



MEMBERSHIP

The annual subscription for individual membership of **ISRS** is currently US\$80, provided renewal payments are made by 1st March each year. Individual and Family Members receive the journal **Coral Reefs**, the newsletter **Reef Encounter** and other periodic mailings. Family membership is US\$90. Student membership costs US\$25 and benefits include all of the above except the journal **Coral Reefs**.

The category—Sustaining Member—is for those supporting the society with a subscription of \$200. In addition to other benefits sustaining members will see their names printed in each issue of **Reef Encounter**.

Renewals received between 1 March and 30 April will cost US\$30 for a student member, US\$90 for a full member and

US\$100 for a family membership. Those received after 1 May will cost US\$32, US\$100 and US\$110 respectively. New memberships will be at the base rate of US\$25, US\$80 and US\$90 regardless of what time of year they join. Financial assistance may be available to prospective members with legitimate needs. Please contact **ISRS** Corresponding Secretary. E-mail raronson@jaguar1.usouthal.edu

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

Subscriptions to the Society should be addressed to: *International Society for Reef Studies, P.O. Box 1897, Lawrence, Kansas 66044-8897, USA.*

NOTES FOR CONTRIBUTORS

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, in that it provides an outlet for book reviews, discussion of issues of general interest 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** is 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, except by e-mail, and this 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, preferably by e-mail or diskette using Word or ASCII text and in an IBM compatible format. 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. Dia-

grams 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. References are to be styled in the format as prescribed by **Coral Reefs**. 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 systems, but contributors will receive a free copy of the relevant issue. We encourage contributors to join the society if not already members.

DEADLINE FOR COPY FOR REEF ENCOUNTER 30 (DUE OUT SEPT 2001) IS JULY 1ST 2001

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APPLICATION FORM FOR MEMBERSHIP

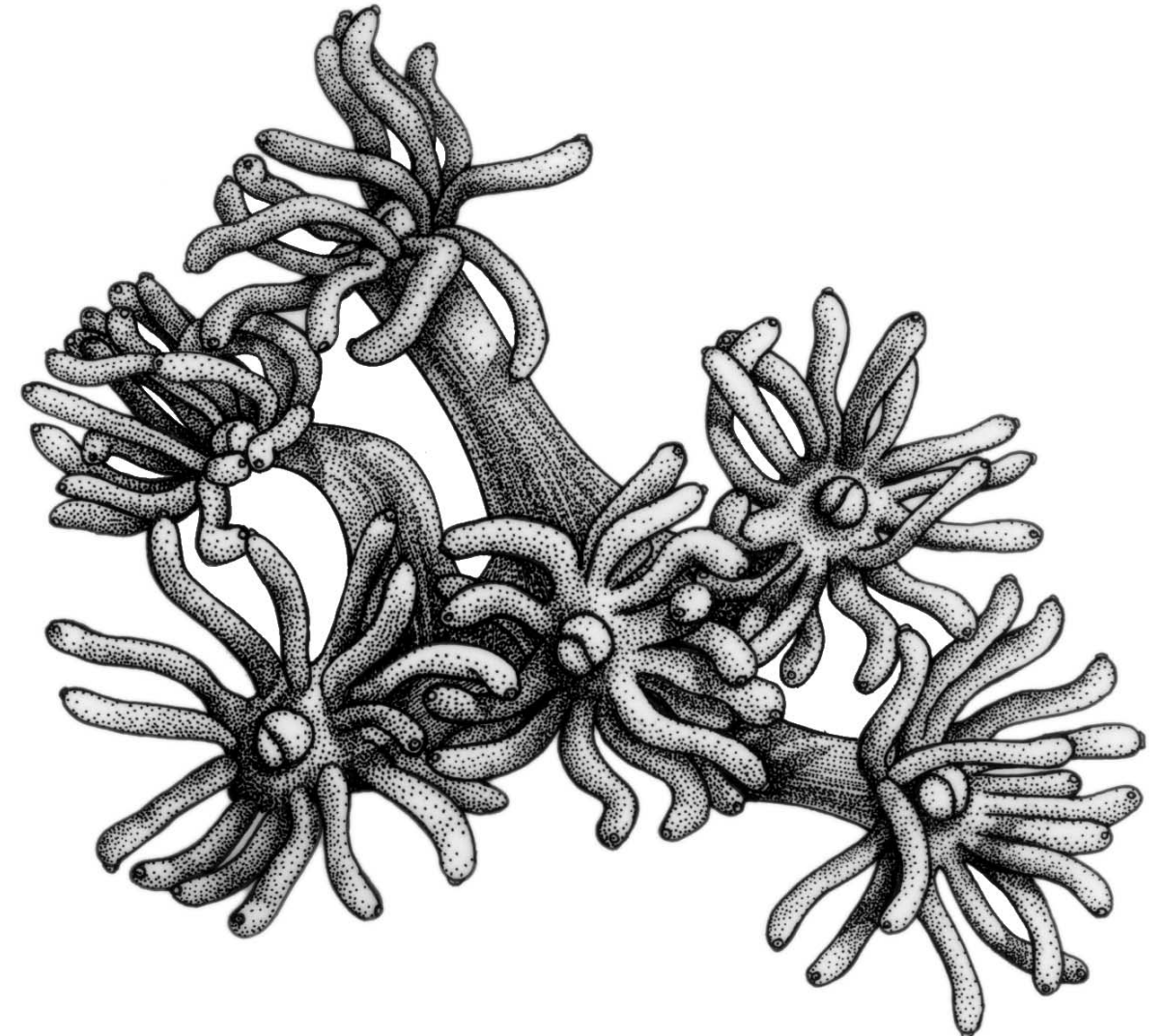
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..... US\$25 for STUDENT membership
..... US\$90 for FAMILY membership
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Send completed application form and your cheque to:
International Society for Reef Studies, P.O. Box 7065, Lawrence, Kansas 66044, USA





REEF ENCOUNTER No. 29 March 2001

Newsletter of the International Society for Reef Studies

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Contributing Editors Maria João Rodrigues, Karenne Tun

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CONTENTS

- 03 Editorial**
M. Watson, K. Teleki, M.J. Rodrigues, K. Tun
- 03 ISRS Comment**
From the President. *T. Done*
- 04 ISRS News**
ISRS Recognition of service
The Darwin Medallist in the millenium year – Prof. Yossi Loya. *B. E. Brown*
ISRS Financial Report 2000. *D. Fautin*
Drawings in **Reef Encounter**
- 09 News**
Mass bleaching threatens two coral species with extinction. *D. Fenner*
The Global Coral Reef Monitoring Network and Reef Check. *C. Wilkinson, G. Hodgson, J. Oliver*
- 12 Upwellings**
Balancing economics and ecological sustainability: proposed industrial port development in the Dominican Republic. *F. Galdes, M. Vega, M. Chiappone*
Litter lessons in Utila. *A. Finlay*
- 16 Currents**
Dispersal of reef fishes by rafting. *C. Mora*
- 18 Features**
Belize Evaluates Marine Protected Areas. *M. McField*
First community led no fishing zone in Indonesia opens in the Tukang Besi Islands. *S. Curran*
Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve
US marine protected areas online
New US institute for MPA training and technology
- 23 Country Profile**
Coral Reefs in Papua New Guinea. *R. Yamuna, T. McClanahan*
- 31 Book Review**
Fully Protected Marine Reserves. *S. Wells*
Reef fish behaviour: Florida, Caribbean, Bahamas. *G. Forrester*
Collected essays on the economics of coral reefs. *R. Pomeroy*
Dynamics of Coral Communities. *P. Mumby*

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Coral Reefs

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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.

Reef Encounter is produced by Allen Press, Inc., 1041 New Hampshire, Lawrence, KS 66044, USA. Printed on recycled paper.

36 Who's Who
Association Of Reef Keepers, British Virgin Islands. *M. Watson*

38 Bookshelf
C-Nav. *K. Osborne*

39 Meeting Reports
9ICRS special
Coral reef science and management - progress and prospects. *B. Salvat*
Does your science pass the Grandma test? *M. Watson*
9ICRS field trip notes
Dragons, manta rays and reefs - Komodo National Park. *A. Rajasuriya, E. Whittingham, D. Wilhelmsson*
Tukang Besi Archipelago – spawning seagrasses and diverse reefs. *E. Borneman*
The UCLA Ladan Mohajerani Memorial Symposium and student awards

46 Diary
Biodiversity of Tropical and Temperate Reefs on The Indo-Pacific.

**COPY DEADLINE FOR REEF ENCOUNTER 30
(due out SEPT. 2001) IS JULY 1 2001**



EDITORIAL

Reef Encounter has had a busy couple of months with moving to the new printing schedule and with Maggie relocating to the UK. This issue we have an addition to the editorial team. We welcome Karenne Tun to **Reef Encounter** as a Contributing Editor from SE Asia and the Pacific. Karenne works at the Tropical Marine Science Institute at the National University of Singapore and will be helping to bring articles from her region. This issue also marks changes to the **ISRS** council, **ISRS** officers, and the editorial board of **Coral Reefs (ISRS Comment and ISRS News)**.

Coming on the heels of the 9ICRS in Bali we have included a special **Meeting Report** with an abstract of Bernard Salvat's plenary discussing the past, present and future of the **ISRS**, ICRS and ITMEMS. We also feature articles about MPAs in Belize, Indonesia and Hawaii, as well as an in depth **Country Profile** of Papua New Guinea.

Be sure to read about Boca Chica, Dominican Republic (**Upwellings**) and the planned construction of a large industrial port development which may have dramatic impacts on the reefs there.

The next Reef Encounter is the 30th issue and we hope to mark event this by bringing you a special issue. The next deadline is 1st July so start planning to get your articles to us in time.

Thank you all who contributed to this issue and who helped us keep to the new deadline. A special thanks to the Waikiki Aquarium for the cover illustration, to Helen Hendry for the drawings in this issue and to Sue Daly for her continued contributions (**ISRS News**).

*Maggie, Kristian, Maria João and Karenne
ReefEncounter@bigfoot.com*



ISRS COMMENT

From the President

The times they are a changing. I write this on the *real* first day of the new Century and Millennium, January 1st, 2001, and though you will not read this before March, I send my sincere greetings and best wishes nonetheless.

My copy deadline in the middle of the festive season marks one small change in the times - the change in publication dates for **Reef Encounter** from July and December to March and September. In another change, we can now say 'We have over 1,000 members', a milestone passed at Bali (see **Treasurer's Report**). Welcome to you new members. We've changed in our leadership - welcome to our new office bearers John Ware and Pete Edmunds, and our new councillors Rob van Woesik, Helge Vogt, Hajime Kayanne, Jaime Garzón-Ferreira, Kathleen Sealey-Sullivan and Lucien Montagnioni. Thanks again to Daphne Fautin, Stephen

Miller, Michel Pichon, Bernard Thomassin, Rolf Bak, Greg Hodgson, Don Potts and Paul Sammarco, who are stepping down at the mandatory completion of their terms. Welcome to Dick Dodge as Managing Editor for **Coral Reefs**, who has stepped up from his role as Geological Editor, and to Peter Swart who has taken on that role. Thanks again Terry Hughes, retiring Managing Editor.

Another important change is that now 9ICRS Bali is behind us and 10ICRS is on the drawing board for Okinawa in 2004, we have some breathing space to ponder the Society's present and possible future role in the affairs of coral reefs. We have a Constitution that defines what we are and how we operate - it is printed inside the Membership Directory sent to all members. Please read it. It says our objectives are to promote and disseminate scientific knowledge and understanding of coral reefs; to hold and

sponsor meetings; to print and publish papers, treatises or communications; to raise money to further the objectives of the Society. We do all of this on a voluntary basis – and it is a measure of our combined sustained commitment, passion and teamwork that we are currently meeting our objectives in spades, and riding so high in coral reef affairs. Who ya gunna call?

Well, local people in the Dominican Republic called **ISRS** to oppose construction of a mega-port that seemed certain to threaten the existence of a coral reef close by (see **Upwellings**). But **ISRS** is not an environmental advocacy group who would necessarily oppose anything that could detrimentally affect a coral reef – our role is defined by the objectives listed above. Our contribution was a letter to the Dominican decision-makers that sought to have the coral reef and its other potential alternate values fully considered.

The International Coral Reef Initiative (on whose Coordinating and Planning Committee the **ISRS** President sits) called us too. Our Society statements on coral bleaching (**RE24**) and coral diseases (**RE25**) have been used to good effect by ICRI to highlight these issues in political circles. At time of going to press, we are working on a statement for ICRI on is-

ues relating to sustainable fishing on coral reefs. In all cases, the challenge is to write statements that are short, authoritative, comprehensible and compelling to sympathetic ‘non-coral reef’ readers who also happen to be able to influence those who make political decisions. Please let us know if that is a Society activity to which you would like to contribute.

These two examples – the letter to the Dominican Republic and the Society statements – perhaps exemplify why it is time to review or extend our Objectives. Perhaps it is time to include explicitly among our objectives, the application of our collective knowledge and informed opinions to issues affecting conservation and sustainable use of coral reefs.

That’s all for now. My best wishes to you all.

Terry Done
President

P.S. Thank you Maggie, Kristian and Maria João for your great efforts in producing two Reef Encounters in such a short time as we move to our new publishing schedule.

ISRS NEWS

ISRS Recognition Of Service

At the 9ICRS in Bali a number of individuals were singled out by the Society and recognised for exceptional service. In appreciation, colleagues and friends have written tributes for those people.

Daphne Fautin

Daphne Fautin was elected Treasurer of the **ISRS** in 1992 and has served under three presidents. During her tenure, we re-organized under a new constitution, gained tax-exempt status in the U.S., put the Society under a professional management contract, assumed a greater role in the International Coral Reef Symposia, and more than doubled our membership. Daphne has had a pivotal role in this record of progress—tirelessly managing our growing pains with a sharp eye for detail and fiscal responsibility.

Daphne is highly organized and always superbly prepared. In a meeting she can be counted on to comment, sometimes bluntly, on the most difficult topics with clear, thoughtful opinions and options for action. In an article in **Reef Encounter (RE11 June 1992)** on taking office, she gave her views on most aspects of the operation of the **ISRS**. She asserted that responsible finances and a smoothly running business operation were the keys to our future growth. Re-reading this article shows how correct her vision was.

Yet for all of her serious professionalism, Daphne is a warm, outgoing, and caring person who can always be found at the **ISRS** table at the Symposia or



at meetings, talking with new members, solving problems, and finding people to take responsibility. She has been a Sustaining Member since proposing this category and has met or corresponded with more members than anyone else. For many years she has personally supported annual memberships for colleagues in developing countries.

