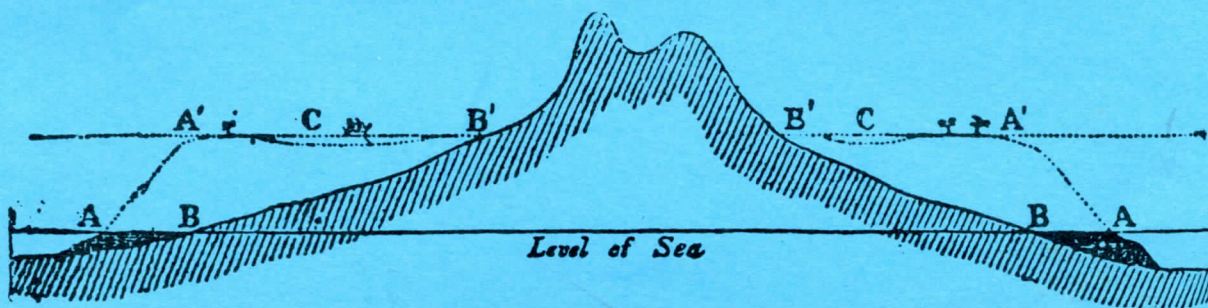


# REEF ENCOUNTER

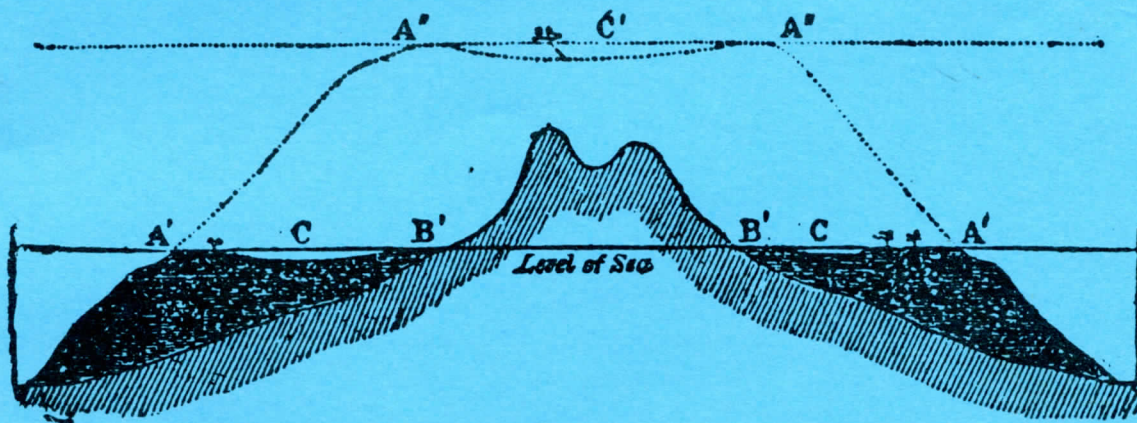
Newsletter of the International Society for Reef Studies

Number 8

December 1990



[No. 4.]



[No. 5.]

CORAL REEFS  
 VOLCANIC ISLANDS  
 SOUTH AMERICAN GEOLOGY  
 BY  
 CHARLES  
 DARWIN

The  
 inhabitants of the Maldiva Archipelago, as long ago as 1605, declared,  
 "that the high tides and violent currents were diminishing the number  
 of the islands:" \* and I have already shown, on the authority of  
 Captain Moresby, that the work of destruction is still in progress

*Reefs and  
 the Rising Seas*

# REEF ENCOUNTER No. 8 December 1990

NEWSLETTER OF THE INTERNATIONAL SOCIETY FOR REEF STUDIES

Edited by Sue Wells



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The **International Society for Reef Studies** was founded at a meeting in Churchill College, Cambridge, UK in December 1980.

Its aim under the constitution is to "promote for the benefit of the public, the production and dissemination of scientific knowledge and understanding concerning coral reefs, both living and fossil."

In order to achieve its aim, the Society has the following powers:

- To hold meetings, symposia, conferences and other gatherings to disseminate this scientific knowledge and understanding of coral reefs, both living and fossil.
- To print, publish and sell, lend and distribute any papers, treatise or communications relating to coral reefs, living and fossil, and any Reports of the Proceedings or the Accounts of the Society.
- To raise funds and invite and receive contributions from any persons whatsoever by way of subscription, donation or otherwise providing that the Society shall not undertake any permanent trading activities in raising funds for its primary objects.

The Society collaborates with Springer-Verlag in producing the quarterly journal *Coral Reefs*. This large-format journal is issued free of charge to all members of the Society, and concentrates on quantitative and theoretical reef studies, including experimental and laboratory work and modelling.

## Membership

The annual subscription for membership of ISRS is currently US\$60 or the equivalent in sterling. Under the constitution, subscriptions are due by January 31st each year. Members receive the journal *Coral Reefs*, the newsletter *Reef Encounter*, abstracts of papers of Annual Meetings and other periodic mailings.

Student, spouse and retired membership costs US\$10 or the equivalent in sterling and benefits include all of the above except the journal *Coral Reefs*.

Institutional subscriptions to *Coral Reefs* must be placed directly with Springer-Verlag.

Subscriptions to the Society should be addressed to the Treasurer (address given above).

**DEADLINE FOR THE NEXT ISSUE OF REEF  
ENCOUNTER IS MAY 1ST 1991.**

## EDITORIAL

This issue focuses mainly on global warming and the Country Profile is appropriately on the Maldives. This theme, with the continued doubt about the future of WIL, brings to the fore again the importance of long-term studies. It is perhaps therefore worth noting that reef scientists are not alone in their struggle to get the value of such research recognised. The following is a quote from a paper on birds - red grouse to be precise - by R. Moss and A. Watson of the Institute of Terrestrial Ecology in the UK, which will be published in the journal *Ibis*:

"The virtue of long-term studies, then, is not simply that they are necessary to understand long-term processes and uncommon events. They can, in addition, provide a framework of data, ideas and questions which give associated short-term studies a coherence and meaning which they would otherwise lack. Long-term studies provide a necessary intellectual structure to the otherwise diffuse and often whimsical discipline of population biology. They are, in this sense, rather like theories and hypotheses in that they help to order the 'objective knowledge' (Popper, 1979) which science creates. Their very length helps to ensure that the knowledge derived from models and short-term studies maintains some general and more reliable relationship to the real world, and helps to avoid the ever-present danger that attractive models may seduce the scientist away from the mundane business of documenting long, slow processes."

But back to the long, slow process of producing *Reef Encounter*. Newsletters become tiresome if they are regularly prefaced by pleas for contributions. Not least, it is perhaps a sign that the newsletter is redundant. Many of us feel that *Reef Encounter* is indeed partly redundant, given the broad coverage of the PSA Coral Reef Newsletter (i.e. Caribbean as well as Indo-Pacific news), the latter's good listings for meetings and publications, and its enormous free circulation.

*Reef Encounter* theoretically differs in its emphasis on debate, correspondence, and feature articles. Unfortunately, it is exactly these items which are most scarce. This issue has no Upwellings column, no Student's Voice and no specially written features. Most of the material has been obtained to a greater or lesser extent by force (metaphorically speaking, of course). I probably get only 5-10% response to my requests for specific contributions, which makes the editorial process time-consuming, tedious and expensive on postage. Particularly disappointing is the lack of response from students and the 'younger' reef science community. Do write in with ideas, news, and information, and if you have any artistic skills, please let us know. As you will see from the report on the Noumea meeting, we should be thinking about producing publicity material, such as posters and handouts, for the Society for future meetings. Help with these would be particularly valuable.

Finally, we are very, very grateful to Margaret Roberts for providing two cartoons in this issue, at very short notice and over Christmas.

Sue Wells

## ISRS COMMENT

From the President:

**Peter Sale**

After one year as President, I have learned how difficult it is to lead a small society with membership scattered round the globe. It is time for ISRS to wake up to the reality of the situation. If we are to function effectively, it must be through correspondence as money simply does not exist to bring us all together at regular annual meetings. So this issue of *Reef Encounter* includes the minutes of the Annual General Meeting held in Noumea, and a number of other items of general society business. I urge you to express your own views through correspondence to the Newsletter Editor, the ISRS Secretary, or me.

### President-Elect

During 1990, the Council carried out various activities by correspondence. Constitutional changes were approved by the membership to create the position of President-Elect, and to include the editors of *Coral Reefs* as members of Council. Both steps ensure greater continuity in ISRS administration. This issue of *Reef Encounter* includes a call for nominations from Council as President-Elect. I am nominating one member who has expressed willingness to serve, and additional nominations are welcome for this important position.



Cartoon by Margaret Roberts

### Subscription increase

Council approved raising the annual dues as of January 1991. Dues had not changed for five years, and we were paying more per member to the publisher of *Coral Reefs* than we received from members. The Treasurer rightly felt this was not a healthy situation.

Councillors also worked to raise membership and to encourage members to use *Coral Reefs* to publish some of their best work, instead of other journals. Our journal is publishing good papers (many of us have learned, sometimes painfully, of the high editorial standards) but too few manuscripts are being submitted. Once *Coral Reefs* starts to make a profit, ISRS will gain financially, so it is in our long term interest to make the journal flourish. Although membership has increased this year, the number of manuscripts submitted is not growing fast enough. So why don't YOU send in one good manuscript this coming year?

### Annual meetings

We have also been debating policy on annual meetings, and would welcome your input on this. With minor changes to current procedures, we could eliminate annual meetings altogether, but this is not a very positive step. Regional groupings have been proposed, meeting independently each year in Europe, North America and perhaps Australia. Alternatively, there could be a formal arrangement that, between the international congresses, annual meetings will be held successively in North America, Europe and Australia, with the understanding that few people will journey between continents to be present. Whatever is decided, we must recognize that the Executive cannot guarantee to be present at an annual meeting held anywhere in the world - at least, not unless we require a certain level of private wealth for election to office!

### Future meetings

In 1991, we will ensure that ISRS has 'a presence' at the Pacific Science Congress in Hawaii in June and at the annual meeting of the Australian Coral Reef Society in August. By 'presence' I mean a desk with literature and information on how to join ISRS. Maybe even tee shirts. We have failed badly in this at past meetings. In Hawaii, there will be a formally organised Council Meeting to take advantage of the presence there of a number of us.

Our 1991 Annual General Meeting will be held at Berkeley, California. David Stoddart has agreed to sponsor a meeting, to be held tentatively the weekend of 13-15 December. In 1992, we will meet during the International Congress in Guam. I am now seeking proposals for a European venue for December 1993.

