates and Theme of POGO 5
Saeki Seiji (JAMSTEC) gave an outline of the plans for the next POGO-5 meeting, at JAMSTEC in Yokohama Institute for Earth Sciences (close to the Earth Simulator Building), on 18-20 November, 2003. Accommodation was proposed in Yokohama Bay Sheraton Hotel and Towers, with easy access by train to Narita airport, Tokyo central station, and Yokohama campus. An excursion was planned to Yokosuka JAMSTEC Headquarters. Mr. Chijiya then drew attention to the Yokosuka statement, adopted on 18 September, 2002, by the directors of the world's 14 major oceanographic institutions, and copies were distributed to all participants.

Dr. Roe suggested a number of possible themes for POGO-5:

- Observing the deep ocean
- Observing the polar oceans
- Coupling biogeochemical and physical observing systems

- The state of ocean observing systems – Where are we? What could come to sunset? What is the value? Where are the gaps? What is the rationale for going ahead? What can POGO do about these?
- Others

The suggestions were discussed in detail and the final decision was to adopt a review of the state of the ocean observing systems as the main themes for POGO-5. There was some discussion on the cost-benefit analysis of ocean observations. Suggestions were made by Drs. Bernal, Kennel and Fellous to have a report on the value of global observing systems, based on work that has already been done in this area (for example, an IOC study, the report by Dr. Mary Altalo, former deputy director of Scripps, and the European Commission work on GMES). Dr. Neville Smith remarked that very good data assimilation and modelling work was being done, and requested that these activities be included among the presentations at POGO 5.

Action: POGO 5

1. **The Secretariat to organise POGO-5 with "the state of ocean observing systems" as the main theme**

POGO 6

On behalf of IFREMER, **Dr. Fellous** offered to host POGO-6 in Brest in the fall of 2004, in association with the 20th Anniversary celebrations of IFREMER. The offer was most welcome and accepted with thanks.

Election of New Office Bearers: Anthony Knap

Dr. Knap reported on the proposal by a nomination committee (composed of himself, Dr. Fellous and Dr. Owens) to elect Dr. Jan W. de Leeuw as the next Chair (after the two-year term of Dr. Roe). The proposal is accepted by acclamation. Dr. Roe welcomed him warmly to the Executive Committee.

The composition of the POGO Executive Committee thus became:

Chair: Howard Roe
Past Chair: Charlie Kennel
Incoming Chair: Jan de Leeuw
Member: Takuya Hirano
Member: Tony Haymet

Dr. Mike Sinclair completed his term on the Executive Committee.

POGO News and Information Group: Don Michel

Mr. Michel (CSIRO) presented a short report on the accomplishments of the News and Information Group (now chaired by Ms Cindy Clark of SIO) in 2002. New membership for 2003 is invited. The Australian communications team had been very active during the POGO meeting, and at least one media event had been organised on each day of the meeting.

There being no more business, the meeting closed after warm thanks were expressed by all towards CSIRO for their wonderful hospitality. After lunch, and participants were invited to a visit to CSIRO Marine Laboratories.

Acronyms Used in the Minutes

ATSR: Along Track Scanning Radiometer
COOP: Coastal Ocean Observation Panel
EEZ: Exclusive Economic Zone
GCOS: Global Climate Observing System
GMES: GlobalMonitoring for Environment and Security
IPCC: International Panel on Climate Change
OOPC: Ocean Observation Panel for Climate
TEMA: Training, Education and Mutual Assistance
UNCLOS: United Nations Convention on the Law of the Sea
UNFCCC: United Nations Framework Convention on Climate Change
WCRP: World Climate Research Programme
WSSD: World Summit on Sustainable Development

Action Items from POGO-4

Action: Biology

1. **POGO to proceed with the organisation of a workshop on chlorophyll-a as a geophysical variable**
2. **POGO to proceed with the organisation of a workshop on molecular oceanography**

Action: Capacity Building

1. **To continue to the Fellowship Programme in 2003, with regional emphasis this year on the Indian Ocean. Furthermore, a part of the Fellowship budget is to be set aside to support the JAMSTEC *R/V Mirai* cruise trainees**
2. **The POGO support for the SEREAD Programme is to continue**
3. **POGO to pursue jointly with CoML and IO-GOOS the organisation of a biodiversity workshop with focus on the Indian Ocean**
4. **POGO provide financial support for the international zooplankton identification course proposed to be held in Chile**

Action: Data Issues

1. **Key recommendations from POGO-WG Report endorsed. e.g.,Scope of POGO Fellowships be extended to include Data Management Use POGO-website to advertise existing sources of (non-physical) data.**
2. **Small WG be established (e.g. drawn from members of Breakout Group) with assistance of Secretariat to develop proposal for POGO Principles for Data Management.**
3. **Do we know how much data we are losing from POGO-institutions Perhaps institute Directors could assess the rate of loss from their institutes.**
4. **POGO to consider promoting the adoption of "good practice" – a POGO or IOC "prize" for excellence in Data Management is recommended.**
5. **POGO consider promoting/advocating the concept of "citable" peer reviewed data products such as held in Data Centres**
6. **POGO consider the idea of "twinning" institutions for the purpose of spreading good Data Management practices.**

Action: Indian Ocean

4. **POGO to request FAO for Norwegian ship time in the Indian Ocean region, if possible**
5. **POGO (through Dr. Howard Roe) to discuss the availability of Polar Stern for work in the Southern Hemisphere**
6. **POGO to write a POGO letter in support of SMOS mission, if this would be helpful**

Action: POGO 5

1. **The Secretariat to organise POGO-5 with "the state of ocean observing systems" as the main theme.**

Action: Southern Ocean

1. **POGO members and other participating organisations are encouraged to keep the POGO Secretariat informed about activities and opportunities in the Southern Ocean. POGO and CLIVAR to share such information.**