This kind of loyalty and energy gives the other officers confidence. I recall meeting Daphne in Berlin in September 1995 to complete the profit-sharing negotiations with Springer-Verlag for the publication of **Coral Reefs**, which she and Bernard Salvat had started. She briefed me at a small café before the meeting and then I had the good sense to sit quietly (but I hope presidentially!) while she took care of the details. Later the same day, I visited her at the natural history museum at Humboldt University where she was happily surrounded by colleagues and small jars containing shriveled, brown, preserved anemones from the collecting expeditions of several centuries.

Recalling Daphne's delight with her anemones reminds me that the **ISRS** is a society of professionals, run by volunteers. On a day-to-day basis, the Treasurer has more work to do than any other officer and Daphne has done this for us for the past 9 years. This is a superb and uncelebrated record of effort and achievement for which we can all be profoundly grateful. From time to time she has pointed out that the increasing responsibilities of a growing society requires a workload which cannot be managed by volunteers alone. I hope that when the question of an executive director inevitably arises in the future, our president has a treasurer as thoughtful and competent as Daphne at her side.

Daphne, on behalf of us all, thank you.

*John Ogden,
Email <jogden@seas.marine.usf.edu>*

David And Patricia Hopley

The Society was delighted to acknowledge the outstanding contribution that David and Patricia Hopley made towards the success of the 9th International Coral Reef Symposium. Whereas the preparation of the scientific program had always in the past been the responsibility of the host country, this time it was taken on by the Society. We sub-contracted David and Patricia to lead our effort, and were re-

warded at Bali by the huge and enjoyable program of 10 plenary addresses and around 60 mini-symposia in 14 concurrent sessions. It was David who rallied the excellent support of over 80 mini-symposium conveners, David and the conveners who allocated the 1,100 oral papers and 400 posters into their sessions and their rooms, David and Patricia who dealt with some 20,000 emails over the 15 months leading up to Bali, and Patricia who produced the largest ever book of ICRS Abstracts. Thanks David and Pat – it was much appreciated!

Terry Done, Email <tdone@aims.gov.au>



Terry Hughes

Terry Hughes has made a significant contribution to **ISRS** lasting throughout the last decade. He was appointed to the Editorial Advisory Board of **Coral Reefs** in 1990, and elected to a term on the **ISRS** Council in 1992. Also in 1992, he became the Biology Editor of the journal, replacing Clive Wilkinson. After five years as Biology Editor, Terry became Managing Editor in 1997, replacing Rick Grigg. Now in 2001, he has stepped down to be replaced in turn by Dick Dodge. During his decade with **Coral Reefs**, Terry has seen, and made a significant effort to ensure, a substantial increase in the size of the journal, and maintenance of its strong reputation. The number of pages per year grew 50% during his term as Managing Editor, and the number of Topic Editors has grown from two when he was appointed Biology Editor in 1992, first to 3, then to 4 when he became Managing Editor, and now to 6 for 2001. The journal went on to the web in 1997, and will soon be able to receive manuscripts electronically. Throughout his term as Managing Editor, Terry Hughes has always been fair to authors and Topic Editors, efficient in handling manuscripts, and dedicated to the success, and the quality of **Coral Reefs**. Thank you, Terry.



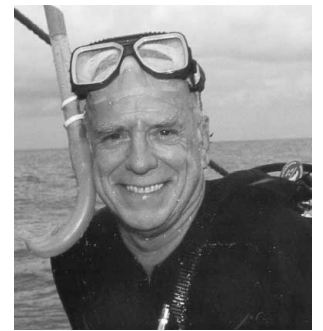
Peter Sale, Email <sale@uwindsor.ca>

John Ogden

The tenure of John Ogden as President of **ISRS** (Jan/95-Jan/99) was a unique and critical four-year period of extraordinary global attention to coral reefs. As President of an organization constitutionally assigned to "promote and disseminate scientific knowledge and understanding of coral reefs...", John took on the critical role of keeping us informed, involved and continually engaged in an awesome number of evolving initiatives to "save the reefs." Such initiatives have ranged from dealing with sustainable use of reef resources and the role of reef research and reef management to new international initiatives for cooperation and financing by various governments.

A highlight during John's tenure was the very successful, record breaking 8th ICERS meeting, orchestrated by Nancy Knowlton, Jeremy Jackson, H. Lessios and the rest of the Panama team. This meeting also appropriately celebrated the 15th anniversary of **ISRS**. A few of the many other highlights of John's administration include the creation of the two annual student awards (**ISRS/CMC** Graduate Fellowship and Student Travel Award Program); regional meetings at Newcastle, Vienna, Luxembourg, Perpignan and Boston; negotiations along with Daphne Fautin in Berlin with Springer-Verlag result-

ing in an expanded size for Coral Reefs; formalizing the purpose and procedures for our five Awards (Darwin Medal, Best Paper, Honorary Life Membership, annual **ISRS/CMC** Graduate Fellowship and STAP student awards); important increases in **ISRS** membership and bank account; a series of advance planning meetings during 1997-98 for the 9th ICERS and, of course, we should not forget initiating the sale of **ISRS** T-shirts!



John's continued service to **ISRS** after his presidency is illustrated by his leading the campaign which successfully raised \$250K for supporting plenary speakers, better international press coverage, and travel stipends of \$500 to \$3500 for over 120 students and scientists from developing countries attending the Bali 9ICERS meeting.

In many ways you are a "hero" John, and we all thank you. As Terry Done so well states (**Reef Encounter 24, From the President**), "you've set a high standard for all of us to follow!"

Gray Multer Email <multerg@infoblvd.net>

The Darwin Medallist in the Millenium Year - Prof. Yossi Loya

Professor Yossi Loya currently holds the Robert Raynor Chair at Tel Aviv University. He is undoubtedly one of the most distinguished reef scientists of the twentieth century and was recently awarded the Darwin Medal of the **International Society for Reef Studies (ISRS)** in recognition of his significant contributions to reef science. This award is the most prestigious honour bestowed by the Society and was presented to Yossi at the 9ICERS in Bali in October 2000. Since the ICERS in Panama, a new ruling of the Society required the Darwin medallist to present a thought-provoking talk at the ICERS which would be called the Darwin Lecture. This talk would subsequently be published in **Coral Reefs**. Yossi chose the following title for his talk 'Homage to *Stylophora pistillata*: an

Yossi Loya was recently awarded the Darwin Medal - the most prestigious honour bestowed by ISRS

important coral in coral reef research'. For many participants this talk was a highpoint of the Bali meeting - it was also a very emotional moment for Yossi as colleagues and students joined him on the stage following the standing ovation that he received. Here are a few facts about his remarkable career in coral reef science.

Yossi graduated in 1967 and subsequently joined the State University of New York at Stony Brook where he met Professor Tom Goreau who had a tremendous impact on Yossi's career. At that time Yossi described Goreau as 'a man with limitless enthusiasm and enormous energy which he transmitted to all those he worked with'. Such characteristics could easily be ascribed to Yossi whose boundless excitement in the scientific study of coral reefs is obvious

to all who come into contact with him. Yossi's outstanding characteristics must be the rigour and insight that he brings to every scientific problem that he tackles, together with the keen eye he deploys while diving on the reef. He has made many fundamental contributions to reef science. His early work on the community structure and species diversity of Red Sea reefs formed the foundation for many modern reef studies. In particular, the line transect methodology he adopted has been extensively used worldwide. He also pioneered investigations of reef community dynamics through the exhaustive study of life-history strategies of important reef-building species, highlighting the contrasting reproductive strategies of Red Sea corals with those from the Great Barrier Reef. His studies on the effects of chronic oil pollution demonstrated the potentially damaging influence of oil on corals for the first time, while sclerochronology of contemporary and fossil Red Sea corals elegantly identified the previous climatology of the Sinai Desert. More recently he and his group have made important contributions to bioerosion studies of coral reefs, to intra-colonial transport of carbon and its regulation as well as to interactions between elevated sea temperature and bacterial disease in the Mediterranean coral *Oculina patagonica*. Most recently he has documented, through long-term ecological monitoring, the demise of Japan's coral reefs through bleaching consequent on the elevation of sea temperatures in 1997-98. This study promises to be one of the most valuable to come out of the worldwide bleaching event in 1998 because of the high resolution of measurements made in both time and space.

Results of Yossi's scientific studies have been published in over 130 articles in leading scientific journals with over 10% of his papers appearing in *Nature*, *Science*, *Ecology*, *Limnology* and *Oceanography* and *American Naturalist*. He has also contributed to seven chapters in books and was co-author of a popular book on coral reefs, published in Hebrew, German and Dutch. He was also the first Biological Editor of *Coral Reefs*, served as a member of **ISRS** Council, as a member of the IABO Coral Reef Committee (1978-1996) and as a member of the Scientific Review Board of the Smithsonian Oil Spill project as well as a member of many other national and international marine committees. Currently he is advising the Japanese Government on research pro-

The line transect methodology he adopted has been used worldwide

Loya's early ecological studies are mirrored all over the world in work quantifying change on coral reefs



ISRS President Terry Done (right) presents the Darwin Medal to Prof. Yossi Loya at the 9ICRS Bali.

grammes to follow up the 1998 coral reef bleaching event, and chairing an ad-hoc study group of the Intergovernmental Oceanographic Commission of UNESCO on indicators of coral bleaching.

Yossi has always maintained a very active research school, having supervised 22 MSc students and 16 PhD students (four of which are now in the Faculty of Life Sciences at Tel Aviv, while others hold academic positions in national and international institutions). Further evidence of his international status is to be found in his invitations as Visiting Professor - as such he worked at the Australian Institute of Marine Science and James Cook University, Australia (1979-1980); at Scripps Institute of Oceanography (1986) and at Sesoko Marine Station, University of the Ryukyus, Japan (summer 1995-present).

While he has made many breakthroughs in reef science throughout the last thirty years, perhaps amongst the most enduring pieces of work are his early ecological studies which are now mirrored all over the world in work quantifying change on coral reefs. As the founder of techniques practised by virtually every reef scientist in the field, and also by following up these early studies with detailed research on community structure, Yossi Loya has provided the world's reef scientists with a research template that has significantly enhanced our understanding of reefs in all the major tropical oceans in recent years.

Barbara Brown, Centre for Tropical Coastal Management, Department of Marine Sciences, Ridley Building, University of Newcastle, NE1 7RU United Kingdom Email <101515.1267@compuserve.com>

ISRS Financial Report 2000

The number of MEMBERS exceeded 1000 for the first time in 2000, ending the year at 1007:

| | |
|------------|-----|
| Individual | 730 |
| Student | 206 |
| Family | 49 |
| Sustaining | 16 |
| Honorary | 6 |

A free individual membership was given to the 1000th member, Michael Berumen, a student who lives in Fort Smith, Arkansas, USA, and who joined in Bali (he had committed to joining as an individual member for two years before he learned that the first would be free!).

Cash ASSETS at the end of 2000 were US\$104,696.50 in checking accounts, and \$24,480.86 in savings accounts. At the beginning of the year, the figures were \$78,521.46 and \$23,920.57, respectively. The change was \$26,175.04 and \$560.29.

| | | |
|---------------|---------------------|--------------------|
| INCOME | Memberships | \$82,766.92 |
| | Donations | \$10,600.00 |
| | Interest | \$ 2,613.22 |
| | Editorial allowance | \$ 2,090.17 |
| | Miscellaneous | \$ 100.00 |
| | TOTAL | \$98,170.31 |

| | | |
|--------------|--|--------------------|
| OUTGO | Return to ICRS | \$19,735.63 |
| | Coral Reefs | \$18,017.27 |
| | Allen Press | \$12,979.81 |
| | Reef Encounter | \$ 9,535.59 |
| | Miscellaneous | \$ 4,906.32 |
| | (tax return preparation, engraving, European ICRS, Hopley) | |
| | Membership directory | \$ 4,071.49 |
| | Card charges | \$ 1,332.32 |
| | Postage | \$ 800.00 |
| | Bank charges | \$ 56.65 |
| | TOTAL | \$71,435.08 |

The budget for 2000 was \$52,300 both incoming and outgoing. Because of the surge in membership associated with 9ICRS, income far exceeded that. Outgo did so as well because of costs associated with memberships. Postage for the two final issues of **Coral Reefs** for 2000 (late due to production problems at Springer-Verlag) remains to be paid. No student travel award was made in 2000.

Membership subsidy awards are not accounted because they amount to income foregone rather than actual cash outgo.

Daphne G. Fautin, outgoing ISRS Treasurer
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Drawings In Reef Encounter

Sue Daly has been a wonderful source of the drawings and sketches of tropical marine life which have graced **Reef Encounter** covers and the articles in last four issues. Sue has been a diver for 12 years and taken underwater photos for most of that time. She began the drawings about five years ago when she became involved in a long term survey to study the effects of diving and tourism on the reefs of the Red Sea with the Marine Conservation Society. She

is also the author of 'Marine Life of the Channel Islands'. At present she works mostly as an underwater cameraman and film maker, and recently has been working with the BBC's Natural History Unit. Although she loves diving in tropical places her real passion is marine life of British waters. We are very grateful for her contributions to **Reef Encounter** and hope that she might inspire others to send drawings and sketches to be used in future issues.

Mass Bleaching Threatens Two Coral Species With Extinction

Most of us know that coral reefs around the world are in great danger from a variety of human practices. Mass coral bleaching killed vast quantities of corals on some reefs during the 1998 El Niño. So has bleaching threatened any corals with extinction?

Fewer marine species have been reported to have become extinct than terrestrial species, but there are a few (Culotta 1994; Roberts and Hawkins 1999; Powles *et al.* 2000). No corals have been documented to have gone extinct, though one came so close that it was thought to have gone extinct. This is a fire coral (*Millepora boschmai*) that was described from the Pacific coast of Panama in 1991 (de Weerd and Glynn 1991). At that time, it was already known that this coral had gone from a population of hundreds of colonies to no known living colonies following the 1982-83 El Niño warming event and subsequent bleaching (Glynn and de Weerd 1991; Glynn 1997). Fire corals are the most sensitive corals to the mass bleaching that hot water produces (Marshall and Baird 2000). Several years after the bleaching, four young colonies were found. They were small enough that they probably began growing after the 1982-83 bleaching episode (Glynn and Feingold 1992). Juan Mate reports that subsequently, 3 more colonies were found, but that during the 1998 mass bleaching event, all known colonies were killed once again. At this point, there are no known living colonies. We will have to wait several years to see if any living colonies reappear, but since the population at the time of this mass bleaching was so small, we will be very lucky if any living colonies are ever found. This species seems to be beyond "Critically Endangered" and should be in the "Possibly Extinct" category.