I close this report with a personal expression of thanks to Sue Wells and to Pat Hutchings who have both worked hard to keep ISRS functioning during a

difficult year, and to David Stoddart, our founding father, who came to my aid, representing me in Noumea, and reporting back promptly and completely. Finally, I must extend my thanks to Betsy Gladfelter for her work as Secretary during a time of particular personal difficulty. I again urge all members to do what they can to help in the protracted struggle to save WIL.

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## ISRS NEWS

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### 1990 ANNUAL MEETING OF ISRS

This took place in November, at the Université Française du Pacifique in Noumea. David Stoddart writes: 'In many ways it was a very enjoyable meeting - the smallest since Mandapam in 1969 (one gets rather tired of meetings with hundreds milling around). Michel Ricard had organised it superbly, and the field trips afterwards were excellent. We were in a hotel half an hour by bus from the university where the meetings were held, but the hotel was both in a very pleasant situation and also adjacent to ORSTOM and the South Pacific Commission. The overwhelming problem was the cost!

Not surprisingly therefore, the numbers attending were small. There was only one person from Europe (apart from the French), only three from the USA (myself and two from Honolulu), one from Australia and one from South Africa. The majority were from Tahiti, France and particularly New Caledonia, and on the plus side there were a number of Pacific islanders who would probably never have made a meeting in Europe or North America. These included people from Vanuatu, Fiji, Papua New Guinea and the Cook Islands. Since it was a small meeting, this group really got into things - so often at monster meetings the locals huddle together and are ignored, but in Noumea they made a real contribution.

We must organise better ISRS publicity at future meetings. Lu Eldredge has offered to have ISRS t-shirts made in Honolulu in time for the Pacific Science Congress meetings, though he would need a cash advance. We need to think about striking posters, handouts and membership forms. They are expecting some three thousand people and we won't get that sort of exposure for some time.'

The scientific programme included sessions on fish poisoning, the environment, resources and reef populations, and sedimentology and endo-upwelling. There were three workshops: Fishing activities and natural resources exploitation in the South Pacific; the South Pacific towards 2000: major environmental problems and the development of observation networks; and coastal management and modifications of the shoreline: the impact on lagoon ecosystems. The

proceedings will be published by the Université Française du Pacifique.

## ANNUAL GENERAL MEETING 1990

### Minutes

The Annual General Meeting (AGM) of the Society for 1990 was held at the Université Française du Pacifique, Centre Universitaire, Noumea, New Caledonia, on Friday 16 November at 11 a.m., with Professor D.R. Stoddart representing the President, Professor P. Sale, in the chair. The Chairman explained that most of the business items brought to the AGM had been discussed by the President with Council members through correspondence in advance of the meeting.

Items 2 and 3 below form the Secretary's Report.

#### 1. Amendments to the Constitution

The following two amendments to the Constitution, proposed by the President, Professor Sale, and seconded by the Treasurer, Dr Pat Hutchings, were approved by a vote of the members and are reported to the AGM:

1. That Clause 10(i) of the Constitution be amended to read as follows (changed wording in italics): 'The officers of the Society shall be a President, *President-Elect*, Secretary, and Treasurer, all of whom shall be members of the Council and of such committees and subcommittees as may duly be appointed. The President of the Society shall be elected at the Annual General Meeting and shall normally serve for two consecutive years. *The President-Elect shall normally be elected President immediately following a term as President-Elect.*'

**Explanation:** The purpose of this change to the Constitution is to achieve an orderly transition of the leadership of the Society, as exists widely in comparable organisations. Individuals would accept election as President-Elect, anticipating a future term as President.

2. That Clause 8(ii) of the Constitution be amended to read as follows (changed wording in italics): 'The Council shall consist of four Trustees, the President, *President-Elect*, Secretary, Treasurer, 16 ordinary Committee members, and the *Co-ordinating, Geological, and Biological Editors of Coral Reefs.*'

**Explanation:** This change to the Constitution will add the President-Elect, and ensure that the Editorial leadership of our journal is always a part of the leadership of our Society. In the past, the Editors have frequently, but not always, been Council members. This change ensures that they will always be members in the future.

#### 2. Elections to Council

Three members of Council retired at this meeting on completion of their term: Dr R.P.M. Bak, Dr E. Jordan and Dr B.R. Rosen. The Chairman thanked them for their services.

Four nominations had been received by the Secretary for five ordinary vacancies: Dr. C. Birkeland (Guam), Dr B. Salvat (France), Dr H. G. Multer (USA), and Dr P. Spencer Davies (UK). All were declared elected.

Dr B. Salvat, seconded by Dr R.W. Grigg, nominated Dr L.G. Eldredge (USA) for the remaining vacancy on Council; this was carried unanimously.

#### 3. Election of Officers

The Secretary, Dr E.H. Gladfelter, retired at this meeting. The Chairman thanked her for her services. On the nomination of Professor Sale, seconded by Dr P. Hutchings, Dr R. Galzin (France) was proposed as the new Secretary. In the absence of any other nomination, Dr Galzin was declared elected.

The Officers and Council for 1991 are listed on the inside front cover of this issue of the newsletter.

#### 4. Treasurer's Report

The Treasurer proposed that the annual subscription to the Society be increased to US\$60 (or equivalent in other currencies) for 1991, noting that this was the first increase since 1985. Retired student and spouse subscriptions (which do not include receipt of *Coral Reefs*) were recommended to be US\$10. The former Treasurer, Dr Bak, spoke in favour of these proposals and seconded them. They were carried unanimously.

#### 5. Coral Reefs and Reef Encounter

Progress with the publication of *Coral Reefs* was reported. The Special Issues on coral bleaching, edited by Dr B.E. Brown, and on *Acanthaster*, edited by Dr C. Wilkinson, had been published. The special issue on reefs as global environmental indicators, edited by Dr Macintyre and Dr Montaggioni, was being assembled, and Dr J. Ogden had proposed an issue on nutrients and reefs. The Coordinating Editor stressed the need for more material to be submitted for ordinary issues and said that publication would be speedy. It was pointed out that while the proceedings of the Noumea meeting would be published by the Université Française du Pacifique, this would constitute an informal publication and papers from the meeting could also be submitted to *Coral Reefs*.

Susan Wells was congratulated on the regular appearance and content of *Reef Encounter*.

#### 6. Meetings in 1991

A session on coral reefs was being organised at the Pacific Science Congress, Honolulu, May 1991, by Dr R.W. Grigg. It was likely that Council would meet dur-

ing that meeting.

The Chairman reported an invitation to hold the 1991 AGM in Berkeley, California, probably 13-15 December, immediately following the meeting of the American Geophysical Union in San Francisco. This proposal was welcomed by the meeting.

### 7. West Indies Laboratory

The following resolution, moved by Dr Eldredge and seconded by Dr Salvat, was carried unanimously:

'The International Society for Reef Studies, at its annual meeting in Noumea, New Caledonia, November 1990, notes with great regret the proposal to close the West Indies Laboratory, St Croix, U.S. Virgin Islands, and urges Fairleigh Dickinson University and all those concerned with the future of the Laboratory to ensure the continuation of this outstanding facility for coral reef research.'

### 8. Any Other Business

Dr Grigg, seconded by Dr Eldredge, moved a vote of thanks to the Université Française du Pacifique for hosting the annual meeting of the International Society for Reef Studies; Dr M. Ricard for organizing the meeting; and the members of the French Scientific Committee (Dr R. Galzin, Dr Y. Magnie, Dr M. Ricard, Dr F. Rougerie, Dr B. Salvat, Dr B. Thomassin, and Dr G. Valet) and of the Organizing Committee (Dr M. Ricard, Dr P. Joannot, Mme A. Savoie, Dr C. Picard and Dr G. Valet) for their work. This motion was carried by acclamation.

The Chairman then adjourned the meeting.

## PRESIDENT-ELECT: CALL FOR NOMINATIONS

Our amended constitution introduced a President-Elect, to be elected from among members of Council to serve for a two-year term normally followed by a two-year term as President. We now call for nominations for this position, that person becoming President in December 1991, at the conclusion of the term of the current President.

Written nominations, seconded by another member of ISRS, and an indication that the candidate is willing to stand must be received by February 28th 1991, by the Secretary Dr R. Galzin, Ecole Pratique des Hautes Etudes, Université de Perpignan, Av. de Villeneuve, 66025 Perpignan CEDEX, France.

## MEMBERSHIP QUERIES

Please address any membership queries (renewals, problems in receiving the journal or newsletter etc.) to

the Treasurer, Pat Hutchings (address on back cover and inside front cover). David Montgomery has resigned as Membership Secretary and queries sent to him may result in months of delay before your new address is processed or your membership renewed.

Please note that this year, renewal notices will not be sent until the end of January. Pat is currently investigating methods of paying the subscription through Visa or Access. We will keep you informed.

## AUSTRALIAN CORAL REEF SOCIETY MEETING

The Australian Coral Reef Society is holding its Annual Scientific Conference in Townsville over the weekend of 10-11th August 1991. Members of ISRS are welcome to attend. The theme of the conference has yet to be determined. Further information available from the Secretary: *Dr T. Done, AIMS, PMB No 3, Townsville MSO, Queensland 4810, Australia.*

The following publications are available to ISRS members at the same price as they are to members of the Australian Coral Reef Society. Cheques should be made out in Australian \$, payable to the Australian Coral Reef Society, and sent to Terry Walker, Division of Conservation, Parks and Wildlife, P.O. Box 5391, Townsville QLD 4810, Australia.

## ACRS Publications

- Cribb, A.B. *Marine Algae of the Southern Great Barrier Reef - Rhodophyta. Handbook 2.* \$10.  
 Mather, P. and Bennett, I. (eds). *A Coral Reef Handbook - a guide to the flora, fauna and geology of Heron Island and adjacent reefs and cays.* \$10.