A second endangered coral was also described from Panama in 1994 (Budd and Guzman 1994). Only 5 colonies of this coral, *Siderastrea glynni*, were discovered, and no additional colonies have been discovered since. The death of one colony has

reduced the species to only 4 known colonies. A color photo has now been published (Veron 2000, Vol 2, p. 138). All colonies were small, of similar size, and in one small area indicating that they may all be young. It appears that parent colonies (dead or alive) must be somewhere else, but none have been found. All the islands around the site have been searched several times, plus another set of islands to the south. Like the fire coral, this species was found in shallow water in plain view. During the 1998 mass bleaching event, the four colonies began to bleach, so they were moved to aquaria in Naos, Panama. Efforts by Hector Guzman to propagate these corals have so far produced three small propagules. The very small numbers would appear to qualify this coral as "Critically Endangered".

Species of several hundred to a few thousand individuals are sufficiently small populations to be considered endangered in some cases. Even if more corals of these species are found, it is very unlikely that more than a few hundred individuals will ever be found. It is time for a plan to conserve these species to be formulated and put into action - hopefully it's not too late. Captive propagation techniques for corals in aquaria are now sufficiently advanced that they have the potential to save endangered coral species (Borneman 2000).

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The Global Coral Reef Monitoring Network And Reef Check

The Status of Coral Reefs of the World: 2000 report was released at the 9th International Coral Reef Symposium in October with all participants receiving a copy on registration. This report of 363 pages contained chapters on the status of reefs in 17 regions featuring 86 countries with contributions from over 100 authors. This is a considerable expansion on the report released in 1998 and is based on the status reports produced by these countries, as part of their contribution to Agenda 21, Chapter 17 of the Rio UN Conference on Environment and Development (UNCED) in 1992. The current status report is summarized on the Coral Health and Monitoring Program page (CHAMP) (www.coral.noaa.gov), the home pages of the National Oceanographic and Atmospheric Administration (NOAA) (www.noaa.gov) and the Australian Institute for Marine Science (AIMS) (www.aims.gov.au/scr2000). The full report, together with several unpublished national/regional reports can be found on the ReefBase web site (www.reefbase.org).

The Status 2000 report illustrates the growth of the Global Coral Reef Monitoring Network (GCRMN) now encompassing many monitoring surveys including the Reef Check global monitoring program and the Atlantic and Gulf Rapid Reef Assessment program (AGRRA). However, there is room for improvement, and any comments would be particularly welcome. Mark Eakin ([Status of the reefs in 17 regions featuring 86 countries.](mailto:mark.eakin@</p>
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noaa.gov), who has recently taken over as Chair of the Scientific and Technical Advisory Committee of the GCRMN from Edgardo Gomez, is now compiling confidential comments and suggestions on the Status 2000 reports. The next summary report will be released at the Rio +10 World Summit on Sustainable Development in Johannesburg in 2002 and also at the 2nd International Tropical Marine Ecosystems Management Symposium (ITMEMS) scheduled at the Philippines in late 2002.

The status 2000 report achieved considerable publicity with articles in *Nature*, *Science*, *Newsweek*, *The Economist* and a range of leading newspapers following the release in Bali. Further publicity followed when the report was provided to the media in Washington, D.C. and New York in early December. A major press conference was jointly organized by NOAA and the Australian Embassy in Washington, D.C. at the National Press Club and was chaired by Dr James Baker, Deputy Secretary of Commerce and Head of NOAA. The conference featured the Secretary for Commerce, Norman Mineta who detailed four new initiatives of the US Government (www.noanews.noaa.gov/stories/s541.htm). The Australian Embassies in Washington, D.C. and New York (embassy to the UN) hosted events for government agencies, the United Nations, and NGOs to focus attention on the decline of coral reefs and to ask them to propose solutions.

The GCRMN also continues to expand with substantial nodes formed in 10 regions, most with ongoing funding for training and monitoring by government and university staff. Nodes are being developed in the other regions with applications for funding being considered or in development. Thus, by the next report in 2002, it is anticipated that virtually all countries with substantial areas of coral reefs will have active monitoring programs using a range of reliable methods varying from the community and volunteer level of Reef Check to the more detailed methods developed by AGRRA in the Caribbean and the GCRMN in Southeast Asia. The principal contacts for these nodes are listed in the summary reports. The data from these programs will be stored in ReefBase compatible databases with summary information deposited in ReefBase for general querying and the production of customized reports. The next Status 2002 global report will draw heavily on these ReefBase summary tables.

About 30 new and old coordinators from about 10 countries attended the Reef Check/GCRMN Workshop in Bali, hosted by Reef Check Coordinator Ketut Sarjana Putra and his able team from WWF-Indonesia. The Quiksilver-sponsored Indies Trader survey vessel (www.quiksilver.com/crossing/) provided the much needed dive support including post-survey cocktails.

In November, the United Nations Environment Program (UNEP) and NOAA sponsored a 10-day Reef Check/GCRMN Workshop in Hainan, China. This is the first time that China has hosted a coral reef training workshop in Chinese waters, and agreed to share data with an international initiative. Considering the number of reefs in Chinese waters and their political sensitivity, this is a major step forward! A second training is planned for Guangxi province in early 2001.

Two major new training and survey initiatives commenced in Thailand and Indonesia in December. A Regional Coral Reef Monitoring and Management Training Center has been established at the Phuket Marine Biological Center (PMBC) under the direction of Dr. Hansa Chansang and Niphon Phongsuan and the new Reef Check Thailand Coordinator Pinya Saras. This year, 20 SE Asian coordinators from 8 countries will be trained at PMBC in addition to 50 Thais.

Socioeconomic Assessment of Coral Reefs

We are now gathering considerable monitoring information on the biological and physical components, but our information base on the critical human components is very thin. Therefore we are seeking your assistance in drafting the protocols, establishing initial assessments and ongoing monitoring programs.

The GCRMN released the 'Socioeconomic Manual for Coral Reef Management' by Leah Bunce, Phil Townsley, Bob Pomeroy and Richard Pollnac in October in Bali. This 251 page manual is specifically designed to assist in baseline monitoring

of social, economic and cultural aspects of how people use and interact with coral reefs. This has been written in very basic language and is intended as a guide for basic monitoring, not at the research level. The manual will get a full review in **Reef Encounter 30**. We were helped by NOAA, IUCN - US, Japan, AIMS and UNEP in putting this together and distributing it around the world.

Now the GCRMN is seeking expressions of interest from people wishing to assist in socioeconomic monitoring and in training coral reef managers to conduct their own assessments. The GCRMN will be: establishing a socioeconomic committee within the Scientific and Technical Advisory Committee; seeking more opportunities for training in the use of the manual in all regions of the coral reef world, especially where there are existing coastal management projects; establishing linkages between other reef monitoring groups e.g. Reef Check, AGRRA, CARICOMP, etc.; ensuring that all this information is lodged within the ReefBase system; and finally, seeking feedback on how we can improve the Manual to be applicable for all regions of the world and to provide useful information for reef conservation.

Please contact Leah Bunce at NOAA (leah.bunce@noaa.gov) for more information. Copies of the manual are available for the cost of postage from Wendy Ellery (w.ellery@aims.gov.au) or from the other sponsors (NOAA, IUCN - US and UNEP).

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Balancing Economics and Ecological Sustainability: Proposed Industrial Port Development in the Dominican Republic

Balancing natural resource protection with economic development is a pressing challenge, particularly in Small Island Developing States with rapidly increasing human populations, and historically poor economic growth. Many such states have limited natural capital or resources, and governments are under enormous pressure to introduce economic development. But the benefit of short-term economic gain is sometimes achieved without weighing up the costs of forgone longer-term sustainable benefits. To Francisco Gerales, Mónica Vega and Mark Chiappone, a proposed port development near the Dominican Republics tourist center of Boca Chica typifies these issues.

The development proposed at Boca Chica, on the southern coast of the Dominican Republic consists of an industrial park and container yard covering 3.2 km², in conjunction with a 1.5 km pier structure and a 20 m deep port large enough to fit up to six post-Panama cargo vessels. The Fundación Dominicana Pro-Investigación y Conservación de los Recursos Marinos (Fundación MAMMA), calculate that dredging could destroy 150 hectares of reefs on the north-eastern portion of Punta Caucedo, and another 50 hectares in the west, east and southern portion of Isla la Piedra. A further 160 ha comprising the Boca Chica barrier reef are likely to be severely impacted (see Figure 1). Additionally, the development is upstream of La Caleta Submarine National Park, one of the most well-studied and heavily visited marine protected areas in the country. To date no full Environmental Impact Assessment has been undertaken.

The recreational center of Boca Chica and the town of Andrés are 32 km from the capital city of Santo Domingo and already have a long history of exploitation. Construction of the existing commercial

the Boca Chica barrier reef is likely to be severely impacted

community reactions to the port development have been swift

port and sugar mill at Andrés necessitated dredging in 1954, with spoils used to create Isla la Piedra. The original mangrove ecosystem at Boca Chica has also been filled with sand dredged from the lagoon. By the 1970s, Boca Chica had become the primary beach destination for Santo Domingo, and a marina was added in 1977. An average of 2,000 visitors per day come to the area. Coral reefs and adjacent habitats show the impacts of increased sedimentation and turbidity from dredging and artificial beach construction. A sugar cane processing factory may also be affecting the area through the discharge of acidic, warm-water effluent.

Notwithstanding these negative attributes, Boca Chica's reef environment has persisted and corals are still thriving in areas not affected by pollution or physical damage. We believe that the Boca Chica reef is important because it is the only barrier reef on the entire southern coast of Hispaniola (the Caribbean's second largest island, comprising the Dominican Republic and Haiti). Additionally, Boca Chica is also one of the few remaining public beaches, and is by far the largest, most popular, and most accessible beach for marine recreation on the southern coast. The reef lagoon, used primarily for water sports activities, generates at least US \$80 million per year and provides for 8,000 jobs. This income is largely dependent upon an intact barrier reef. Altered current patterns resulting from the development may lead to coastal erosion and loss of this valuable resource.

Community reactions to the port development have been swift, represented by Dominican conservation groups (such as Fundación MAMMA, CIBIMA, INTEC Ecológico, and PRONATURA), recreational diving and surfing interests; as well as the business sector, led by the Asociación de Desarrollo Turístico

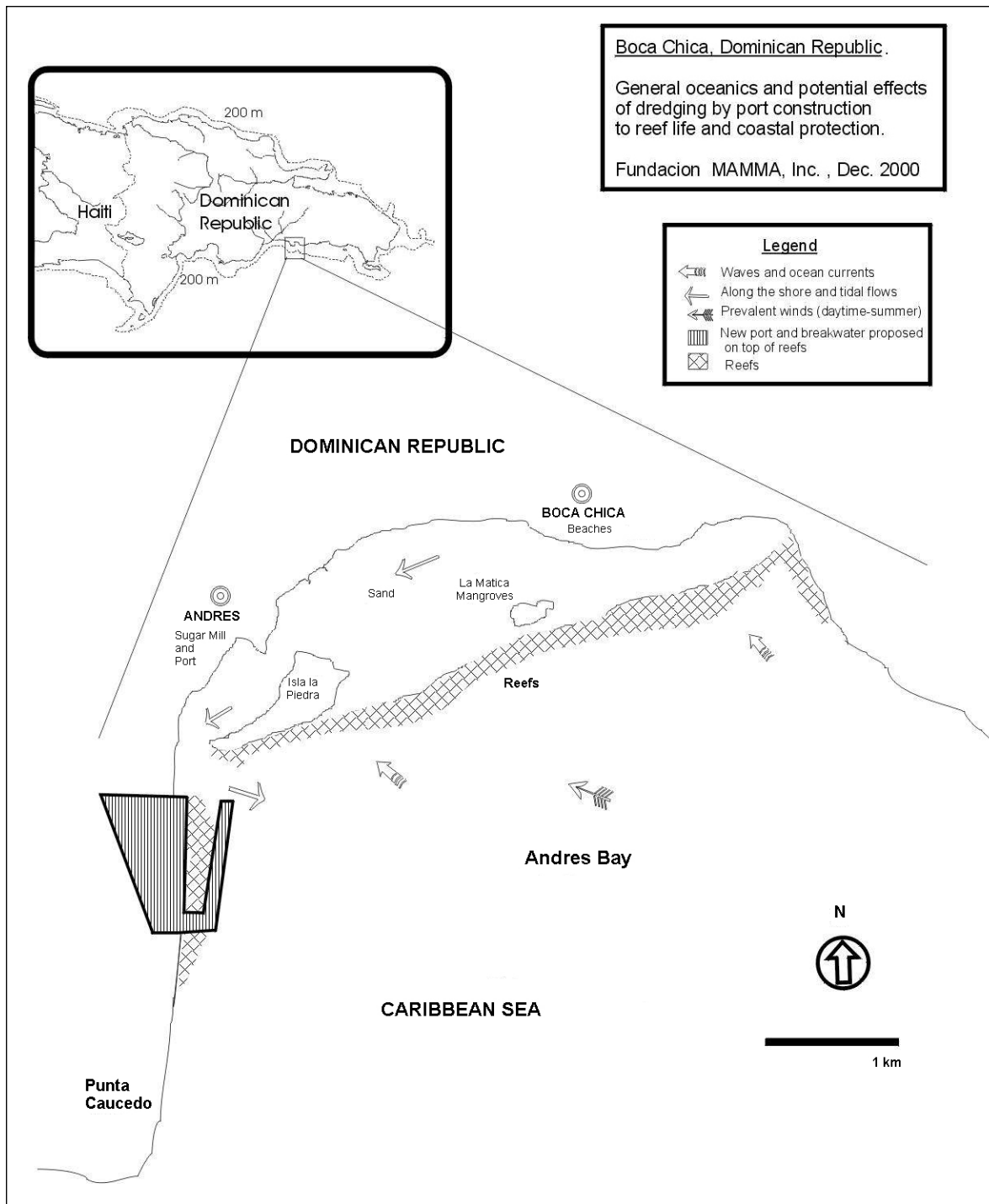


Figure 1. Proposed port development near Boca Chica and Andres, southern coast of the Dominican Republic. The proposed industrial port and container facility would be located between Andres and Punta Caucedo.

de Boca Chica (representing hoteliers, the yachting society, tourism transport and other related businesses). This united group wants to halt international financial support for the proposal and per-

mits from Dominican authorities until a full environmental assessment is carried out. If you would like more information about this development, please contact us at the addresses below.

Francisco Galdes and Mónica Vega, *Fundación Dominicana Pro-Investigación y Conservación de los Recursos Marinos (MAMMA, Inc.)*, César Nicolás Pensón #83, P.O. Box 748, Santo Domingo, Dominican Republic, Email <mamma@codetel.net.do> and Mark Chiappone, *Center for Marine Science Research, University of North Carolina at Wilmington*, 515 Caribbean Drive, Key Largo, FL 33037, USA, Email <lina@shadow.net>

Fundación MAMMA made a presentation to **ISRS** at the 9ICRS in Bali asking for support for their

cause. Recognizing that all countries must provide for their present and future human populations by using those human, economic and natural attributes and resources that are available to them, and also that economic opportunities that build on the values and attributes of coral reefs may not always take precedence over other options, **ISRS** President Terry Done wrote in support of Fundación MAMMA's proposal for a full regional assessment of the cultural, socio-economic, environmental and ecological implications of the proposed development.

The Boca Chica Reefs a System Already Under Stress

A well-defined spur and groove system extends across the Boca Chica lagoon from northeast to southwest, and then becomes a 10 m wide fringing reef extending to Punta Caucedo. The reef flat is 0.2-0.4 m deep and is largely composed of dead finger corals (*Porites*) and seagrass (*Thalassia testudinum*). Towards the breaker zone, large coral boulders are found with some scattered live corals. In the deeper and more exposed parts of the reef crest, elkhorn coral (*Acropora palmata*) historically dominated the reef surface to 4-5 m depth. Below the breaker zone is a buttress zone with scattered rubble from dead elkhorn coral. Recent surveys (1997-98) indicate many symptoms of reef degradation in the Boca Chica fore reef environment, including low cover by corals (< 10 %), a dominance by bor-

ing sponges such as *Cliona langae* (20%), and only small to medium-size (< 50 cm diameter) living coral colonies. The reef environment has been noticeably damaged in places and the fish fauna is impoverished from years of exploitation. Classic signs of ecosystem overfishing and serial depletion of target species are prevalent. Additionally nutrient pollution and freshwater discharges are increasing during the peak tourism season. Offshore of the breaker zone is a low-profile spur-and-groove system separated from the main barrier reef by sand. The barrier reef was formerly the location of a CARICOMP (Caribbean Coastal and Marine Productivity Monitoring Network) station surveyed by the Centro de Investigaciones de Biología Marina-Universidad Autónoma de Santo Domingo.

Litter Lessons In UTILA

One baseball cap, one old shoe, one can of beans, three empty crisp packets, four drink cans and nine bottles of soft drink, and that was all in one 30 minute reef survey. The prevailing wind action had transported material from Utila, a tropical island in the Bay Islands of Honduras, west to Water Cay. Litter, garbage, pollution, call it what you like.... I can't stand it.

Before a huge campaign by the Bay Islands Conservation Association (BICA), all garbage was dumped in the sea, in the mangroves, on other peo-

ple's property etc. Sense was finally seen in 1996, when bins and a small garbage truck were introduced to pick up domestic waste. However, the garbage is now dumped in the middle of the island on a pristine wetland ecosystem. The problem has not been solved, simply shoved out of the public eye, and litter remains on the streets. The island is small, and is in a region renown for heavy storms. Hence, with natural run-off, most of the garbage ends up in the sea. With no environmental education, the problem is worsening with the ever-in-



creasing demands of a rapid rise in tourism. Litter deters tourists, and can have dramatic impacts upon the marine life that Utila relies on both for food and a thriving diving industry.

Last summer Coral Cay Conservation ran a five week education project for 9-14 year old school children in Utila. The project had to be fun, interesting and relevant for the children to gain a true understanding of not only the importance of coral reef as a resource, but also the threats that may have an impact on future sustainability. To emphasize this importance, a presentation attended by BICA, the Mayor, Dive Shops and parents was planned for the end of the project, and a tile mosaic was designed as a permanent reminder (see photo).

As well as learning about the importance of reefs, and the threats reefs face, the children dressed up in SCUBA gear and had laughing fits as they witnessed the Principle don the full jacket, regulator, mask, fins and snorkel. The pupils also looked at photographs of the garbage around Utila, and as a follow up, then wrote letters to the Mayor. On the back they drew pictures of the affects of rubbish on marine life. I took the letters to the Mayor and I'll never forget his response, "You know, now the kids are educating me!" he explained. He wrote a letter back to the children, which was read out by one of the pupils: "You are the future of this island and we

most of the garbage
ends up in the sea

need you to take care of our coral reefs if this island is to survive..." A tremendous standing ovation stunned me as I realized just how important the words were to those children.

At the end of the project the mosaic was finished. All the children took great pride in their work, smacking other children's hands when they attempted to touch the tiles. Finally, the children made their presentation to parents, dive shop employees, teachers and the majority of the senior school who all packed into the small hall.

Groups explained and acted out the importance of the reef. Skits demonstrated the money gained from tourism, sources of food, medicines from marine life, reefs as an indicator of environmental change and reefs as barriers to coastal erosion. The children also acted out the reef threats of over-fishing, tourism, poorly planned construction and development, global warming and unmanaged collection for the curio trade. A huge round of applause echoed throughout the school after each group acted out their skit. The presentation was a great success, with BICA handing out certificates to the children, and also special prizes to the hardest workers. And in the playground, the mosaic still provides a lasting reminder.

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Dispersal Of Reef Fishes By Rafting

Dispersal is the way marine animals expand their geographic distribution and exchange genetic material among spatially discrete populations. Coral reef fishes disperse principally during the planktonic larval phase of their bipartite life-cycle, recruiting to reefs for the adult benthic phase.

Efforts to predict the geographic distribution and gene flow amongst reef fishes using measurements such as the duration of the larvae period and larval swimming ability have so far proved unsuccessful (Victor 1991; Shulman and Bermingham 1995; Stobutzki 1998). In other marine organisms such as corals, bryozoans, gastropods and ascidians *rafting* with floating objects can contribute to the wide geographic distribution and genetic similarities among distant populations (Johannesson 1988; Jokiel 1989; Worcester 1994).

Rafting may enhance dispersal by improving survival in open water and so extending drift time in the pelagic environment. Gooding and Magnuson (1967) showed fishes (including reef fishes) associate with floating objects, but few studies have discussed the significance of such an association. However, two recent events of long distance dispersal of fishes associated with floating objects may suggest a role for rafting as a dispersal mechanism in reef fishes (Kokita and Omori 1999; and pers. obs.).

Floating objects are often home to adult fish (Figure 1), but planktonic fish larvae can also find a suitable refuge and source of food on floating objects (Gooding and Magnuson 1967; Kingsford and Choat 1985). However, not all species appear to be attracted. Fish fauna drifting within floating objects differ from the fauna found in surrounding waters (Kingsford and Choat 1985). In addition, my own studies show significant differences in the species composition of fishes settling to similar floating and benthic experimental units. Through a preliminary bibliographic investigation and personal observations I have recorded 280 species that as-

Rafting may enhance dispersal by improving survival in open water and so extending drift time in the pelagic environment

It is not clear what determines the residence time of fish on floating objects

sociate with floating objects in the Pacific Ocean, of which approximately 20%, represent reef fish species. Although this number could be considered low relative to the total number of species in the Pacific Ocean, I suspect that improved sampling could increase the count. For example almost 80% of the references are restricted to the northwest Pacific.

The second important factor in dispersal by rafting is the time fishes spend associated with floating objects. Although it is still not clear what determines residence time, the physical characteristics of the floating objects themselves are important. For example, sizes and ages of fishes are positively correlated with raft size (Hunter and Mitchell 1967). Furthermore, floating objects that don't last long in the ocean, such as detached macroalgae, harbour fewer juvenile and adult fish compared with long-lived objects, such as logs and man-made materials. However, the duration of associations between fishes and floating objects will likely depend heavily on active behaviour. For example fish may leave the raft when a certain developmental stage is reached (Kingsford and Milicich 1987) or when predation and/or competition become intense. Of course, successful dispersal by rafting would depend on successful recruitment onto reefs, either through fish actively leaving the raft or, as my colleagues and I have observed at Gorgona Island in the Colombian Pacific, direct recruitment when floating objects run aground. Considering the abundance and variety of floating objects in the Pacific Ocean, could rafting be a significant and overlooked dispersal mechanism for some reef fish species? I believe rafting deserves further study and warrants consideration in biogeographical studies of reef fishes.

Acknowledgments

I thank F. Zapata, V. Francisco and the Coral Group at Universidad del Valle for providing help and en-



Figure 1. Adult fishes associated with a floating log.

couragement during this study. This study was supported by Colciencias, Fundacion Banco de la Republica, FES and C.I. Oceanos.

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*Reef science and reef management go hand in hand in Marine Protected Areas (MPAs). Biological monitoring, socioeconomics and community involvement must all play a part. Despite the depressing statistic that 50% of the world's MPAs are "paper parks" (Kelleher et al. 1995) our Feature articles provide a spark of optimism. It is time for MPAs to truly come of age as a prominent reef management tool. Don't forget to read **Book Review** to find out about the new guide to 'Fully Protected Marine Reserves'.*

Belize Evaluates Marine Protected Areas

Belize is taking a long look at its Marine Protected Areas. Of twelve on the books, only four have been managed for at least a year. In the 1980s and 1990s Belize was a leader in the field of Marine Protected Areas (MPAs), but it currently lags behind in the global trend towards community-based management and full devolution of authority over MPAs.

Last summer the four managed MPAs were evaluated for management effectiveness. The survey coincides with broader governmental initiatives to develop a National Protected Areas Policy and to restructure the organization of the marine reserves within the Belize Fisheries Department.

Overall, the evaluation found Belize's managed MPA system "moderately satisfactory" indicating that the minimal elements necessary for management are present. Indeed, one of the four - the Hol Chan reserve, has long been held up as an example of the value of MPAs in coral reef environments.

But there are also deficiencies that prevent effective management and reduce the probability that conservation objectives will be achieved. The main problem area is administration. The best managed park was Half Moon Caye, which has been managed by a NGO for approximately four years. Next most effective was the semi-autonomous Hol Chan reserve, while the Government administered Glovers Reef and Bacalor Chico reserves lagged behind. The assessment suggested these problems might best be addressed by removing the responsibility for MPAs from the already over-burdened Fisheries Department and devolving management to NGOs. Overall responsibility could be shifted to the Coastal Zone Management Authority, a "quasi-governmental"

authority with proven administrative capacity and expertise, or to a new autonomous body developed along similar lines to the Australian Great Barrier Reef Marine Park Authority.

Belize is certainly not alone in lacking full management of all its protected areas. A 1995 global review found that approximately 50% of MPAs are "paper parks" (Kelleher et al. 1995). But even under-managed parks are a valuable starting point (**Reef Encounter** 25: 18-20) and assessing management effectiveness is an essential task (**Reef Encounter** 26: 24-26). Achieving and maintaining effective management of Belize's MPA system will always be a challenge. This forthright evaluation of the effectiveness of current management efforts is an important first step on the road to improved performance.

The evaluation was undertaken by Melanie McField, Email <mcfield@btl.net> using a quantitative hierarchical evaluation protocol developed by the World Wide Fund for Nature (WWF) and the Tropical Agronomic Center for Research and Higher Education (CATIE) in Latin America (Cifuentes et al. 1999).

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First Community Led No Fishing Zone in Indonesia Opens in the Tukang Besi Islands

The first totally protected community-led no fishing zone in Indonesia was officially opened on 22nd September 2000 with a Bajau ceremony that hadn't be performed for 8 years. The event was covered by local and international TV crews. Small though the area is - a 500m stretch of reef in front of the Hoga Island Operation Wallacea Research Center, Tukang Besi Islands - it is an important testing area in a country still in the early stages of marine protection through community involvement, and in a region of high marine biodiversity, escalating resource use and human growth.

The Tukang Besi islands in South east Sulawesi lie close to the centre of marine biodiversity. Here, coral reefs support high numbers of species and fisheries are some of the richest in the country. The area also provides livelihoods for thousands of coastal communities and the nomadic Bajau Sea Gypsies that roam the Indo-Malay archipelago. Escalating resource use and abuse in the forms of over fishing, illegal dynamite fishing and use of poisons for the live reef fish trade are destroying large areas of coral reefs, losing rich diversity and impacting the communities relying on those resources. In response to increasing concern, a Wakatobi Marine National Park was declared several years ago in 1996. Wakatobi is the name taken from the four main islands in the group and the park covers most of the Tukang Besi islands, an area of 1.3 million hectares. But although officially the area is divided into several protected and multiple use zones, effective management and enforcement is still non existent. Confusion about zone boundaries continues amongst communities, and weak protection has created little more than another paper park.

The first time the National Parks Authority of Indonesia have allocated an area of coral reef to a local fishing community

In return for fishing restrictions - a package of compensation for local Bajau and fishing communities.

In return for fishing restrictions, Operation Wallacea (a UK eco tourism and research group which has been conducting surveys to provide information for management of marine areas in the area since 1996) put together a package of compensation for local Bajau and fishing communities using Fishing Aggregation Devices (FADs). FADs, locally called *rompongs* are simple structures made of local materials that can be used in deeper waters. They are very effective in increasing catch from pelagic fisheries. The aim is to divert effort and pressure away from already heavily stressed coral reefs in the area,

while in turn compensating the income lost to local communities. Operation Wallacea paid for and facilitated the building of several cooperative based *rompongs* in return for a complete no fishing area agreement around a small stretch of healthy coral reef on Hoga Island, where their Research Centre is based. Hoga, an idyllic desert island in the Banda Sea surrounded by diverse and healthy reefs, is one of the secrets of the archipelago. But despite some protection from the tourism presence in Wakatobi, intense local fishing, as well as dynamite and poison fishing continues around much of the island. The no-fishing zone was an essential start to community based conservation efforts. It is the first time that communities have been involved in protected area discussions and also the first time the National Parks Authority of Indonesia have allocated an area of coral reef to a local fishing community. This kind of tenure-ship management means that in theory, the area will be self policing. From its initiation in June, the rationale for such an area was rapidly accepted. It is hoped that local communities will benefit through increased fish catches as resources recover, and through enhancement of

the growing dive tourist industry. After three months of negotiations, local communities and officials agreed on an area to designate, although this was smaller than had initially been proposed.

Nonetheless, this is a real breakthrough for Wakatobi Marine Park. Giving ownership or responsibility back to coastal communities is perhaps the only effective way we have of managing coral reef areas. These fishing communities are the real day to day managers and a feeling of ownership and investment in the reef will be the key to the protection of Wakatobi's endangered marine life.

The area will be monitored during 2001 by the science team based on Hoga. Once the no fishing zone's success is demonstrated to local fishing communities, Operation Wallacea hopes to propose an extension of the zone to cover a larger area of coral reef around the island.