## Reports of the Great Barrier Reef Committee

- Moorhouse, F.W. (1933). *Notes on the Green Turtle.* Vol. 4, part 1, no.1. \$2.00  
 Moorhouse, F.W. (1933). *The commercial trochus.* Vol. 4, part 1, no.2. \$2.00.  
 Moorhouse, F.W. (1933). *The recently formed natural breastwork on Low Isles.* Vol. 4, part 1. \$2.00.  
 Moorhouse, F.W. (1933). *Commercial sponges from the Great Barrier Reef.* Vol. 4, part 1. \$2.00.  
 Bryan, W.H. (1936). *The supposed deepening of the sea floor off Breaksea Spit.* Vol. 4, part 2. \$2.00.  
 Steers, J.A. (1938). *Detailed notes on the islands surveyed and examined by the geographical expedition to the Great Barrier Reef in 1936.* Vol. 4, part 3. \$5.00.  
 Richards, H.C. (1938). *Boring operations at Heron Island, Great Barrier Reef.* Vol.4, part 3. \$2.00  
 Richards, H.C. *et al.* (1942). *Great Barrier Reef bores, 1926 and 1937; Cushman, J.A. Report on samples obtained by boring at Heron Island; Iredale, T. Report on molluscan content of Heron Island bores.* \$10.00.  
 Gleghorn, R.J. (1947). *Cyclone damage on the Great Barrier Reef.* Vol. 6, part 1. \$2.00.  
 Fairbridge, R.W. and Teichert, C. (1948). *The rampart system at Low Isles, 1928-1945.* Vol. 4, part 1. \$5.00.  
 Jones, O.A. and Jones, J.B. (1956). *Notes on geology of some north Queensland Islands. Part 1. The islands of Torres Strait. Part 2.*

- Cairncross Island to Hudson Island. Vol. 6, part 2. \$2.00.
- Chapman, F.D. A report on samples obtained by boring into Michaelmas Reef, about 22 miles n.e. of Cairns, Queensland. No. 3. \$2.00.
- Henderson, D.A. Subsidence of the continental shelf northward of Sandy Cape. No. 4. \$2.00.
- Lucas, A.H.S. The marine algae hitherto recorded from north-east Australia. No. 6. \$2.00.
- MacGillivray, and Rodway, F.A. Plants on islands of Bunker and Capricorn Groups. No. 7. \$2.00.
- Marshall, P. Coral reefs: rough-water and calm-water types. No. 8. \$2.00.
- Cribb, A.B. (1966). The algae of Heron Island, Great Barrier Reef, Australia. Great Barrier Reef Committee and Heron Research Station. Vol. 1(1). \$3.00.
- Straughan, D. (1967). Some Serpulidae from Heron Island, Queensland. Great Barrier Reef Committee and Heron Research Station. Vol 1(2). \$2.00.
- Stephenson, W. (1968). The intertidal acorn barnacle *Tetraclita vitiata* Darwin at Heron Island. Great Barrier Reef Committee and Heron Research Station. Vol. 1(3). \$2.00.
- Bergquist, P.R. (1969). Shallow water Desmospongiae from Heron Island. Great Barrier Reef Committee and Heron Research Station. Vol. 1(4). \$2.00.

## 7th INTERNATIONAL CORAL REEF SYMPOSIUM 1992

This will be held in Guam, organised by the University of Guam Marine Laboratory, **22-26 June 1992**. It will be sponsored by ISRS, Pacific Science Association, Wildlife Conservation International, University of Guam, several Guam Government departments, and a revolving fund initiated by the Organizing Committee of the 6th International Coral Reef Symposium.

The entire symposium will be held in one building with a maximum of four concurrent sessions. There will be both oral and poster presentations and these will be considered to have equal status; they will be limited to one per senior author. Oral presentations will be limited to 20 minutes including questions. The official language will be English and simultaneous translations will not be available. The proceedings will be typeset in the format of the journal *Ecology* and bound in the form of the 4th (Manila) Symposium.

Topic-based sessions will be organized on the basis of frequency of titles submitted in various subjects. You are encouraged to suggest a mini-symposium on a topical problem or issue that you would be interested in organizing and chairing, or for which you could suggest a chairman. If you require a meeting room at midday or in the evening for a society meeting or special workshop, information on the date, number of participants etc. must be sent to the organisers.

Field trips to the outer islands of Micronesia will take place in the weeks before and after the symposium and are currently being organised. Information concerning accommodation and travel arrangements will be provided in the second circular.

Further information available from: *7ICRS, Marine Laboratory, UOG Station, Mangilao, Guam 96923.*

## CURRENTS

### UPDATE ON GUIDELINES FOR MULTILATERAL DEVELOPMENT BANKS

In the last two issues there has been reference to environmental policies of multilateral development banks (MDBs) and to guidelines for their funding of development projects that may impact marine ecosystems. At the request of the U.S. Treasury Department, the Oceanic Society/Friends of the Earth, the National Audubon Society and the Natural Resources Defense Council have taken the lead in producing a background paper and recommended guidelines, applicable to marine ecosystems, for the U.S. to follow when voting on projects proposed for funding by the World Bank and other MDBs. The documents include contributions from a working group of experts chaired by Dr George Woodwell, have been circulated broadly for review, and have now been submitted to Secretary Brady.

The Treasury Department is eager for the guidelines to be used in any context where they are applicable. The U.S. will propose that the board of executive directors of each MDB adopt them as bank policy, but initially the voting instructions apply only to the U.S. We also hope they may be useful as working documents in the development of international conventions, such as various Regional Seas agreements. The World Bank claims to be developing its own internal guidelines for marine ecosystems, but we have yet to see any evidence of that.

The environmental organizations involved in the development of these guidelines and the Treasury Department are enthusiastic about John Ogden's suggestions that coral reef scientists in the member nations of the MDBs - especially the borrowing nations - press their governments to adopt these or similar guidelines tailored to the specific needs of their own countries. Such guidelines would be important, not only for voting by the various member countries in the MDBs but also for establishing criteria within the borrowing nations for the kinds of projects they are willing to propose for funding. Although they apply to all marine ecosystems, it is clear that coral reefs are in particular danger because of their fragility and their predominance in waters of countries where development projects are being funded. The Oceanic Society/Friends of the Earth is eager to cooperate with Dr Ogden and others interested in pursuing this avenue of coral reef protection. To begin with, we can provide copies of the document submitted to the U.S. Treasury and the names of key contact people in the governments of particular countries. We plan to coordinate our ISRS networking with Dr Ogden, so there is no need to contact us both.

Although there is no longer an opportunity for input into the Treasury guidelines themselves, they can certainly be modified and adapted to fit into other contexts. For example, the coral reef portion can be embellished with specifics applicable to particular coral reef nations or regions interested in adopting development guidelines for coastal and marine environments. We hope that a number of you will see the value in trying to influence the economic development process to reduce damage to coral reefs and other marine ecosystems. If you would like more information or a copy of the Treasury guidelines, please contact me.

Boyce Thorne-Miller, Staff Scientist, Oceanic Society Project, Friends of the Earth U.S., 218 D. Street S.E., Washington D.C. 20003, USA. Tel. (202) 544 2600. Fax: (202) 543 4710.

*An old, brown man tells us .....*

*My wife and children lived with me -  
O, this was many years ago -  
Beside a sunny tropic sea  
In times my boys no longer know.*

*Between the reefs along the shore  
We swam, or waded through a gap,  
The ocean was our only store -  
Our island home, Elugelap.*

*A ship came to our land one day,  
A white man in a navy cap  
Persuaded us to go away -  
And so we left Elugelap.*

*And now there is no trace of land,  
Nor coral reef beyond the foam.  
There are no palms, no hills of sand;  
The seas have covered up our home.*

*Now, sharks and flying-fish abound  
Where once we set our lobster trap,  
And there remains no fishing ground  
Where once there was Elugelap.*

*No-one can calculate our loss;  
You will not find it on the map.  
There is a hole, a mile across,  
Where once there was Elugelap.*

Ralph A. Lewin, May 1989  
Scripps Institute of Oceanography

## NEWS

### CONGRESS ON COASTAL AND MARINE TOURISM HONOLULU, 25-31 MAY 1990

The first Congress on Coastal and Marine Tourism was held in Honolulu in May 1990 at the East-West Center in Hawaii. It was sponsored by several universities of the U.S. Sea Grant College Program, the East-West Center, the National Coastal Resources Institute, the Pacific Basin Development Council and 17 other government, private, commercial and non-profit organizations. Over 224 listed participants from 33 countries and territories from around the world participated. The majority were from the U.S.A., Australia, Canada, Indonesia, Thailand, Federated States of Micronesia, Palau, Philippines, Northern Mariana Islands, Taiwan, Puerto Rico, Malaysia, New Caledonia and South Africa, most of which have coral reefs. Many of the developing countries were interested in learning how to plan and implement coastal marine tourism in their countries.

Coral reefs serve as the primary visitor attraction in most of these countries, based on the topics covered in the 114 papers, workshops, and other sessions during the Congress. Specific reference to coral reefs was mentioned in many of the following sessions:

- Conservation, Recreation and Tourism in Marine Settings: or the Good, the Bad and the Ugly.
- Towards Successful Tourism Development- Perspectives on Managing Hanauma Bay (Hawaii)
- Use, Abuse and Overuse: Lessons Learned
- Carrying Capacity Case Studies in Hanauma and Kaneohe Bays
- Developing Parks and Protected Areas as Tourism Attractions
- Parks and Protected Area Systems
- Parks and Protected Areas - Systems Planning and the Theory and Reality of Protected Area Establishment
- The Importance of Natural Resources for Coastal and Marine Tourism
- The Importance of Sustainable Use of Nature for Coastal/Marine Tourism
- The Myths and Truths About Water Quality: Impacts and Their Management
- Environmental Planning and Monitoring for Tourism
- Coastal Zone Management Principles and Tools
- Perspectives on Tourism
- Enhancing the Visitor Experience
- Analytical Tools for Successful Tourism
- Community Involvement in Tourism Development
- Development Alternatives



One constantly re-emerging theme in many of the presentations was that coral reefs managed as marine parks are sensitive to visitor use and are easily degraded by over use or abuse. Although marine park and sanctuary designation are important strategies for protecting coral reefs, inadequate management or monitoring of such areas often leads to coral reef damage. In addition, eutrophication and sedimentation from adjacent hotels and other resort facilities (golf courses, marinas, sewage treatment plants) were cited as major reasons for degrading water quality near coral reefs. A variety of field techniques and planning tools were described to assist in resource survey, environmental assessment, planning, management and monitoring of coral reefs for tourism. In particular, the involvement of local communities and fishermen in reef park management was cited in several papers while new techniques to monitor coral reef health were described in others. Finally coral reef tourism serves as a major source of revenue for many island nations and indirectly stimulates other types of tourism.

The success of the meeting and the enthusiasm and interest conveyed by many of the participants suggests that the May 1990 Congress may be the first of many future meetings on marine and coastal tourism, and the need for a follow-up congress was frequently mentioned by the end of the congress.

The workshop proceedings will be published and will be available for purchase (date and price not yet determined). Directories of the abstracts and resource personnel, contributors and moderators are still available for purchase at US\$5.00. A few notebooks with a complete listing of the participants (including addresses, fax and phone numbers) and other congress materials are also available for US\$5.00. Make cheques payable to the U.H. Foundation/Marine Tourism.

Further information from: Don Bauer, Logistics Co-ordinator, University of Hawaii Sea Grant Extension Service, 1000 Pope Rd, MSB 226, Honolulu, Hawaii 96822. Phone: 1-808-956-8191. Fax: 1-808-956-2858.

James E. Maragos, East-West Center, 1777 East-West Rd, Honolulu, Hawaii 96848.

## TURKS AND CAICOS MARINE PARKS

Twenty four marine parks have been proposed for the Turks and Caicos, the group of islands lying on the south-eastern most extension of the Bahamas platform, and one of the last remaining British Dependent Territories. The two main sources of income on the island, tourism (especially diving tourism) and fishing, are both dependent on the islands' fringing reefs. Two parks have been designated: Grand Turk, which includes Salt Cay, and Princess Alexandra National

Park which was opened in November 1988 and lies on the north shore of Providenciales. Mooring buoys have been placed at all the dive sites in this latter area.

The establishment of these protected areas, through a recently set up National Parks Commission, was largely triggered by survey work by UK and US divers who became concerned at the increase in anchor and diver-related damage in some of the popular diving sites and the extent of illegal fishing with bleach and spearfishing. Reef surveys have been carried out of the proposed sites on South Caicos, North-west Point (Providenciales) and West Caicos. To date, the protected areas programme has been carried out largely on a voluntary basis. The UK diving expeditions have received funding from WWF-UK, BP and the UK-based Fauna and Flora Preservation Society, and have been carried out with assistance from the Operation Raleigh programme (in 1986), and students from the University of Hull, with scientific advice from the Reefwatch Programme at the Tropical Marine Research Unit at York University, and support from PRIDE (the local Society for Protection of Reefs and Islands from Degradation and Exploitation).

Reports are available for the survey work carried out at North Shore (Providenciales), Grand Turk, South Caicos, West Caicos and North-west Point (Providenciales). A five-week survey of North Caicos was carried out in the summer of 1990.

Further information from: *Les Holliday, 102, Dijon Avenue, Acomb, York YO2 3DD, UK.*

### THE COMPLEAT REEF ENCOUNTER No. 8

"Now, everything the Princess was wearing had grown big along with her, so that there dangled from her golden girdle a pair of scissors as big as the Malay Peninsular, together with a pincushion the size of the Isle of Wight, and a yard measure that would have gone around Australia. And when she heard the little, little voice, she knew it, small as it was, for the dear voice of Prince Florizel, and she whipped out the scissors from her gold case and snip, snip, snipped all her hair off, and it fell into the sea. The coral insects got hold of it at once and set to work on it, and now they have made it into the biggest coral reef in the world; but that has nothing to do with the story."

From: *Melisande or Long and Short Division: Stories for Eight-Year-Olds* by Elizabeth Nesbit (author of *The Railway Children*).

## PROPOSAL FOR A FLORIDA KEYS MARINE SANCTUARY

In *Reef Encounter* 5, August 1989, John Ogden wrote of the increasing deterioration of the Florida Keys reefs. Bill H.R. 3719 "The Florida Keys National Marine Sanctuary Act of 1990" has been drawn up, proposing that the whole area should be designated for protection under the Marine Protection, Research and Sanctuaries Act of 1972. The Bill is now undergoing public hearings. The following excerpt is from John Ogden's testimony at one hearing. As he points out, the term 'sanctuary' should be replaced with one more descriptive of the situation, e.g. 'zoning plan'.

'Unfortunately, H.R. 3719 is directed only at the recent groundings of large ships, all of which occurred within existing marine sanctuaries and parks. The proposed Florida Keys Marine Sanctuary, if limited by its present language to regulation of ship traffic, will have little impact on the alarming, continuing decline of the coral reefs of South Florida.

Collisions between ships and coral reefs are dramatic, but relatively insignificant to a reef over 200 miles long. Coral reefs are remarkably robust and resistant to physical damage, to smashing by anchors, and to chipping away by divers and collectors, provided the damage isn't too persistent or concentrated.....

At recent meetings concerned with the health of the marine environments of South Florida, a consensus has emerged that the fate of the coral reef is inevitably tied to the land of the Florida Keys and South Florida and that what we do there is having a slow but inexorable impact 'downstream' on the reef tract..... Thus we must gain greater understanding of the interaction of land and sea in the Keys and we must do this at the geographic scale of the whole Florida Keys seascape. The creation of a sanctuary, or zoning plan is a critical first step.

The Great Barrier Reef (GBR) of Australia provides us a valuable example of the approach that is needed in the Florida Keys..... The scope of bill H.R. 3719 should be expanded to include other impacts on the coastal seascape including tourism, fishing and exploration. Following an environmental assessment report and public hearing, a draft Zoning Plan would then be issued for detailed public comment. The final plan would be responsive to all user groups, would incorporate their concerns and would predispose public acceptance of and participation in regulation and preservation of a resource of great local and national significance.

Such a zoning plan would largely mirror present public use patterns of the Florida Keys seascape. I

have taken the liberty of defining four hypothetical zoning sections .....

1. **The Upper Keys** including Biscayne National Park, John Pennekamp State Park, and the Key Largo National Marine Sanctuary would be zoned for parks, tourism and limited fishing. Some smaller sites might be set aside for general use, preservation and research.

2. **The Central Keys**, largely inaccessible to tourists, could be zoned for general use, including regulated spearfishing, line fishing and trolling, trap fishing, and permitted exploration and salvage.

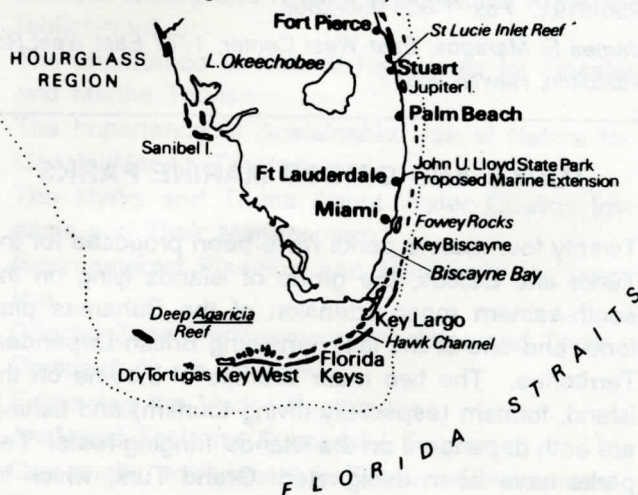
3. **The Lower Keys to Key West** would be a mosaic of park and general use areas, largely following present use patterns and including Looe Key National Marine Sanctuary.

4. **Key West - Dry Tortugas**, including Fort Jefferson National Monument, would be largely regulated for general use with the Dry Tortugas set aside for park, preservation and research.

My objective is not to impose a zoning scheme on the Keys, but to point out that a Zoning Plan incorporating present user group concerns would most likely duplicate the existing and largely accepted use patterns. Thus, the daunting task of creating an acceptable Plan might not be as contentious or impose as much hardship as might be expected.

The principal strength of H.R.3719 is that it encompasses the whole Florida Keys seascape which is the suitable management unit for long term survival of resources that are universally valued and universally viewed as being in decline. If the bill is broadened to include major impacts on the Florida Keys seascape and a zoning plan to regulate them, we will have gone a long way to insuring the future preservation, use and enjoyment of a unique section of the coastline of the U.S.'

John Ogden, Florida Institute of Oceanography, 830 First St, South, St Petersburg, Florida 33701, USA.



From Wells (1988) *Coral Reefs of the World*, vol. 1. IUCN.

## FEATURES

### GLOBAL WARMING - SEA LEVEL RISE

It is impossible to keep up with all developments in this field; the following is mainly a selection of items that have come through the editor's mail box. It would be more interesting if you, the membership, could send in brief reports of 'greenhouse'-related meetings etc. that you have attended. Bob Buddemeier kindly sent comments following up on his two newsletters.

'My impression of the climate change prognosis continues along the lines I indicated earlier - examinations of ocean interactions, cloud effects, ice responses, etc. seem to be reducing the probability of the previous higher range of values (4-5°C for doubled carbon dioxide) estimated for atmospheric change. Atmospheric values more in the order of 2°C average global change in the coming century seem to be gaining in popularity. I think it's important to note that this isn't necessarily because there are big changes in the estimates of greenhouse gas concentrations or their heat-trapping potential; some of it stems from possible counterbalancing effects, but a significant factor seems to be higher estimates of oceanic heat uptake.

This, of course, is where marine types should be interested, but predictions are hard to come by - because of the enormous differences in heat capacity, average global ocean temperature changes are going to be trivial, and the local or temporal distributions of perceptible effects remain at least as difficult to predict as regional atmospheric climate effects. Nonetheless progress seems to be occurring, and my suggestion is that people who are interested in a particular patch of ocean would be well advised to assemble and validate as much historical or baseline data (either direct measurements or suitable environmental proxies) as they can and institute thoughtful monitoring programmes where possible. Without credible data bases, the present phase of arguing about whether changes are or are not occurring could stretch on indefinitely, to the detriment of both research and planning.

Sociologically, it seems interesting that just as political and public opinion pressure to 'do something' about climate change is cresting, various forms of scepticism (about the probability, magnitude and undesirability of climate change) are more in evidence. Whatever the ultimate outcome there will be plenty of blame to go around in retrospect, which reinforces my opinion that it is very important for scientists to maintain an intellectually honest and rigorous approach to the subject.'

**Bob recommends the NETWORK NEWSLETTER as being the most comprehensive source of information on**

the subject, as well as the Carbon Dioxide Information Center publication mentioned in one of his newsletters. NETWORK NEWSLETTER available from: Environmental and Societal Impacts Group, National Center for Atmospheric Research, P.O. Box 3000, Boulder, CO 80307-3000, USA.

### Carbon Dioxide Sink - or sinking reefs?

At the Australian and New Zealand Association for the Advancement of Science meeting in Hobart in February, Don Kinsey and David Hopley presented a paper on 'The response of coral reefs to greenhouse - significance to global CO<sub>2</sub> budget'. This will be published in *Global and Planetary Change*. Like Bob Buddemeier, Don Kinsey stresses that estimates of rates of change are now much more conservative; current predictions of sea level rise are in the order of about 30 cm by the middle of next century, i.e. c. 6 mm/yr - and coral reefs can readily achieve such vertical growth rates. The following is a shortened version of the abstract.

Coral reefs are net sinks for C, principally as CaCO<sub>3</sub> accretions. It is possible to predict quite accurately the rate of production, given adequate information about any particular reef environment. The best data set for an extensive region is that for the Great Barrier Reef (GBR). Careful analysis of this region and the incorporation of previously documented present day system calcification rates suggest a total production of c. 50 million tonnes of CaCO<sub>3</sub> a year for the 20,055 sq km of the GBR. If sea level rise reaches or exceeds 8 mm/yr, and causes extensive and prolific recolonisation of present-day reef flats, production could rise to c. 70 million tonnes a year. Accepting an existing estimate of 617,000 sq km for reefs worldwide, global reef production can be estimated at present to be c. 900 million tonnes/yr. We suggest this rate could almost double within the next 50-100 years, to c. 1800 million tonnes.