*Sarah Curran, Operation Wallacea, Priory Lodge,
Spilsby, Lincolnshire, UK.*

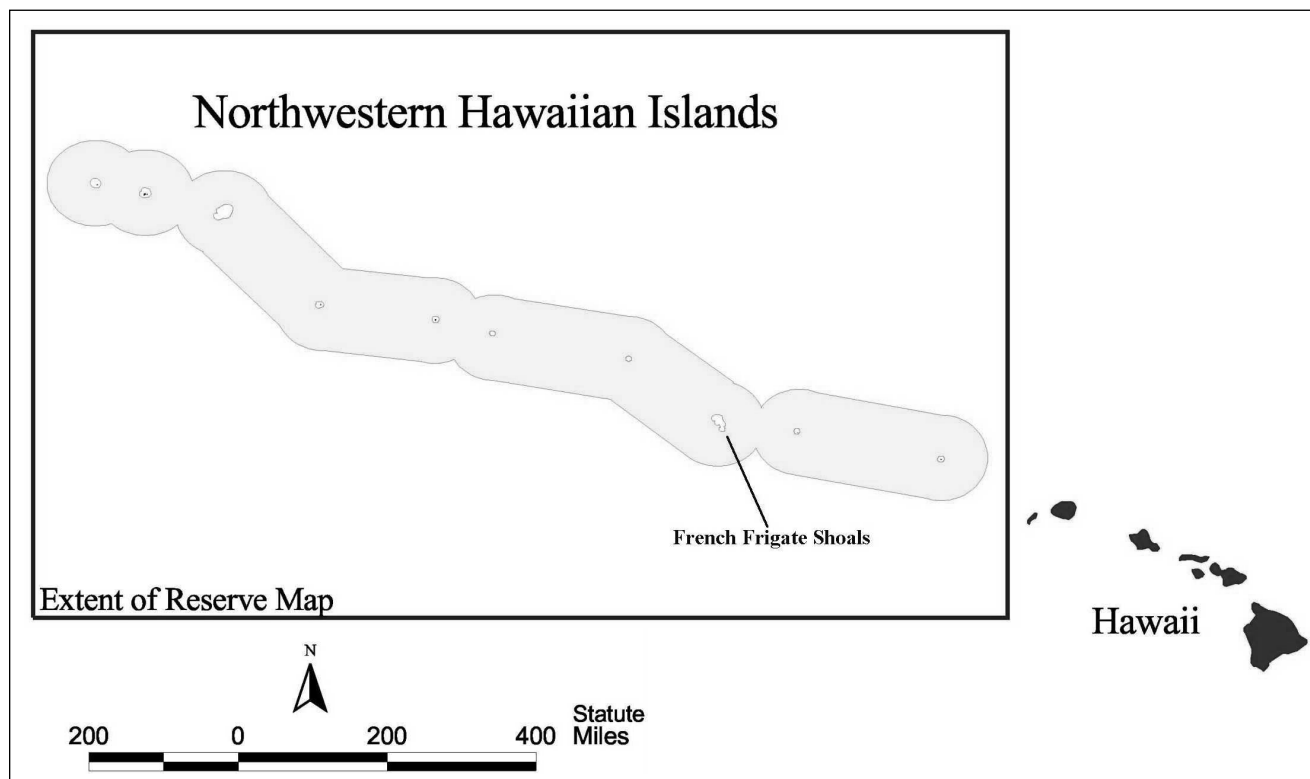
Email <curran@altc.freereserve.co.uk>

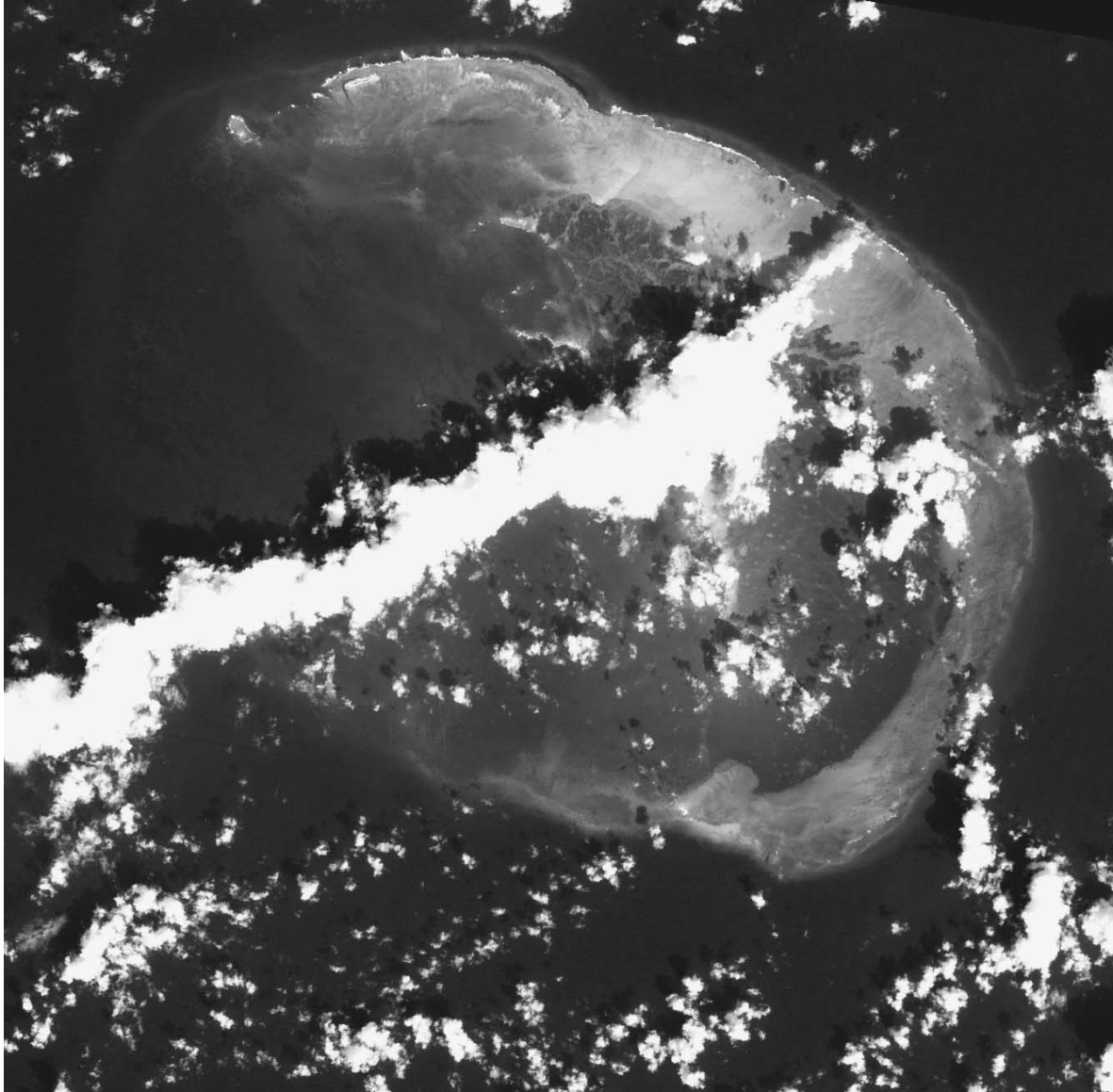
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Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve

The second largest marine protected area in the world was established by an Executive Order from the United States President on 4th December 2000. The Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve will be approximately 1200 nautical miles (2200 km) long and 100 nautical miles (185 km) wide. This huge stretch of coral islands, seamounts, banks and shoals contains some of the healthiest and most extensive coral reefs in the world.

Approximately 70% of the U.S. coral reefs are in the Northwestern Hawaiian Islands, and the area is home to more than 7000 marine species, of which approximately half are unique to the Hawaiian Island chain. The incredibly diversity of coral, fish, birds, marine mammals, and other flora and fauna includes the endangered Hawaiian monk seal, leatherback and hawksbill sea turtles and the threatened green sea turtle. The principal purpose of the >84 million acres (> 34 million hectares) Re-





The Reserve Preservation Area for French Frigate Shoals includes the waters and submerged lands from the seaward boundary of Hawaii state waters out to a mean depth of 100 fathoms (~180 m). French Frigate Shoals (FFS) is an 18 mile (34 km) wide, crescent-shaped atoll. It is approximately 830 miles (1,330 km) Northwest of Honolulu. About 67 acres (27 hectares) of land and 230,000 acres (93,150 hectares) of coral reef habitat are associated with FFS which makes it the largest atoll in the Northwestern Hawaiian Islands.

serve is the long term conservation and protection of the coral reef ecosystem and related marine resources and species of the Northwestern Hawaiian Islands. About 4.4%, or 3.3 million acres (1.3 million hectares) is less than 100 fathoms (~180 m) deep, and considered coral habitat.

However, levels of protection will vary considerably. Within the reserve as a whole, fishing will continue but will be capped at current levels. Other activities such as oil, gas or minerals exploitation, anchoring on dead or live coral, and altering the seabed will be prohibited. In 15 Reserve Preserva-

some of the healthiest and most extensive coral reefs in the world.

tion Areas (which reflect and extend the current boundaries of the Hawaiian Islands National Wildlife Refuge) consumptive use will be banned.

With some exceptions! Existing bottom fishing will continue in eight of these reserves at least for the foreseeable future, and native Hawaiian non-commercial subsistence, cultural or religious consumptive uses can continue in all.

Creating 'fully protected' MPAs is never an easy job – see **Book Review**.

More information at <http://hawaiiireef.noaa.gov>

US Marine Protected Areas Online

The American Government's new website <http://MPA.GOV> is designed to provide information, facilitate partnerships, help identify key needs and challenges, and encourage public participation in the design, implementation and evaluation of the United States marine protected areas. The first version of MPA.GOV provides a variety of services such as general information on the role of MPAs ocean and coastal management, a virtual library of references on MPAs, and the beginnings of a comprehensive inventory of U.S. marine protected areas. The site will

be updated as new material is available, and will provide reports on progress towards building a comprehensive system of marine protected areas. Your input is sought!

For more information please contact Roger Griffis, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Tel: 202-482-5034 Fax: 1-202-501-3024 Email: <roger.b.griffis@noaa.gov> or Ashley Simons, Department of the Interior, Tel: 1-202-208-6211 Email: <Ashley_Simons@ios.doi.gov>

New US Institute for MPA Training and Technology

A new United States Institute for Marine Protected Area Training and Technical Assistance is planned at NOAA's* Coastal Services Center in Charleston, South Carolina.

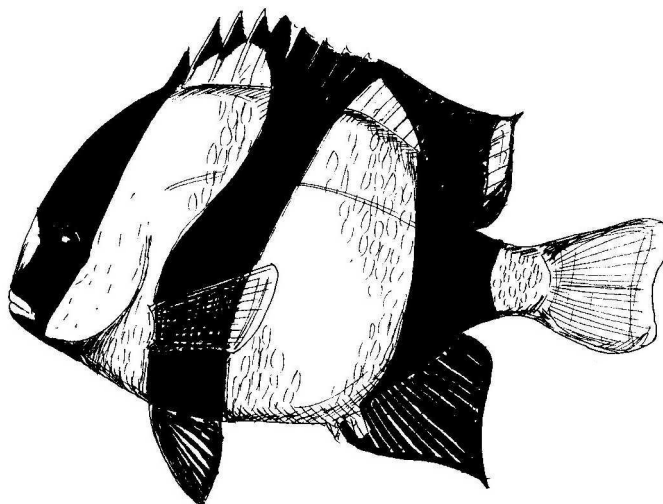
The new Institute will develop and provide a wide variety of training opportunities and technical assistance on marine protected areas to managers, scientists, community groups, fishermen and other interested groups. It will provide classes, workshops and advance technologies to equip ocean and coastal managers with new skills to design and manage MPAs. Training will also be available for teachers, community leaders, the fishing community and others. The Institute will work with partners to identify training

and assistance opportunities across America, and serve as a clearinghouse for information on these topics.

The new MPA Training Institute is one of two Institutes established as part of a National MPA Center. In October, 2000, NOAA established the Institute for MPA Science in Santa Cruz, California.

For more information on the National MPA Center, the MPA Training Institute or the MPA Science Institute, please contact Roger Griffis, NOAA/Department of Commerce Tel: 1-202-482-5034; Email: <roger.b.griffis@noaa.gov>

* National Oceanic and Atmospheric Administration



Coral Reefs In Papua New Guinea

Geography And Distribution

With a coastline of >10,000 km and an Exclusive Economic Zone (EEZ) of several million square kilometers, Papua New Guinea (PNG) makes up the eastern half of the island of New Guinea. PNG includes the islands of New Britain, New Ireland, Bougainville and many smaller islands. At low latitudes, and therefore lying outside the cyclone belt, PNG reefs contain every morphological type originally described by Darwin - but most are fringing and barrier reefs. However, reef distribution is poorly surveyed (Maniwaive *et al.* 2000; Quinn and Kojis 2000). The only estimate of total reef area is a probable underestimation of 40,000 square kilometers (Maniwaive *et al.* 2000) which makes it the 4th ranked in the world for reef area (M. Spalding, pers comm).

Southern reefs of PNG are a northern continuation of the Great Barrier Reef of Australia. In contrast, reefs to the north and around the islands have stronger affinities with the Solomon Islands to the east and Indonesia to the west (Maniwaive *et al.* 2000). PNG's marine ecosystems are generally in excellent ecological condition and boast some of the world's best examples of biologically rich coral reefs. Fourteen of the nineteen PNG provinces are maritime and the two largest urban industrial centers, Port Moresby and Lae, are coastal cities. Low human population density has been critical in maintaining the excellent status of these reefs, but the threat of coral bleaching is looming and global warming may be one of the top long-term threats to the health of the country's coral reefs.

Research

Historically, coral reef research in PNG has been strongly associated with two marine research stations, Motupore Island Research Center (MIRC) and

PNG reefs are estimated to be ranked 4th in the world for reef area

More coral species are recorded from PNG than from anywhere outside of the Philippines, including the Great Barrier Reef

the Christensen Research Institute (CRI). Motupore is 15 km from the capital city of Port Moresby in the south. CRI is on the northern side of the country, close to the important port city of Madang. The University of PNG (UPNG) acquired Motupore Island in 1969, after preliminary investigations by visiting archaeologists uncovered important shell and pottery middens (McGregor and Huber 1993). Coral reefs are plentiful near the lab, and a number of important studies have been undertaken.