Thus coral reefs at present act as a sink for 111 million tonnes C/yr, the equivalent of 2% of the present output of anthropogenic CO<sub>2</sub>. In the short term greenhouse scenario (50-100 yr) we predict this could increase to the equivalent of about 4% of present CO<sub>2</sub> output. Unfortunately, we also predict that this considerable sink will be most likely of negative value in alleviating the greenhouse effect because the immediate effect of calcium carbonate precipitation is to raise the partial pressure of CO<sub>2</sub> of the surface oceans, and thus encourage an efflux of CO<sub>2</sub> to the atmosphere. We do not attempt to quantify this effect.

Other changes such as seawater temperature increase, changes in cloud cover, increased rainfall and runoff, increased storm activity and changes in dissolved CO<sub>2</sub> concentration and surface ocean circula-

tion may complicate this response. However, we suggest that sea level rise will be the dominant influence, at least during the next 50-100 years.

Dr. D. Kinsey, GBRMPA, PO Box 1379, Townsville, Qld 4810, Australia.

### Malé Declaration on Global Warming and Sea Level Rise

The Malé Declaration was drawn up at the Small States Conference on Sea Level Rise, held in November 1989 in the Maldives. Recognising that the overloading of the atmosphere with greenhouse gases has occurred primarily through the actions of industrialized nations, the Declaration calls on these nations to initiate, on an urgent basis, international action to stabilize and subsequently reduce emissions of these gases. It calls for a worldwide programme of action to combat the serious implications of climate change, global warming and sea level rise, and urges industrialized nations to make available resources and technology to vulnerable states that do not have the financial and technical means themselves to combat these problems. It calls for a global strategy to be developed, in association with the work of the WMO/UNEP Intergovernmental Panel on Climate Change, within which the issue of the impact of sea level rise in small states should be addressed separately. It recommends, among other things, that small states should take adequate measures to protect vulnerable natural ecosystems such as coral reefs and mangroves.

Further information from: Hussein Shihab, Director of Environmental Affairs, Ministry of Planning & Environment, Malé 20-05, Republic of Maldives; or Dr Barbara Brown, Centre for Tropical Coastal Management Studies, Dept Biology, The University, Newcastle upon Tyne, NE1 7RU, UK.

### Intergovernmental Panel on Climate Change (IPCC)

Summaries and an overview of the reports of the Working Groups of the IPCC are now being released. The IPCC was set up in November 1988 by the World Meteorological Organisation and the United Nations Environment Programme. It co-ordinated the work of more than 1000 scientists and policy makers worldwide, divided into three Working Groups:

**Working Group 1:** reported on the scientific aspects of global climate change; subgroups looked at trends and processes and came up with model simulations and predictions for several areas and issues including sea level rise.

**Working Group 2:** reported on the impacts of climate change, with subgroups that considered natural ecosystems, water resources, and ocean sea level among others.

**Working Group 3:** reported on strategies to limit or adapt to climate change; two subgroups were set up to consider means of limiting the change, and two to consider means of adaptation.

Reports and articles that have come out of the IPCC and its Working Groups include:

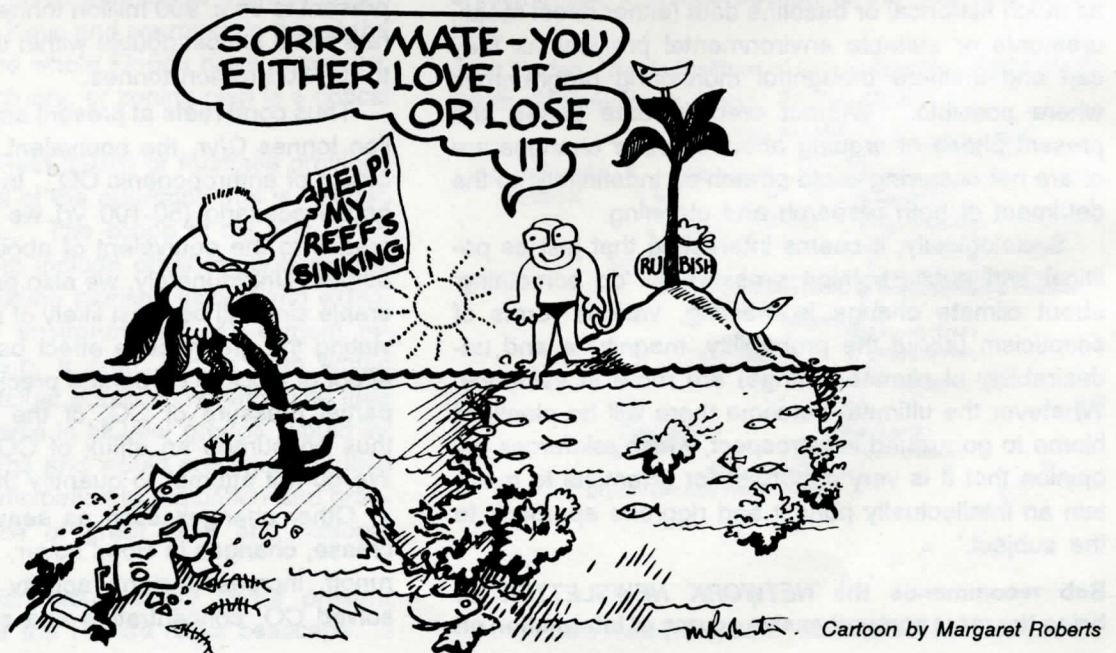
*Policymakers Summary of the Scientific Assessment of Climate Change.* Working Group 1, 39 pp. \$7.95.

*Policymakers Summary of Potential Impacts of Climate Change.* Working Group 2, 38 pp, \$7.95.

*Policymakers Summary of the Formulation of Response Strategies.* Working Group 3, 39 pp. \$7.95.

*Overview.* 20 pp. \$5.00.

These are available from UNEP North America, DC2-0803, United Nations, New York, NY 10017. The results of Working Group 1 have been published as: *Climate Change: the IPCC Scientific Assessment.* Cambridge, 365 pp., £40 hbk, £15 pbk.



The work of the Coastal Zone Management Subgroup of Working Group 3, which met in Miami, in 1989, on Adaptive Responses to Sea Level Rise is described in the following: Freestone, D. (1990). Preparing for the rising tide. *Marine Policy* (issue of September 1990).

If any ISRS members have been involved with any of the IPCC Working Groups or subgroups, perhaps they could write in with information on their work.

### U.S. Senate Hearing on Coral Reef Bleaching

On October 11, 1990, a research panel appeared before the U.S. Senate Committee on Commerce, Science and Transportation to testify about coral reef bleaching. The hearing was organized and chaired by Senator Albert Gore, Jr. (Democrat - Tennessee). Ray Hayes, Tom Goreau, Bert Williams, Walt Jaap and Bob Wicklund constituted the scientific panel. Following their presentations, Roy Spencer and Phil Jones testified about global temperature data. Representatives from NOAA, NSF and EPA followed with discussion of federal agency involvement in scientific investigations of coral reef bleaching. The objective of the hearing was to focus attention on this important disturbance and to encourage support for an adequate research response.

Further information from: R.L. Hayes, Dept Anatomy, Howard University, Washington D.C. 20059, USA, and E.H. Williams, Dept Marine Science, Univ. Puerto Rico, Mayaguez, PR 00708, USA

### How to deal with that sinking feeling ....

Anyone with the sinking feeling of being drowned by publications on sea level rise and global warming might do well to obtain *The Rising Seas* by Martin Ince, published by Earthscan. This little paperback is probably the best current straightforward overview of the whole topic. It is based on the reports produced by the Commonwealth Secretariat, following the complaints of countries like the Maldives that the developing world will suffer most from the impact of climate change. The book, however, embraces a much greater area than the Commonwealth, covering problems and potential solutions from the Netherlands to Bangladesh, from high-tech to low-tech. Coral reefs get plenty of attention, with discussions of growth rates, bleaching and brief case studies of the Maldives and the Great Barrier Reef. The general discussion, which provides a global context for the concerns of reef scientists, is particularly useful.

*The Rising Seas* by Martin Ince, Earthscan. 152 pp. ISBN 1-85383-077-1. £5.95 pbk. Earthscan Publications Ltd., 3, Endsleigh St, London WC1H 0DD. UK.

### Unesco Report

The Unesco COMAR Working Group on Mean Sea-Level Rise and its Influence on the Coastal Zone has produced a report which provides a critical summary of the causes, likelihood and consequences of mean sea level change. It concludes that, while current scientific opinion does not tend toward 'doomsday' forecasts of dramatic global sea level rise, significant changes in the levels of both the land and sea are likely. Most of these are seen to be site-specific rather than global. The Working Group suggests components and basic considerations for the establishment of international programmes to ascertain sea level change.

Stewart, R.W., Kjerfve, B., Milliman, J. and Dwivedi, S.N. (1990). *Relative sea-level change: a critical evaluation*. Unesco Rep. Mar. Sci. 54. Available from: Marine Information Centre, Division of Marine Sciences, Unesco, Place de Fontenoy, 75700 Paris, France.

### TREE Special Issue

Many members will have already seen the special issue of *Trends in Ecology and Evolution* (1990, Vol 5(9)) that is devoted to the theme of 'Biology and Palaeobiology of Global Climate Change'. For those who have not, or who would like their own copy, individual copies are available from the publisher. The issue includes two articles with marine themes:

'Climate and change in oceanic ecosystems: the value of time-series data' by John A. McGowan.

'Ocean productivity and climate change' by Phillip Williamson and Patrick H. Holligan.

Price US\$12.00/£7.50 (p&p inc.). Orders with cheque to Ms Sue Waite, order Fulfilment Dept, Elsevier House, Linton Rd., Barking, Essex IG11 8JU, UK. Discount for 10+ copies; write for details.

### IUCN Global Change Programme

IUCN - The World Conservation Union is developing a programme to consider the implications of global climate change for resource management and conservation. A workshop on 'The Environmental Implications of Global Change' was held during the 18th General Assembly of IUCN in Perth, Australia in December 1990. Topics included analysis of global climatic models, human demands on natural resources, impact on vegetation and species distribution patterns, and changes in coastal ecosystems.

Further information from: Danny Elder, Marine Programme Co-ordinator, IUCN, Ave de Mont Blanc, Gland, CH 1196, Switzerland.

## COUNTRY PROFILE

### CORAL REEF PROJECTS IN THE REPUBLIC OF MALDIVES

M. Shiham Adam, A. Edwards and B. Brown

The Maldives has been much in the public eye recently as a result of the initiatives taken by its president, Maumoon Abdul Gayoom, to draw world attention to the threat posed by sea level rise to lowlying countries such as his. This has been partly responsible for the enormous increase in reef-related research underway in the archipelago. Early studies of the Maldivian reefs included the notable work of Agassiz, Gardiner and Sewell. Their descriptive work was followed by two major expeditions - the 'Xarifa' Expedition of 1957/58 and a British expedition to Addu Atoll in 1964.

However, research requiring long-term studies and laboratory work suffered from the lack of a permanent base in the country. This was remedied in 1984 by the creation of the Marine Research Section (MRS), under the Ministry of Fisheries and Agriculture. MRS was set up not a moment too soon. The Maldives has always depended on its marine resources to feed its people and to provide foreign exchange, but the reefs have only recently come to have really major economic significance. The tourist industry has grown at an explosive rate since the early 1970s, and to a large extent caters to foreign SCUBA divers. Pollution, once of little concern in such a sparsely populated country, is an increasing threat as more resorts, ports and factories are built. There is increasing demand for reef fish, curios and other products to satisfy tourist demand. Rapid population growth, combined with the tourist industry and increasing urbanisation has meant a huge increase in demand for building material - and the reefs are the only readily available source. Finally, of course, the reefs may prove to be the Maldives' most important natural defence against sea level rise. Certainly the arguments for their sustainable management have never been more compelling.

Below we briefly outline the major projects underway which are aimed at solving some of these problems.

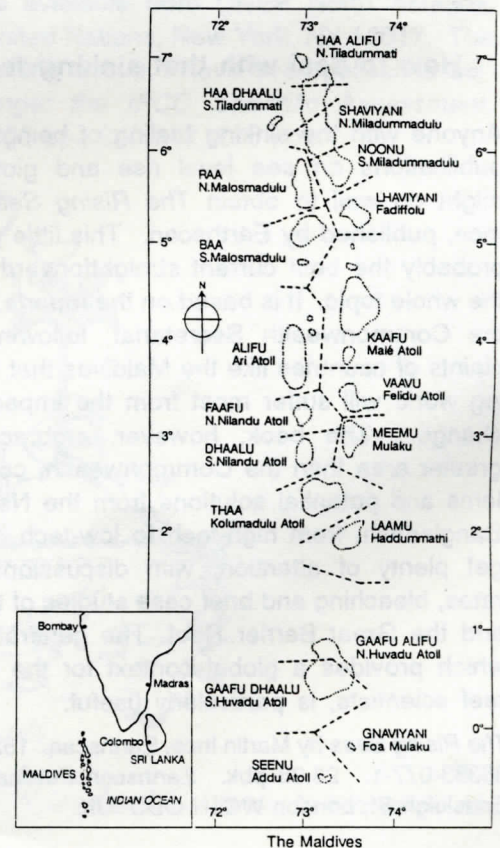
#### Reef fish research and resources survey

This project is funded by UNDP (United Nations Development Program) and executed by FAO (Food and Agricultural Organisation). The aim is to study the abundance of the reef fish resources and to examine the suitability of various gears for exploiting them. During the first phase of the project (1987-88), which concentrated on Male and Ari Atolls, various gears

were tested, including arrowhead traps, longlines, droplines and trolling. The second phase which started in 1989 is focussing mainly on Laam Atoll in the central Maldives. All fish caught are investigated for their length, weight, sex, gonad maturity, stomach contents and for the presence of parasites. A large collection of otoliths were also obtained during the first phase of the project for most common families of reef fish occurring in the Maldives, covering all the size classes caught.

#### Reef fish identification

One of the problems faced by reef fishermen, divers and fisheries scientists alike is the identification of coral reef fishes. In the Maldives, there are probably well over one thousand species, and more than half are seen fairly regularly on the reefs. Many of these can be identified using literature available from other areas such as the Red Sea, Caribbean and the Great Barrier Reef, but such sources include many species not common in the Maldives and do not include others. Recognising the need for a country specific identification guide, the Marine Research Section (MRS) started work in 1986 on a catalogue of fishes of the Maldives. So far, 2 volumes have been published, with 70 species in each, that are most commonly encountered on Maldivian reefs. The book contains line drawings with their scientific and local name and also major habitats in which they are found. The price of each volume is 50 Maldivian rupees, and these are available from the MRS or Ministry of Fisheries and Agriculture.



## Crown-of-Thorns Program (COT)

*Acanthaster* recently became a problem on some resort islands in North Male atoll and was officially reported to MRS in 1986. As a first priority, MRS initiated a nation-wide survey to determine the seriousness of the situation throughout the country. Questionnaires were sent to each island in 1989 and are now being analysed. In addition, a Crown-of-Thorns awareness program was launched with the assistance of ICOD (International Centre for Ocean Development) of Halifax, Canada. This involves conducting workshops for resort operators and diving instructors. A monthly *COT Newsletter* is published which deals specifically with the problem and other general environmental issues. A video about crown-of-thorns and reefs is also being produced.



## Tuna tagging program

The Maldives have traditionally been famous for pole-and-line tuna fishing, which is one of the pillars of the national economy, providing a major source of food and foreign exchange. The two most important species caught are skipjack and yellowfin tuna. Both are highly migratory in behaviour: a school sighted in the Maldives may be near the Seychelles or Mauritius by the next month. In the past, this was not of concern as the Maldives was the only tuna fishing nation of importance in the Indian Ocean. However, today, not only have many coastal states expanded their tuna fisheries but also many other nations are carrying out large scale fishing operations especially French and Spanish purse seiners, operating out of Seychelles. There is therefore real concern that the increased fishing effort by the neighbouring countries may adversely affect the tuna catches in the Maldives.

As part of gathering data for the sustainable management of tuna in the Indian Ocean, this programme is being carried out with neighbouring Sri Lanka. Tuna are tagged from known locations noting the length, and recaptures are recorded. So far, 13% of the Maldivian tags have been recovered. The information gained could be used to study the growth rates, migration patterns and the degree of overlapping between the fisheries of two countries.

## Rehabilitation of degraded reefs using artificial reef blocks

This project is funded by the UK Overseas Development Administration and is being carried out by a team from the Centre for Tropical Coastal Management Studies of the University of Newcastle upon Tyne. Numerous reef flats, particularly in the vicinity of Male, have been mined for their coral. Quite a number of these have shown little recovery over 20 years. This project sets out to investigate why and to elucidate the factors that are critical to reef rehabilitation in previously degraded areas. A heavily mined reef, 2.4 km NNW of Male has been chosen as a study site. A series of 50 sq km artificial structures providing varying degrees of reef surface stabilisation and topographic diversity has been placed in a 4.5 ha site. Colonisation of the structures by fishes, corals and other organisms will be monitored over three years initially. In parallel, coral larval settlement will be studied on settlement plates, algal grazing pressure will be investigated at a series of experimental plots and reproduction of nearby corals will be studied to try to get a handle on the various processes contributing to reef rehabilitation.

## Reef monitoring programme

ICOD is also funding a reef monitoring programme in North and South Male atoll. The aim of this is to set up a number of permanent monitoring sites where plot-less line transects will be monitored at monthly intervals to provide information on changes on the reef over time. The programme began in July 1990 with a workshop on monitoring and taxonomy for local participants in Male.

Further information may be obtained from: *Mr Maizan Hassan Maniku, Director, MRS, Ministry of Fisheries and Agriculture, Male, Maldives; and Centre for Tropical Coastal Management Studies, Dept Biology, The University, Newcastle upon Tyne NE1 7RU, UK.*

## Postscript

### 'Adopt a Coral'

MRS has developed a novel scheme to foster public interest in the Maldives in reefs and gain information at the same time. Resorts are being encouraged to 'adopt a coral'. Dive School staff are asked to select one or two healthy corals on the local reef (in snorkelling depth), name them and send details to MRS. If any disaster befalls them, the information is sent to MRS - and if all goes well, a photograph of the adopted coral is sent to MRS on each anniversary of the adoption date. Eight resorts have joined the scheme so far; corals now in care include Fatima, Dish, Zulu, Bonzo and Greenpeace, among others.

## BOOK REVIEWS

### TROPICAL ATLANTIC FISHES

#### Fish and Fisheries of St Helena Island

A. Edwards

Centre for Tropical Coastal Management Studies, Newcastle, 1990. ISBN 0-9516480-0-4.

Available to ISRS members from: Alasdair Edwards, Centre for Tropical Management Studies, Dept of Biology, The University, Newcastle-upon-Tyne, NE1 7RU, UK. £14 (US\$25) surface mail, £17 (US\$30) air mail.

#### Reef Fish Identification

P. Humann. Edited by N. Deloach.

New World Publications, Florida, 1989.

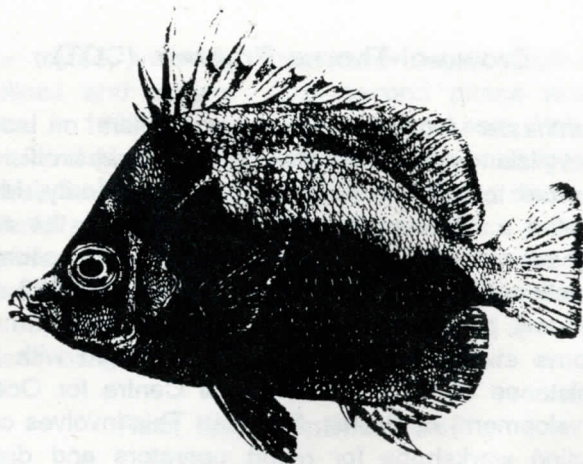
ISBN 1-878348-00-0.

Two books have appeared recently on tropical Atlantic fishes, the first covering the central Atlantic and the second the Caribbean. Both fill important gaps in the literature.

*Fish and Fisheries of St Helena Island* is both a narrative and identification guide to fishes of one of the remotest islands in the world. The nearest land is the tiny Ascension Island, some 1290 km away. It was this remoteness which drew the author, a biogeographer and authority on central Atlantic fishes, to St Helena. Here can be found the products of extreme isolation: an impoverished fauna of only 80 or so species of shallow-water benthic fishes, and a high degree of endemism (12.5% are unique to St Helena).

Since its discovery in 1502, the inhabitants of St Helena have relied heavily on the sea for food. Over the ensuing 500 years a rich and florid vocabulary has developed to describe marine organisms. For example, this book shows you how to tell a Bastard Cunningfish from a Shitty Trooper! The former, a butterflyfish, is apparently named for its ability to remove bait from hooks, while the latter is a surgeonfish whose brown colour and habit of eating faeces did not go unremarked.

This book is well illustrated with many line and half-tone drawings and 24 colour plates. Colour photographs emphasise species endemic to St Helena or the central Atlantic, making this book a valuable addition to the library of anyone interested in Atlantic fishes. The species descriptions are clear and provide enough detail to accurately identify both living and dead individuals. The section on moray eels will be particularly helpful to divers intent on feeding them, allowing a positive identification from the impression left by the teeth on the hand! The book is well produced in an A4 format with a soft binding. At £14, it is very reasonably priced and gives good value for money.