Grants from the European Union have helped expand Motupore's facilities. Motupore Island has been a de facto nature reserve for the past 25 years. It is the most diverse, best preserved, and most intensely studied coastal zone in all of PNG (Maniwaive *et al.* 2000).

The Christensen Research Institute was once a leading private research institute in PNG, but three years ago it closed when the major donor withdrew. The buildings still stand, but desperately need maintenance. The landowners, together with the World Wildlife Fund for Nature-Papua New Guinea and other NGOs, are working towards restoring CRI.

Sadly, equipment, publications and reference material collected over the years are no longer available at the station. More recently, The Nature Conservancy (TNC) has established a research center at Mahonia na Dari in the Walindi region (**Reef Encounter** 28 p29-31).

Geological research on the Huon Peninsula found that a steady rise in the landmass has produced tiers of ancient reefs over a period 95 thousand years and nine cycles of global perturbations (Pandolfi 1996). Interestingly, Pandolfi found that there were greater differences between study sites at the same time than over time, suggesting that local spatial variability in environmental parameters (such as fresh water inputs) had greater effects than global change. The study suggests a limited species assem-

Table 1. Percent cover of live hard corals, soft corals, algae, abiotic and other substratum types from reefs surveyed by line intercept transect in PNG. NM - not measured, *-reference not available. Table quoted by permission of N. Quinn.

| Location | Year | Percent Cover | | | | | Source |
|--|------|---------------|------------|-------|---------|-------|--------------------------------------|
| | | Hard coral | Soft coral | Algae | Abiotic | Other | |
| Motupore & Loloata Islands, Bootless Bay | 1995 | 20-58 | NM | 11-59 | 1-56 | 0-22 | *Maniwaive and Bass unpublished data |
| Walter & Joyce Bays, Papuan Coast | 1997 | 14-43 | NM | 11-59 | 15-67 | 2-18 | Maniwaive <i>et al.</i> 1998 |
| Collingwood Bay | 1998 | 19-72 | NM | 20-56 | 0-51 | 5-17 | Opu and Aruga 1999 |
| Tufi | 1996 | 31-32 | NM | 44-52 | 14-26 | 0-2 | *Maniwaive unpublished data |
| Kamiali | 1997 | 47-52 | 11-17 | 23-29 | 4-8 | 4-5 | *Jenkin and Led 1997 |
| Madang, Sek Harbour | 1994 | 34-63 | 5-34 | 0-36 | 0-18 | 2-14 | DEC-ADB 1995 |
| Madang | 1999 | 22-49 | 17-27 | 19-22 | 2-20 | 11-13 | Jenkins pers. comm, unpublished data |
| Aitape (Ali) | 1997 | 22 | 8 | 26 | 38 | 6 | Jenkins pers. comm, unpublished data |
| Southern New Ireland | 1996 | 29-79 | NM | 19-50 | 0-29 | 0-49 | Hair 1996 |
| Kimbe Bay, New Britain | 1997 | 64-66 | NM | 16-27 | 4-9 | 8-12 | *Maniwaive unpublished data |
| Kimbe Bay, New Britain reef front, 2-10m | 1999 | 21-60 | 0-17 | 28-59 | 2-21 | 0-13 | Jones pers. comm. unpublished data |
| Kimbe Bay, New Britain reef back, 2-10m | 1999 | 9-38 | 0-3 | 18-40 | 34-67 | 2-8 | Jones pers. comm. unpublished data |

blage over the Pleistocene and a 5°C range of temperature. Consequently, reef species composition has been stable and diverse over a number of glacial-interglacial cycles.

Fish research in PNG dates back to the early 1800s when the naturalists Quoy and Gaimard published records of 30 collected species (Munro 1967). Reef surveys of living Holocene reefs include the 1994 Rapid Ecological Assessment (REA) survey in Kimbe Bay by TNC (Holthus 1995). TNC hired a team of international scientists in partnership with the many local authorities. The REA produced a seven-volume report with information on coral species, abundance and distribution. Seagrass and other benthic macro-invertebrates were also assessed. This report was the first detailed marine biodiversity survey done in PNG. Coral cover varied from 25-100%

(Holthus and Maragos 1994). The researchers also reported approximately 345 species of stony corals. Soft corals, gorgonians and black corals were not assessed in detail.

The 1996 Lak Marine Survey of Southern New Ireland by the Department of Environment and Conservation (now called the Office of Environment and Conservation, OEC), the United Nations Development Programme (UNDP) and staff from Motupore Island Research Center (MIRC) produced the second most detailed rapid assessment. The data collected were intended as a baseline for future monitoring. Coral cover from the different sites surveyed ranged from 16.3% to 85.4% (Hair 1996 and Table 1).

The Madang region is an area of exceptional biodiversity for invertebrate fauna, especially the coral reef amphipods (Thomas 1992). Comatulid crinoids

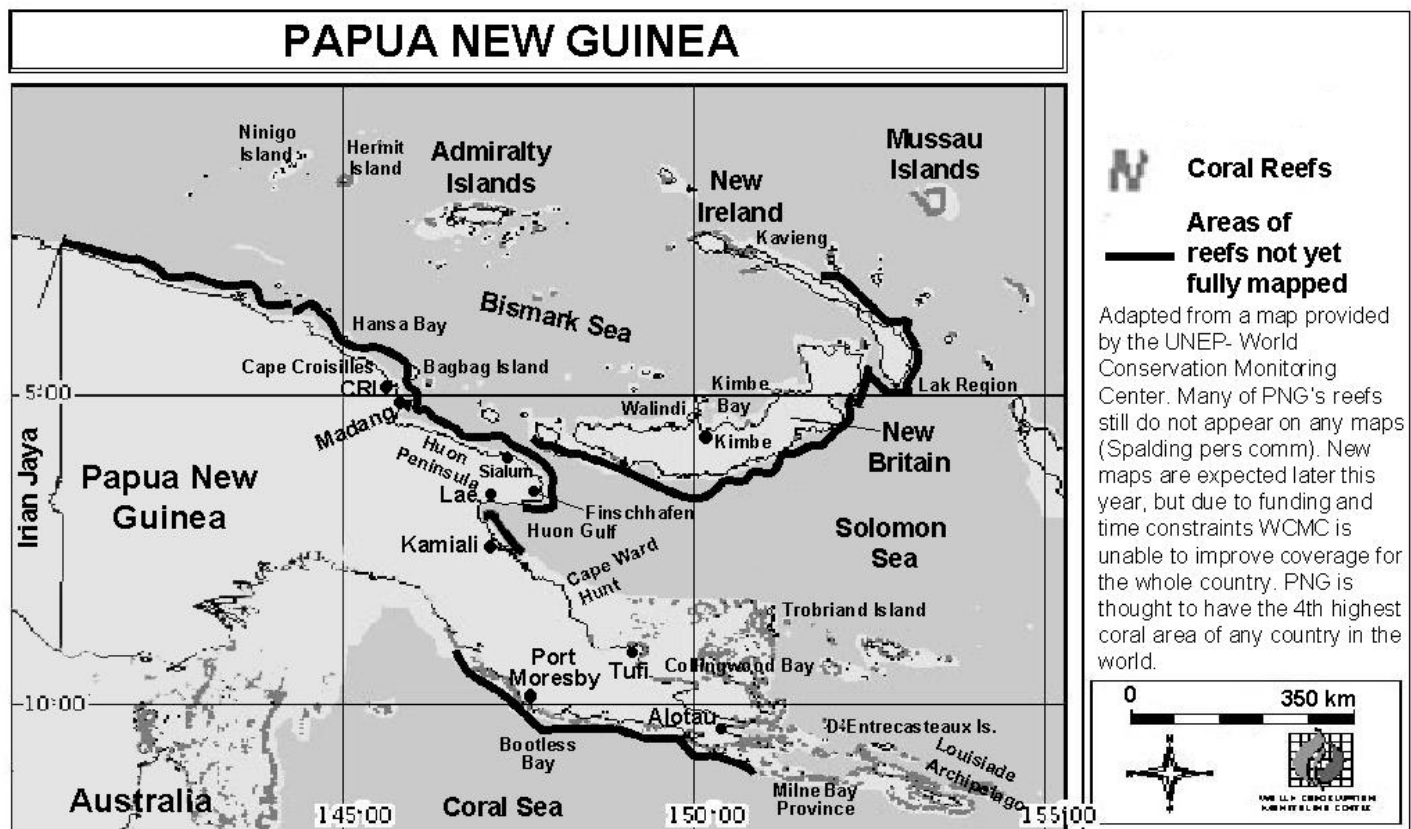


Figure 1. Map of Papua New Guinea showing places named in the text. Derived from a map produced by WCMC (M.D. Spalding). Note all reefs are not shown in this map, due to incomplete mapping. This map is based on Petroconsultants SA (1990). MUNDOCART/CD. Version 2.0. 1:1,000,000 world map prepared from the operational Navigational Charts of the United States Defense Mapping Agency. Petroconsultants (CES) Ltd, London, U.K. UNEP-WCMC is updating this map but the updated map has not been released.

collected at the reef adjacent to CRI also indicated species richness comparable to the Great Barrier Reef and Palau (Messing 1992). In 1994, marine studies were conducted by the OEC (assisted by the Asian Development Bank - ADB) in the Madang Lagoon (DEC ADB 1995). The heavily impacted site at the out fall of the Madang Harbour Cannery, had unexpected rich marine life. Live coral cover ranged from 60-80% while the dead coral cover ranged from 18-35% throughout the lagoon (Maniwaive unpubl. data) (Table 1).

Quinn and Kojis (2000; Table 2) have examined coral abundance and diversity in the reefs throughout PNG. They note that scientific records of Papua New Guinea reefs are often inaccurate. For example, Whitehouse's (1973) account of coral reefs in northeast New Guinea stated that along the coast from East Cape to the Huon Peninsula "coral reefs were only found as occasional

small fringe reefs and patch reefs" and that on the northern sides of the island the coastline is "without any active reefs for 1250 km". On the contrary fringing reefs with a high coral cover and species diversity are common except near river mouths (Kojis *et al.* 1985). Maps of PNG such as the one presented in Figure 1 are incomplete in describing the extent of reefs and further mapping programs will be required to identify the true extent of the reefs.

Werner and Allen (1998) recently performed a rapid biodiversity assessment of the coral reefs of Milne Bay Province. This is the PNG province with the most coral reefs and is an area of very high marine diversity. Conservation International recently confirmed 362 species of corals (with a final total of 420 predicted) and 1039 species of fish (1150 predicted) (CI 2000). More coral species are recorded here than from anywhere outside of the Philippines,

Table 2. Reefs Surveyed in PNG, with number of genera observed and percentage live coral cover (Quinn and Kojis 2000). Tables quoted by permission of N. Quinn.

| Reef Group | Genera | Method | # Genera | % Live Coral | References | Region |
|---|--------|---------|----------|--------------|--------------------------------|-------------|
| Joyce and Walter Bay | 245 | MT, LIT | No id | 13-43% | Maniwaive <i>et al.</i> 1998 | PMB |
| Bootless Bay | na | SS | 54 | ~100% | Weber 1973 | PMB |
| Trobriand Islands & Louisiade Archipelago | 16 | SS | 37 | 12-83% | Cahill <i>et al.</i> 1973 | PMB |
| Milne Bay | 53 | SS | 77 | na | Veron in Werner and Allen 1998 | PMB |
| Collingwood Bay | 10 | MT, LIT | 13 | 19-72% | Opu and Aruga 1999 | MBCWH |
| Tufi | 22 | LIT | 35 | 21-68% | Quinn 2000 | MBCWH |
| Kamiali Wildlife Management | 2 | LIT | No id | No id | Jenkins unpublished report | CWHF |
| Huon Gulf | 45 | SS | 55 | 55% | Kojis <i>et al.</i> 1985 | CWHF |
| Sialum | na | na | 20 | na | Chappell 1974 | FCC |
| Madang | 10 | SS | 53 | na | Kojis <i>et al.</i> 1985 | FCC |
| Nagada Harbour | na | SS | 5 | 0-50% | Jebb and Lowry 1995 | FCC |
| Padoz and Mizegwadan | na | SS | 3 | 30-100% | Jebb and Lowry 1995 | FCC |
| Mazamoz & Yazi Reefs | na | SS | 2 | 0-20% | Jebb and Lowry 1995 | FCC |
| Barrier Reef | na | SS | 5 | 70-100% | Jebb and Lowry 1995 | FCC |
| Madang Harbour | 25 | LIT | No id | 22-49% | Jenkins pers.comm. | FCC |
| Hansa Bay | 28 | SS | 69 | 5-60% | Kojis <i>et al.</i> 1985 | CCV |
| Hansa Bay | na | SS | 47 | 5-100% | Claereboudt and Bouillon 1987 | CCV |
| Hansa Bay, Laing Is. Reef flat | na | na | na | 17% | Tursch and Tursch 1982 | CCV |
| Kimbe Bay | 40 | LIT | No id | 2-59% | Jones pers. comm. | NGI |
| Rabaul Harbour | na | na | 1 | na | Maniwaive <i>et al.</i> 1998 | NGI |
| Southern New Ireland | 188 | MT | No id | 20-45% | Hair 1996 | NGI |
| Southern New Ireland | 80 | LIT | No id | 29-79% | Hair 1996 | NGI |
| Kavieng | 14 | SS | No id | 40-75% | Quinn 2000 | NGI |
| Northern New Guinea | na | SS | 73 | na | Hoeksema 1992 | FCC,CCV,NGI |

Legend

LIT - Line Intercept Transect
 MT - MantaTow
 SS - Scuba dive
 No id - no identification of coral attempted
 na - no information

Region Abbreviations

PMB - Papua and Milne Bay
 MBCWH - Milne Bay to Cape Ward Hunt
 CWHF - CWH to Finschhafen
 FCC - Finschhafen to Cape Croisilles
 CCV - Cape Croisilles to Vanimo
 NGI - New Guinea Islands

Table 3. Condition of the PNG reefs, including human influence, anchor damage, eutrophication, destructive fishing practices, coral bleaching and evidence of crown-of-thorns starfish activity (with permission from Quinn and Kojis 2000).