The Bastard Cunningfish *Chaeton dichrous*

The second book, *Reef Fish Identification*, is both stunning and a little disappointing. It represents one of a new wave of fish identification guides targetted at divers and snorkellers who want to know what a fish looks like *underwater*. In this way it is a break from the taxonomic approach where numbers of spines and rays are paramount, and the fishes look like they've been hauled backwards through a trammel net! This book is a catalogue of photographic excellence which takes your breath away each time you open it. Budding photographers must expect to feel a bit green at the gills but may be consoled by the fact that these are the products of thousands of films taken over the last 20 years, mainly by Paul Humann. Many others have contributed their best shots and the complete collection sets a new standard.

The book is very well laid out and fishes are grouped into 12 sections based on their general appearance or behaviour. The descriptions completely omit the fish market approach and concentrate instead on features important for underwater recognition. These are complemented by excellent line drawings which pick out key distinguishing characteristics. Where juveniles or sexes differ, each is described and is usually illustrated with a photograph.

The book fails where almost every other book I have seen on reef fishes has failed: in the description of behaviour. There are gems of descriptions such as "constantly swims about reefs" for the wrasse *Thalassoma bifasciatum*. Perhaps more is known about the behaviour of this fish than any other in the Caribbean yet the scientific literature remains a closed book to most divers. How about behavioural ecologists teaming up with photographic enthusiasts to make the next book on reef fishes the definitive one?

This criticism aside, the book can be strongly recommended to both divers and scientists. It is produced in a comb bound A5 format which will easily slip into the dive bag. At \$29.95 it is well worth the cover price.

Callum Roberts, Dept of Biology, The University, Newcastle-upon-Tyne, NE1 7RU, UK



## BOOK SHELF

### THE LIVING OCEAN: UNDERSTANDING AND PROTECTING MARINE BIODIVERSITY

*B. Thorne-Miller and J.G. Catena*

Island Press, Box 7, Covelo, CA 95428, USA. Available Jan. 1991.

This book reviews the scientific and environmental policy issues associated with the conservation of biological diversity in the marine environment. It is a general overview of the topic applicable to the development of environmental policy and environmental management practices in coastal and oceanic ecosystems. It raises scientific issues as to how biodiversity in the ocean should be assessed, valued and protected and draws comparisons among different types of marine ecosystems and between marine and terrestrial environments. The perspective is global and does not favor one type of ecosystem over another, so coral reefs are only one of many interconnected ecosystems addressed. Nevertheless, the causes of degradation leading to the critical status of reefs worldwide and the need for immediate action are acknowledged. The book concludes with a number of recommendations having to do with the future study and conservation of biological diversity in marine ecosystems. The authors are a marine biologist and a marine policy analyst with the Oceanic Society, a project of Friends of the Earth, U.S.

### GENERIC GUIDE TO COMMON CORALS

*C. Sheppard*

Marine Conservation Society, 1990. Available from MCS Sales Ltd, 9 Gloucester Road, Ross-on-Wye, Herefordshire HR9 5BU, U.K. Price £7.50 + £1.80 p & p.

This is a revision of the author's earlier guide, also for the MCS (then the Underwater Conservation Society). It has black and white photos of nearly 100 genera (skeletons, not living colonies), including about 95% of those most likely to be encountered by divers. The genera are grouped according to gross colony character and shape rather than taxonomically. A list at the end shows their taxonomic arrangement. This is designed mainly for amateurs but could certainly be useful as a teaching aid as it provides a quick way of narrowing down possibilities. The only quibble is the price, which seems a lot for a 30 page booklet.

### OUR COMMON SEAS - COASTS IN CRISIS

*D. Hinrichsen*

Earthscan Publications Ltd. in association with UNEP, Nairobi. 1990. 184 pp. ISBN 1-85383-030-5. £6.95.

One of Earthscan's useful paperback overviews, this book describes what is happening in coastal areas around the world. The book is based heavily on the work of the UNEP Regional Seas Programme, with chapters devoted to the issues and problems within each of the Programme's ten regions. It presents rather a depressing picture, which is probably largely true, but suffers from the sort of journalistic generalisation that riles a reef scientist: 'Of all the vital coastal ecosystems under threat, it is coral reefs - the marine versions of tropical rainforest - which are being decimated faster than any other marine resource. It is possible that they are being extinguished more rapidly than rainforests'. Nevertheless, it is a good guide for anyone unfamiliar with the UNEP Regional Seas Programme activities and also provides valuable teaching material.

## ANNOUNCEMENTS

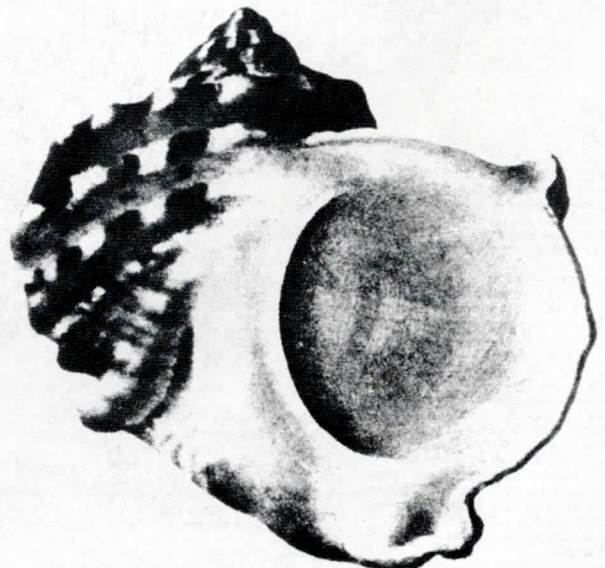
### TROCHUS AND GREEN SNAIL

I visited the small island of Anatom (or Aneityum), the southernmost inhabited island of the Republic of Vanuatu, in April 1989. I had hoped to find pristine stocks of the reef gastropod, the green snail *Turbo marmoratus*, in order to study their population parameters and other aspects of their biology. This species has been driven to 'economic extinction' in my home area of the Ryukyus in Japan as a result of economic overharvesting, making population studies impossible.

However, I was naïve in thinking I could carry out such studies in Vanuatu. Although Anatom (the southern limit of the range of the green snail) is very remote, this species had already been overexploited and affected by illegal harvesting. Devambe reported in 1959 that six divers could collect 11 green snails in 45 minutes on these reefs, and that two divers found 13 shells in 10 minutes in 1961. During our brief survey, a local diver and myself found only three green snails at three sites in about three hours. Population density may therefore be an order of magnitude less than it was three decades ago.

Local people admitted that their collecting activities could have contributed to the decline. However, they also pointed out that poaching by divers from foreign vessels had become frequent. I was surprised to learn that buyers of both green snail and trochus shells regularly visit the island although export of unprocessed shell had been banned by the Government.

Recent trade statistics, where available, indicate strong demands for green snail shells: unit export value has soared and exports from major producing nations (Papua New Guinea, Solomon Islands and In-



*Turbo marmoratus*

donesia) has declined. There is little information from other producers such as the Philippines and Malaysia but I suspect that overexploitation is prevalent throughout the region. There is an urgent need to mitigate this stock depletion through management and stock enhancement, but it is hard to control the fishery as poaching and smuggling activities are common and widespread.

We have developed techniques for the mass production of juvenile shells of trochus and green snail in hatcheries for releasing and restocking reefs. Several researchers in Okinawa (and in other parts of the Pacific) are now investigating methods of restocking reefs with juveniles. We hope to establish methods of stock enhancement for this species which will benefit islanders who rely on reef resources for their cash income or to supplement or augment their subsistence livelihood.

I would like to ask readers of *Reef Encounter* to supply information on green snail, trochus and other reef mollusc resources from areas such as the Mergui Islands (Myanmar/Burma), the Andamans, the Seychelles, Mauritius and the East African reefs as well as those countries already mentioned.

Masashi Yamaguchi, Dept of Marine Sciences, University of the Ryukyus, Nishihara, Okinawa 90301, Japan. Fax. (81) 988 952247.

## TOBAGO REEF SURVEY, TRINIDAD AND TOBAGO

In 1989, the Glasgow University Exploration Society carried out a 5-week survey of Bucco Reef, on the north shore of Tobago, in collaboration with the Crusoe Reef Society (a non-governmental Trinidad and Tobago based organisation established to help protect the Tobago reef systems), and the Institute of Marine Affairs. Financial support came from a wide variety of sponsoring organisations and charitable trusts. Tobago's economy is heavily dependent on tourism. Bucco Reef is a particularly popular attraction but there is evidence that the reefs are suffering from intensive visitor pressure. A number of projects were carried out, including studies on coral growth, fish distribution, sedimentation, and feasibility of coral transplantation.

The expedition members concluded that the current state of the reef was perhaps not as poor as had been thought, but recommended that some protective measures are implemented, particularly as so many local people involved with reef activities are convinced that there has been deterioration over the last few years. A number of suggestions were made for developing a more conservation-oriented tourism, and improving management of the area. Bucco Reef was proclaimed as a Restricted Area in 1973 under the Marine Areas (Preservation and Enhancement) Act of 1970.

Report and further information available from: Ben Tuxworth, Richard Rutnagur or Dr P.S. Davies, Dept. Zoology, University of Glasgow, Glasgow G12 8QQ, UK. Fax: 041 330 4808.

# Reef encounter in Australia

TRAVEL NEWS: STAR WARS

Starfish are eating their way through the Great Barrier Reef, an important tourist attraction. Down Under, fishermen and scientists may be on a collision course over the spikey underwater puzzle, report SUE MOTT and EDWARD WELSH

**L**T SOUNDED a good idea at the time: a floating hotel anchored right over one of the world's great tourist attractions, Australia's Great Barrier Reef. Last year the idea actually became reality when the 200-room Barrier Reef Floating Hotel was pulled by tugs from a shipyard in Japan and anchored over the reef.

But when tourists started to arrive they discovered one problem that nobody could have foreseen: the scenery had been eaten. A species of starfish, the Crown of Thorns, is devouring the Great Barrier Reef, feeding on the intricate coral formations which give the underwater rocks their fabulous colours, and leaving only a dull expanse of algae-covered limestone in their place.

Last week the project came to an embarrassing end. The hotel stopped taking guests and in the next fortnight will begin its journey to a new destination: Ho Chi Minh city in Vietnam.

The Great Barrier Reef, the largest system of coral reefs in the world, stretching some 2,300km from the Gulf of Papua in the north to beyond the Tropic of Capricorn in the south, is so central to Australia's growing tourism industry that to suggest anything might be wrong with it is akin to treason.



Phil Green

## DIARY

Please send contributions for the Diary section as soon as possible for the next issue.