| Reef Group | Reef Condition | Human interference | Anchor Damage | Eutrophication | Destructive Fishing | Bleaching | COT | Reference | Region |
|-----------------------|----------------|--------------------|---------------|----------------|---------------------|-----------|-----|---------------------------------|--------|
| Trobriand Islands & | | | | | | | | | |
| Louisiade Archipelago | 3 | 0 | 0 | 0 | 0 | na | 0 | Cahill <i>et al.</i> 1973 | PMB |
| Joyce & Walter Bay | 1 | 1 | na | 0 | 1 | na | 2 | Maniwavie <i>et al.</i> 1998 | PMB |
| Bootless Bay | 3 | 0 | 0 | 0 | na | na | na | Weber 1973 | PMB |
| Bootless Bay | 3 | 2 | 0M | 0 | 0 | n | 0 | Quinn 2000 | PMB |
| Milne Bay | 3 | 0 | 0M | na | 3 | na | na | Halstead <i>et al.</i> 1998 | PMB |
| Milne Bay | na | na | na | na | na | 2 | na | Davies <i>et al.</i> 1997 | PMB |
| Collingwood Bay | 3 | 0 | 0 | 0 | 0 | na | 2 | Opu and Aruga 1999 | MBCWH |
| Tufi | 3 | 0 | 0M | 0 | 0 | 0 | 0 | Quinn 2000 | MBCWH |
| Busama | 2 | 2 | 0 | 3 | 0 | n | 0 | Kojis pers. comm. | CWHF |
| Salamaua | 3 | 2 | 1 | 0 | 0 | n | 0 | Kojis pers. comm. | CWHF |
| Tami Islands | 3 | 0 | 0 | 0 | 0 | 0 | 0 | Kojis pers. comm. | CWHF |
| Madang | 3 | 0 | 0 | 0 | 0 | n | 0 | Kojis <i>et al.</i> 1985 | FCC |
| Madang | 3 | 0 | 1M | 0 | 0 | n | 0 | Quinn 2000 | FCC |
| Kimbe Bay | 3 | 0 | 0 | 0 | 0 | n | 0 | Kojis <i>et al.</i> 1985 | CCV |
| Holthus and | | | | | | | | | |
| Kimbe Bay | 3 | 0 | 0 | 1 | 1 | 1 | 0 | Maragos 1994 | NGI |
| Kimbe Bay | 3 | 0 | 0M | 0 | 0 | 0 | 1 | Quinn 2000 | NGI |
| Southern New Ireland | 3 | na | na | na | na | y | 0 | Hair 1996 | NGI |
| Southern New Ireland | 3 | na | na | na | na | y | 0 | Hair 1996 | NGI |
| Kavieng | 3 | 0 | 0M | 0 | 0 | n | 0 | Quinn 2000 | NGI |

Legend

na - not mentioned

Reef Condition 0 low-3 high coral diversity and % coral cover

Human interference 0 low-3 high

Anchor Damage 0 low - 3 high M - moorings installed

Eutrophication 0 low - 3 high

COTS - Crown-of-Thorns 0 low - 3 high

Bleaching - y yes ; n no

Regional Abbreviations as in Table 2

including the Great Barrier Reef which has 343 species (Veron in Werner and Allen 1998).

Threats to PNG Coral Reefs

Local Influences

Recently, escalating development has directly and indirectly impacted the environment, creating an increasing need for conservation and sustainable management of the marine resources that provide livelihoods for approximately a million PNG people, or one quarter of the human population (CI 2000 and Table 3). Some of the most serious threats to PNG's mostly nearshore reefs come from terrestrial activities, such as large-scale logging and agriculture along the coast. Fishing pressure and sewage pollution are also increasing. Fish stocks are already overfished around the largest coastal towns (CI 2000).

Destructive harvesting methods such as dynamite fishing supply the high demand for fresh fish in urban markets. Cyanide is used illegally to harvest fish for the live fish and aquarium trades, and live corals are harvested for lime production and also as souvenirs. Bycatch of vulnerable animals such as juvenile fish, dugongs, sharks, turtles and some cetaceans is a problem with net fisheries. Many local people fear that their resources are being swept away and feel powerless to prevent it. The culprits are both domestic and foreign fishing vessels.

The disposal of household, industrial and commercial waste lacks regulation and enforcement, and high levels of microbial contamination occur in the waters around Port Moresby (Maniwaive *et al.* 2000). Litter, particularly plastic waste, is piling up in mangroves, reefs and coastal areas. The problem is worse in the Southern Papua Region (Yamuna *pers obs*).

Global Influences

Coral bleaching occurred during three main periods over the last 20 years. The most severe and widespread bleaching event in PNG was probably 1996-1997. Milne Bay was the most affected area with one study reporting 54% of corals exhibiting bleaching. Hair (1996) reports that there were unusually high proportions of bleached corals on all

Coral reefs are integral to the social systems of many PNG coastal communities

Improved scientific and management capacity for coral reefs in PNG is urgently needed

sites surveyed in the 1996 Lak Marine Survey. Bleaching rates ranged up to 27% at the sites and nearly all species of corals were affected to some degree to a depth of 25 m. Huber *et al.* (in Munday 2000) reported that bleaching affected 100% of corals on some reefs from the D'Entrecasteaux Islands in the Milne Bay Province. Overall, bleaching in PNG may not have been as severe as experienced in some other countries. However, many bleaching episodes may have been missed due to the scarcity of active marine biologists in PNG. Bleaching has again been observed in several locations during early 2000 (Maniwaive *et al.* 2000). Corals in a number of sites in the nearshore areas of northern PNG (Kamiali and Walindi) visited in May 2000 had recently died, and bleaching is the likely cause (McClanahan and Yamuna *pers obs*). Monitoring for bleaching should be a priority, as bleaching remains the most likely cause of reef degradation in the near future.

Management and Conservation

PNG is a country where over 800 languages are spoken. Virtually the whole country is under traditional land tenure, and where large fringing reefs occur, they are claimed as customary land. Offshore reefs are also claimed, especially where there is a history of fishing (Kolkolo 2000). Thus coral reefs are integral to the social systems of many PNG coastal communities. Traditional practices and knowledge are passed on orally from generation to generation.

PNG has ratified the Law of the Sea and has a declared a 2.4 million square kilometer EEZ, in which coral reefs abound. But in practice the government has very limited powers to protect this Zone. Increasingly, traditional landowners prefer to work with NGOs as many government programs fail from a lack of resources and finances. There are now a growing number of village-based protected areas such as Kamiali Wildlife Management Area in the Morobe Province. However, these are generally very small and sparsely distributed. These areas must be replicated throughout the country before they can have a substantial conservation effect.

In 1995, The Nature Conservancy (TNC) recognized the exceptional quality and condition of coral

reefs in PNG and helped the PNG Divers Association (PNGDA) buy and install permanent boat moorings to avoid anchor damage. There are now well over 100 moorings on dive sites throughout the country, and more are being installed. Many are subsurface floats so as not to attract extra fishing pressure.

Scientific capacity for coral reef monitoring is scattered among government departments, academic institutions, NGOs, mining companies, and the dive tourism industry. From time to time, monitoring programs start, however, financial constraints and personnel shortages have consistently limited their effectiveness. There is an urgent need for baseline monitoring in areas currently or likely to be subjected to increasing anthropogenic stresses. The MIRC arranged training in standard monitoring techniques and Reef Check methods in 1998. Local dive operators, some from the PNGDA, helped conduct surveys in many locations. The PNGDA plays a significant role in marine conservation and is well placed to assist in ongoing monitoring and skills training.

Education

There is an overwhelming need to educate people about the conservation and sustainable use of marine biodiversity. Current educational programs are almost exclusively limited to terrestrial ecosystems. Community awareness and education programs could help reduce unsustainable or destructive fishing, provide incentives for marine protected areas, and increase enforcement capacity at the community level. TNC in conjunction with their Mahonia na Dari Research Station has such a program in Walindi. This facility supports research and formal education but also reaches out to communities throughout the Walindi region. The program has been so successful that four nearshore reefs have been closed to fishing, and negotiations are underway to close others.

The Future

Improved scientific and management capacity for coral reefs in PNG is urgently needed. Yet the scarcity of job opportunities has probably slowed the development of an indigenous marine conservation community. Reef conservation needs private businesses, local communities, NGOs and the national government to work together. PNG does have legislation to protect its flora and fauna but there is no specific legislation targeting marine conservation. Some of the Acts can be broadly interpreted to pro-

tect marine species and ecosystems, but it is the prominence of customary marine tenure that makes PNG unique in the region. In parts of PNG certain marine species are the totems of clans and tribes, therefore legislation has to consider many ethnic customs. For conservation to work, a two-way education process is needed. Local people need to be educated, but also need to educate conservationists about local customs. This interaction and integration is the most promising path to conserving the unique character of PNG's coral reefs.

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Fully-protected Marine Reserves: a Guide

Callum M. Roberts and Julie P. Hawkins (2000) WWF Endangered Seas Campaign

Also available on the Endangered Seas Campaign website in French and Spanish: www.panda.org/EndangeredSeas/

Callum Roberts and Julie Hawkins, in collaboration with the World Wide Fund for Nature (WWF) have come up with an innovative product to promote the establishment and effective management of marine protected areas (MPAs). This 'toolkit' or resource pack is aimed at a wide variety of people including marine park managers, scientists, policy makers, fishers and NGOs. The 'meat' in the toolkit is a report that provides an overview of scientific literature related to MPAs, mainly in the context of their role in fisheries management. There are also two presentations on the benefits and roles of MPAs, one with 12 overheads and one with 30 copyright-free slides. These can be used as they are, but have also been designed for customization – combining overheads and slides, or adding additional materials to suit the requirements of a particular situation. Two brochures complete the toolkit – one a good clear summary of the topic; the other featuring statements from commercial and artisanal fishermen on why they think MPAs are beneficial.

The theoretical overview will be invaluable for improving general understanding of the role of MPAs and how no-take areas can be used as a tool in fisheries management. The report is somewhat evangelical in tone, but perhaps that is needed! In practice, it is often difficult to implement simple recommendations and situations are often much more varied than scientists appreciate. In many parts of the tropical world at least, fishing communities need little convincing of the value of closing areas to fishing and may be doing this of their own accord, or perhaps have done so for centuries. More difficult is developing the mechanisms for ensuring that MPAs of any form are managed effectively in the long-term, that closed areas are adequately enforced, and that other marine conservation or management measures are put in place – MPAs on their

own will not resolve the multiple threats facing marine biodiversity at present.

Reading this as someone who has been involved with the establishment and management of a number of MPAs, I sympathized with the authors over the problem of terminology, but could have wished that this had been made a little clearer. The academic community is tending to use the term 'marine reserve' for areas closed to fishing. However, this term has evolved from the concept of forest and game reserves which were originally areas managed specifi-

cally. The term 'marine reserve' has evolved from the concept of forest and game reserves which were originally areas managed specifically.

Fully-protected Marine Reserves—a definition from the guide's glossary

Fully-protected marine reserves: an area of the sea that is protected from all fishing, extractive or harmful human uses. Many people react negatively to the term no-take reserve, believing that it means 'no-people reserve'. Furthermore, no-take reserves may not limit other non-consumptive human activities to non-damaging levels. Hence, the broader term fully-protected reserve is used here. The term is not perfect, as to some people it may imply fully protected from all uses. However, it should be interpreted as meaning fully-protected from extractive uses (= no-take) and from harm by other uses. Thus, a fully-protected reserve is one where there is no fishing, and no extractive use (e.g. mining, dredging or curio collection). However, non-consumptive uses such as swimming, scuba diving, snorkeling, recreational boating, passage of shipping etc. are permitted up to levels which do not harm the environment.

cally for exploitation. Consequently, in several countries, MPAs are designated under legislation as 'marine reserves' within which certain controlled forms of fishing are allowed, and closed areas are called 'marine parks' or are zones within marine reserves. Confusing to say the least! The authors introduce the term 'fully protected marine reserve' which they define as an MPA in which fishing is prohibited as well as 'other harmful uses'. This raises the question of what is meant by 'harmful use', and how this very general term could be used in categorizing an MPA, or providing supportive legislation, which is generally needed to underpin any protected area

very useful for the many practitioners who need data to back up their efforts to establish MPAs and closed areas'

for long-term success (even though set up first as community initiatives).

The report includes a set of 14 case studies – many of which are probably already familiar to **Reef Encounter** readers (Saba, Hol Chan in Belize, Sumilon Island in the Philippines) but others that may be less well known. These provide good 'real-life' examples of how closed areas can have benefits – all the examples have been well-studied and there are now good data sets for them which should go along way to

convincing the skeptics. I would have liked to have seen case studies from the less well publicized sites – there is interesting work underway in the Pacific, for example – and also more examples from community-oriented initiatives, but perhaps such sites are not considered 'fully protected' by the authors.

As an ex-editor of **Reef Encounter**, I hope I am qualified to say that the report would have benefited from more careful editing. Parts of the text will probably be hard going for some of the target audience intended, despite the glossary, and a 'lighter', less scientific tone could have been used. Potentially useful summaries are also confusing – for example, a table summarizing the effects of marine reserves after differing periods of protection lists some sites twice with different results according to different researchers – understandable results for scientists but confusing for the lay-person.

These quibbles apart, the toolkit will be very useful for the many practitioners in the field who find it difficult to access scientific literature and who need data to back up their efforts to establish MPAs and closed areas. The slides and overheads will be particular welcome additions in MPA and project offices around the world. 1000 copies of the toolkit have been produced to 'give away to people working in the front line of conservation'. Since the report is available on the web, and thus accessible to the scientific community, it is to be hoped that efforts will be made to ensure that the toolkits themselves find their way into the hands of the people working with fishermen and protected areas, many of whom still do not have access even to a computer, let alone the Web.

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Mooring buoy fixture to avoid anchor damage in Saba, Caribbean (Photo: C. Roberts)

Reef Fish Behavior: Florida, Caribbean, Bahamas

Ned DeLoach (with photographer Paul Humann), New World Publications Inc., Jacksonville, FL, USA 360 pgs. ISBN 1-878348-28-0, \$39.95

Reef fish behavior is presented as "an overview of what's currently known about the nature of reef fishes inhabiting the waters of Florida, the Caribbean and Bahamas". The first eight chapters are overviews of different topics related to behavior and ecology: reproduction, life cycle, feeding, colors and camouflage, symbiosis, senses, sound communication, and marine life management. The following fifteen chapters are descriptive narratives about specific groups, most of them families. The groups discussed are angelfishes, basslets, blennies, butterflyfishes, damselfishes, dragonets, flounders, frogfishes, groupers and seabasses, jawfishes, parrotfishes, sharks and rays, surgeonfishes, tilefishes and wrasses.

Most of the overview chapters are accessible essays that include both very basic descriptive information and some quite technical precis of primary research on the topic at hand. Although the references that the author uses are not generally cited, in many places I was able to guess the research papers from which the narrative was derived. While there are occasions where I would have emphasized different papers from the literature and places where I took issue with the interpretation given, in general I thought the book was fairly up to date and well researched. The one chapter that stands apart from the majority of the book, which is laid back in tone, is the section on marine life management. Here the author moves beyond summarizing the state of knowledge to give an impassioned sermon that includes a harsh indictment of commercial and recreational fishers and a plea for the establishment of marine protected areas.