### Conferences

#### 5-7 April, 1991, Swansea, UK

##### COELENERATE GROUP AND PORCUPINE JOINT MEETING

The theme of this meeting will be 'Change and Adaptation', and it will include a Biological Council lecture by Dr P. Spencer Davies on 'Adaptive responses to environmental change in reef corals'. Further information from: *Dr M. Sheader, Dept of Oceanography, University Road, The University, Southampton SO9 5NH, U.K.*

#### 11 May-5 June, 1991, Florida, USA and Costa Rica

##### THIRD INTERNATIONAL SEMINAR ON COASTAL PARKS AND PROTECTED AREAS

The seminar is sponsored by the National Park Service (US Dept of Interior) and the Rosenstiel School of Marine and Atmospheric Science (Miami). The organizing theme is 'Carrying Capacity: loading factors'. A variety of attempts to limit use of the coast will be examined, use zoning case studies will be presented, and management planning exercises will be held. Further information from: *J.R. Clark, University of Miami RSMAS, 4600 Rickenbacker Causeway, Miami, Florida 331491098, USA. Fax: (305) 3619306.* (Note to prospective participants: seminar brochure states that 'disruptive behaviour will be discouraged!')

#### 27 May-2 June 1991, Honolulu, Hawaii

##### XVII PACIFIC SCIENCE CONGRESS

Entitled 'Towards the Pacific Century: the Challenge of Change' and sponsored by the University of Hawaii, East-West Center and the Bishop Museum, with the US National Academy of Sciences, the 1991 congress of the Pacific Science Association will include symposia on: 1) Global Environmental Change Pacific aspects; 2) Population, Society and Health; 3) Science and Culture; 4) Biological Diversity; and 5) Emerging Technologies and Development. The PSA Scientific Committee on Coral Reefs is organising a session on 'Coral Reefs and Environmental Change: the next 100 years'. A session on the 'Role and Function of Biological Diversity in an Ecosystem Context' will include the topic 'Behaviour and Ecology of Coral Reef Fishes'. Further information from: *XV11 Pacific Science Congress Secretariat, 2424 Maile Way, Fourth Floor, Honolulu, Hawaii 96822, USA.*

#### 8-12 July, 1991, Long Beach, California

##### COASTAL ZONE 91 - 7TH SYMPOSIUM ON COASTAL AND OCEAN MANAGEMENT

The permanent theme of this meeting is 'A Spotlight on Solutions', and presentations concern detailed technical data-gathering, research and evaluation studies, policy development, case histories and implementation. The 1991 meeting also has the specific theme of 'Global Concerns: Multilevel Responsibilities', in order to link coastal and ocean-related topics to the emerging resource issues of society. Sessions will include one on coral reef processes. Further information from: *Orville Magoon, Coastal Zone 91, P.O. Box 279, 21000 Butts Canyon Rd, Middletown, CA 95461, USA.*

#### 9-14 September, 1991, Munster, Germany

##### FOSSIL VI CNIDARIA 6TH INTERNATIONAL SYMPOSIUM ON FOSSIL CNIDARIA INCLUDING ARCHAEOCYATHA AND PORIFERA

Organised by the International Association for the Study of Fossil Cnidaria and Porifera, in collaboration with the Westfälische Wilhelms Universität, Munster. The planned scientific programme includes Evolution of Corals, Intraspecific Variability and Fossil Races, Di-

agenesis and Microstructure of Fossil Cnidaria and Porifera, Evolution of Reefs, Porifera, Coral Research History and Computer Supported Palaeontology. Further information from: *Fossil VI Cnidaria, Westfälische Wilhelms Universität, Forschungsstelle für Korallenpaläozoologie, Pferddegasse 3, D4400, Munster, Germany.*

#### 4-8 November 1991, Honolulu, Hawaii

##### THIRD GLOBAL CONGRESS

Sponsored by Heritage Interpretation International, Eastern Michigan University and several University of Hawaii units, this is tentatively entitled 'Interpretation, Preservation and the Travel Industry'. Further information from: *Ray Tabata, Congress Co-chairman, Sea Grant Extension Service, 1000 Pope Road, Room 205, Honolulu, Hawaii 96822.*

#### 17-22 November, 1991, Jerusalem, Israel

##### INTERNATIONAL SYMBIOSIS CONGRESS

The programme will be arranged to encourage comparative discussions on different symbiotic systems and will be planned according to topics rather than types of symbiosis. There will be plenary lectures, parallel symposia, workshops, poster sessions and commercial exhibits. Further information from: *Prof. M. Galun, Dept of Botany, The George S. Wise Faculty of Life Sciences, Tel Aviv University, Ramat Aviv, Tel Aviv 69978, Israel. Fax 972-854-13752.*

### Courses

#### 2-29 June, 1991, Coastal Resources Center and Dept of Marine Affairs, The University of Rhode Island

##### SUMMER INSTITUTE IN COASTAL MANAGEMENT

The Summer Institute is intended for professionals who are currently or in the future will be responsible for planning, implementing or managing coastal management programs or projects in developing countries. It may also interest international graduate students already in the U.S. studying for a degree in resource management and who may become involved in these issues on their return to their own countries. The course will cover the wide variety of subjects involved in coastal zone management. Instructors will include faculty and staff at the University of Rhode Island and practitioners in coastal management with experience from around the world.

Course fees are US\$3,900 and cover meals, housing, field trips and reading materials. Further information from: *Summer Institute Coordinator, Coastal Resources Center, The University of Rhode Island, Narragansett Bay Campus, Narragansett, RI 02882 USA.*

#### July 11-August 5 1991, Bermuda Biological Station for Research

##### GLOBAL ENVIRONMENTAL CHANGE

This is a graduate level course that will focus on global biogeochemical cycles and the greenhouse gases. Topics will include cycles of C, N, P, and S, the global carbon cycle, acid rain, stratospheric and tropospheric ozone, deforestation and loss of biodiversity, interactions of gases with sea-water, computer modeling of future global change, and environmental policy and prospects for the next century. Laboratory and field work on the carbon dioxide carbonic acid system and nutrients, and computer modeling of N and S emissions and acid precipitation will also be included. The chief instructor will be noted biogeochemist and carbonate geologist Dr Fred Mackenzie (University of Hawaii); the atmospheric component will be taught by Dr Doug Whelpdale (Environment Canada). The cost, including tuition, fees, room and board is \$1,995. Scholarships averaging 60% of course costs are available.

Other 1991 summer courses with relevance to reef scientists and advanced undergraduate and graduate students include Tropical Marine Invertebrates, Zooplankton Ecology, Biology of Fishes, Marine Microbial Ecology, Analysis of Marine Pollution, and Biological Oceanography. Further information from: *Dr Susan B. Cook, Education Director, Bermuda Biological Station for Research, Inc., Ferry Reach, GE 01, Bermuda. Tel. 809-297-1880; Fax. 809-297-8143.*

**NOTES FOR CONTRIBUTORS**

**Video of hurricane impact on marine ecosystems**

A video is now on sale showing the impact of Hurricane Hugo (September, 1989) on marine ecosystems in the U.S. Virgin Islands. There are 'before' and 'after' underwater scenes of coral communities, sea grass beds and mangroves, including the damage caused at popular Buck Island dive spots. The video uses footage shot by scientists and professional and amateur videographers before, during and after the hurricane. It was initially produced to convince local government officials that action was needed to preserve what remained of the devastated ecosystems. The commentary emphasises that the natural disaster only exacerbated a range of pre-existing man-made environmental problems.

Available in English or Spanish from: *VUE Productions, c/o Environmental Science and Assessment Services, Inc., Suite 400, 1155 Connecticut Ave, N.W., Washington D.C. 20036, U.S.A. Price US\$19.95+ \$2.95 p & p.*

**New CoDirectors at the Lizard Island Research Station**

The Lizard Island Research Station is a facility of the Australian Museum located in the northern section of the Great Barrier Reef. Anne Hoggett and Lyle Vail took over the positions of codirectors in August 1990. Anne's research interests are in the systematics of echinoderms, particularly ophiuroids and crinoids. Lyle is particularly interested in reproduction and population dynamics in crinoids. The research station has been operating since 1974. It is dedicated to supporting research into all aspects of the biology, geology, hydrology, history, management and conservation of the Great Barrier Reef. Enquiries concerning station facilities should be addressed to: *Lizard Island Research Station, Private Mail Bag 37, Cairns, Queensland, Australia 4871. Phone and Fax: 070603977.*

The aim of *Reef Encounter* is to provide a magazine-style newsletter on any aspect of reefs, the livelier the better. In addition to news, meeting and expedition reports and announcements, we aim to have discussions and debates about particular issues concerning ISRS or the broader field of reef science in general. *Reef Encounter* does not publish original scientific data, so please do not submit such papers. The newsletter aims to complement the journal which carries scientific papers only, in that it provides an outlet for book reviews, discussion of papers in the journal and a correspondence column (**Upwellings**). It also carries short reviews of recent trends and developments in reef research or events that bear on reef studies. In the tradition established by the first editor, *Reef Encounter* will continue to be cheerfully illustrated, with cartoons, newspaper cuttings and other entertaining material.

Please note that *Reef Encounter* is an entirely voluntary effort. We do not have funds to pay authors, and the editors are also unpaid. Please help ISRS by submitting material on a regular basis and in a form that does not require too much editing.

To save time and postage, we shall not normally acknowledge submitted material and material will not normally be refereed or returned for corrections. Opinions expressed and errors of fact will have to remain largely the authors' responsibility. No published item should be taken as ISRS opinion unless indicated.

Please help by sending items of not more than 2,000 words in length and in double-spaced typescript, or on diskette using the Multimate word-processing package (we hope eventually to have other options available). You can expect some gentle editing for flow and sense and to address our readership as appropriately as possible. Illustrations should be of a size compatible with our format. Black line drawings are preferable at present, although we hope eventually to be able to afford photographs. Diagrams should have legends and/or captions to explain all symbols, abbreviations and shading patterns etc. Maps should have a scale and indication of orientation. Use *World List* abbreviations in references. Please use metric, or imperial-with-metric units, but not imperial units on their own. Do not forget to give your name and full address, or any other contact address where applicable.

We have no regular reprint system, but contributors will receive a free copy of the relevant issue.

**DEADLINE FOR COPY FOR REEF ENCOUNTER 9 (due out July/August 1991) IS MAY 1ST 1991.**

*Sue Wells  
56 Oxford Road  
Cambridge  
CB4 3PW, UK*

*Fax: (0223) 277136  
Telex: 817036 SCMU G  
Phone: (0223) 350409*

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Send completed application form and your cheque to:

Fields of interest:.....

*Dr Pat Hutchings, Australian Museum, P.O. Box A285, Sydney South, New South Wales, Australia 2000.*

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