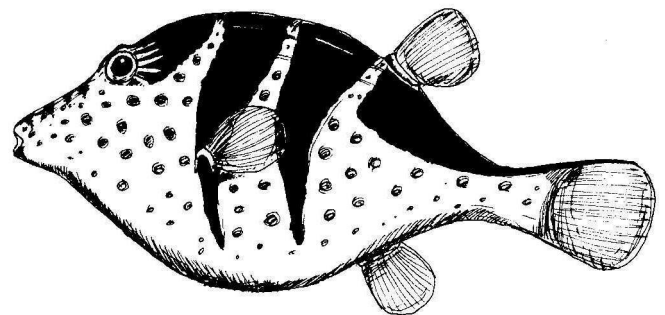
The chapters on specific fish groups obviously leave out a lot of species, but they do cover some of the families divers see on a day to day basis (wrasses, damselfishes, parrotfishes), some of the larger ones they look out for (groupers) and several less conspicuous and less studied groups (frogfishes and blennies). Each chapter gives an overview of the group, followed by shorter essays on selected species within the group. This part of the book contains a wealth of natural history information and is

full of fascinating vignettes - I certainly learned a lot while looking through it.

I suspect the primary audience for this book is the recreational diving community, and for the non-specialist this is a good introduction to reef fish ecology and behavior. Like the best nature shows on television, the book presents a blend of anecdotal and technical information in an appealing and accessible manner. Adding to its appeal are the hundreds of beautiful photographs. The photographs are all the more remarkable as they capture many of the behaviors described in the text, including events like courtship displays and spawning rushes that are difficult enough to observe, let alone photograph. The book's suitability as a formal reference for university level students or researchers is limited because citations are not identified in the text, though there is a good bibliography of sources. There were many times when I would have liked to have known where a piece of information came from so I could check the original literature or at least know who provided the anecdote. That said, it will be a good resource for anyone teaching courses in a coral reef setting and will provide a wealth of ideas for student projects. For researchers, this is a great book to take in the field and thumb through after a day's diving and I certainly plan to keep a copy nearby on field trips.

accessible essays that include both very basic descriptive information and some quite technical precis of primary research on the topic

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Collected Essays On The Economics Of Coral Reefs

Edited by Herman S. J. Cesar (2000) CORDIO, Department of Biology and Environmental Sciences, Kalmar University, SE-392 82, Kalmar, Sweden 244 pgs. ISBN 91-973959-0-0

Two primary messages are presented in this timely, useful and important new book edited by Herman Cesar. The first message is that the people dimension of coral reefs is becoming increasingly important in coral reef research and management. While biology, ecology and other natural sciences have dominated the research agenda on coral reefs, recently the socio-economic and management dimensions have received increasing attention. Many coral reef researchers and managers increasingly recognize that the underlying causes of coral reef ecosystem overexploitation and degradation are often of social, economic, institutional and/or political origins. From an economic perspective, for example, the causes of overfishing on coral reefs are generally found in the absence of property rights or other institutions that might otherwise provide exclusive control over harvesting and, as a result, an incentive to conserve and protect the resource. The primary concern of coral reef management, therefore, should address the relationship of these resources to human welfare, and the conservation of the resources for use by future generations. Policy interventions, if they are to bring about lasting solutions, must address these concerns. The increased attention to people, and to socio-economic and management issues of coral reefs was evident at the recent ICRS meeting in Bali where there were a significant number of sessions dealing with these issues.

The second message is that economics can serve as an important tool for improved policy and management of coral reef ecosystems. At its heart, economics is about people and choices—how people allocate resources among competing alternative uses to maximize their own well-being. Multiple resource systems and multiple users characterize coastal areas. Land-based activities, such as logging and agriculture, may impact upon coral reef ecosystems. Com-

The primary concern of coral reef management should address the relationship of these resources to human welfare, and the conservation of the resources for use by future generations

a book that brings together knowledge, methods and experiences on the range of uses of economic analysis for coral reef management and policy

petition for resource use among multiple users inevitably leads to conflict. If left unmanaged, competition among resource users may result in resource degradation or overexploitation, equity problems with income generation and distribution, and loss of social welfare.

Management of resource use is never easy. Management, therefore, requires identification of impacts, assessment of benefits and costs, and analysis of alternatives. Information is needed by decision-makers to evaluate the trade-offs between

alternative development and management scenarios. Economic analysis can help identify the winners and losers, and the benefits and costs associated with a decision on coastal resource use and what happens to resources available for future generations. Economic analysis of alternative coastal resource use scenarios often requires the valuation of goods and services not traded in competitive markets. The valuation process is termed nonmarket valuation, and there are a number of valuation techniques. While decisions are frequently made at the political level, economic analysis can serve as a framework to identify and organize economic, social, cultural, political and ecological information to improve the decision-making process.

In this book, Dr. Cesar has brought together 16 case studies from around the world of economic analysis of coral reef ecosystems that represent a variety of different threats and circumstances. While many of these case studies have been written and reported on elsewhere in the last two years, they have been brought together here in the first book on the economics of coral reef ecosystems. The focus of the case studies is on one or more of four elements—coral reef threat analysis, stakeholder analysis, economic or nonmarket valuation, and policy and management issues. The case studies are generally grouped together into four themes. The

first two studies are methodological. The next five case studies give an economic analysis of threats to coral reefs (poison and blast fishing, development, coral mining, and coral bleaching). The following four case studies address policy and management solutions such as fully-protected marine reserves, rehabilitation, cyanide fishing, and marine parks. The final five case studies focus on management of coral reefs, including marine protected areas.

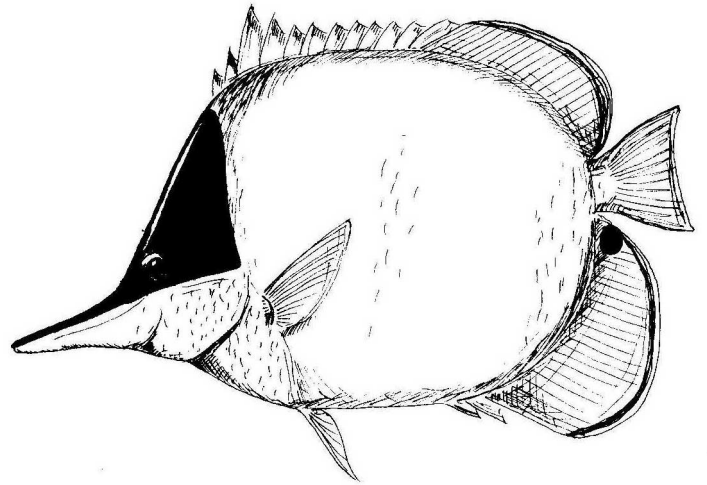
This is not a how-to manual on the economics of coral reefs. The extensive bibliography in Chapter 1 by Dr. Cesar can provide direction to those who want more detail on how to conduct economic analysis. Rather it is a book that brings together knowledge, methods and experiences on the range of uses of economic analysis for coral reef management and policy. It is a book that is important for policy makers and managers who need to understand the value of coral reefs and the high cost of continued overexploitation and degradation of these ecosystems. It is a book to guide researchers, economists and non-economists on further studies in this area. It can also be a useful textbook in undergraduate and graduate courses in resource management, coral reef studies, and economic analysis.

Dr. Cesar has done an excellent job in compiling a range of case studies, in bringing economic analysis to the forefront of coral reef research, and in high-

lighting an often under-reported aspect of coral reef science.

In the postscript to the book, the corals speak to us:
We, coral, have shown you what we are worth.
The choice is now up to you, humans, to determine and to decide how much you find yourselves worth.

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Dynamics Of Coral Communities

Ronald H. Karlson (1999) Kluwer Academic Publishers, Population and Community Biology Series 23, 250 pgs ISBN 0412795507, £88/\$US150

At a time when a suite of coral reef text books are available, *Dynamics of Coral Communities* manages to create a niche of its own. Rather than reviewing reef literature by taxon or process, Karlson has written an ecological text book for people interested in coral reefs. The result is a highly accessible treatise of ecological concepts and the degree to which they apply to coral reef communities. Thus, the book provides a refreshing spin on well-trodden issues (e.g. disturbance) and also a thoughtful insight into relatively recent topics such as scale-dependency and regional enrichment.

Karlson begins by reviewing models of community dynamics, many of which were derived from well-studied temperate rocky systems. The con-

highly accessible treatise of ecological concepts

cepts discussed in this introduction set the scene for the forthcoming chapters. Chapters 2 – 7 cover diversity, stability, succession, interspecific competition, consumer-resource interactions, and disturbance. The final two chapters focus on large-scale and cross-scale perspectives on community dynamics and diversity. Personally, I found these chapters the most rewarding because these issues have rarely been covered so comprehensively and clearly with respect to reef communities. Specifically, Karlson explores the general notions of convergence, saturation, limited membership, and regional enrichment on local communities. He then weighs the evidence for such phenomena on reefs using a range of taxa including fish, crustaceans

and corals. Whilst some of this discussion builds on his own work with HV Cornell, Karlson treats alternative views fairly and ultimately subscribes to the middle ground in which apparently contrasting concepts of limited membership and regional enrichment may both be appropriate but for different species.

The book ends with a stimulating cross-scale perspective on the effects of biogeographical and other large-scale processes on local community dynamics. I feel that we can all learn something from this discussion because we frequently focus our research and monitoring on a limited range of spatio-temporal scales without considering processes acting at other scales. While this chapter may not change the way we conduct research (and that was

certainly not its intention), an appreciation of scale is essential for making balanced inferences from field studies. This will be particularly important for any study concerned with species diversity.

Each chapter has a clear concise summary and I whole-heartedly commend this book to both scientists and managers. If I had to make one criticism, I'd complain that the publishers have levied a high price (£88/\$US150). This is a very useful book and at the very least I suggest you ask your library to purchase a copy!

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WHO'S WHO

Association of Reef Keepers, British Virgin Islands

Around 50 islands and rocks girdled by reefs make up the British Virgin Islands (BVI) in the Eastern Caribbean. The tourist board's slogan is 'nature's little secrets' but the secret is out, and here as elsewhere, development (especially yachting tourism) is impacting the marine environment. In the mid-1990's a small group of concerned people began looking for ways to protect the BVI's reefs. Charter yacht captain Trish Baily suggested a flyer outlining steps snorkelers, divers, and boaters could take to reduce damage to reefs, and the loose-knit group set to work on what was to be the Association of Reef Keepers first and most publicly visible project. In addition to Ms. Baily, the group included dive shop owners and instructors (who had previously helped initiate a Mooring Buoy system to protect vulnerable dive sites from anchor damage), a lecturer in Environmental Sciences at the local Community College, and members of the BVI Natural History Society.

It took nine months to raise the necessary \$7,500

ARK is expanding its web site to include an erosion control handbook

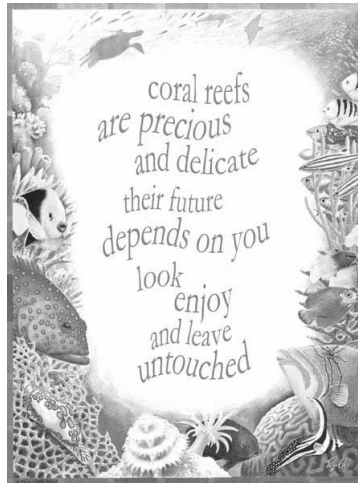
from local businesses and organizations such as the Tortola Ladies Club. Then volunteers distributed the flyers to bareboat charter yacht companies, tourist organizations, and local businesses. They were soon posted throughout the BVI from the Immigration Department to supermarkets.

ARK expanded with new volunteers and new ideas. The association began briefing bareboat companies (who rent yachts but not crews) on reef conservation, and distributed a pamphlet explaining how feeding can disrupt fish behavior. Inside the anchor hatch on each bareboat ARK volunteers stenciled 'Anchor in sand (white) not coral (brown or green)', and this slogan has now become a familiar bumper sticker around Tortola, the BVI's main island. In addition, ARK hosts an 'Environmental Breakfast' at the annual Yacht Charter Society Boat Show to educate crews and brokers about marine conservation. In 1997 ARK promoted the International Year of the Reef, and started running ongoing Reef Check surveys.

1998 saw ARK organizing an Erosion and Sedimentation Control Workshop for the island's construction industry in collaboration the local community college, and in 2000 the Association was instrumental in establishing an Environmental Management Committee to oversee the BVI's largest ever development project – a multi-million dollar airport expansion.

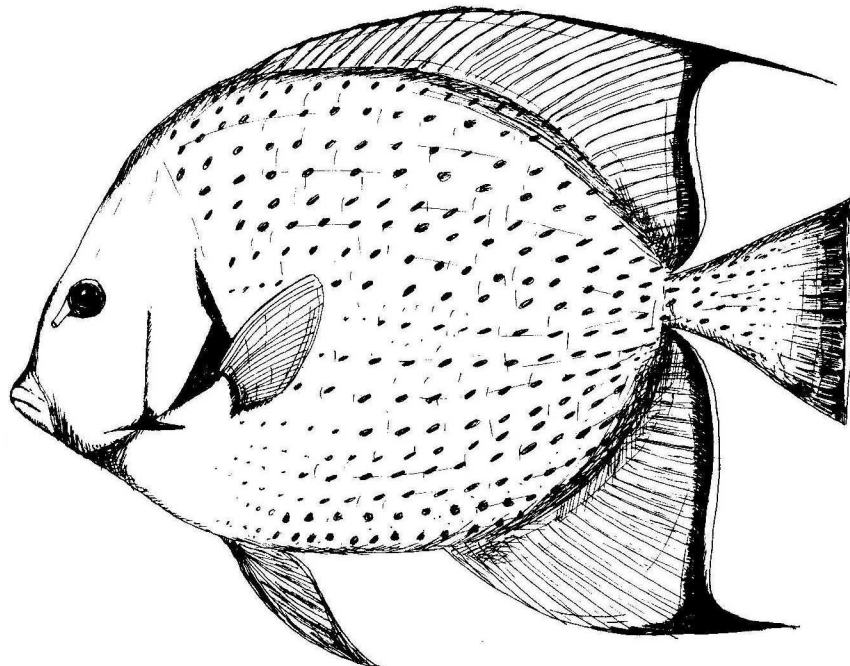
Sedimentation is often touted as one of the biggest global threats to coral reefs, and BVI is not immune. From small road cuts on steep hillsides to major land reclamations such as the airport, sediment is washing into the sea. Many bays that were once clear now turn brown after rains. Yet despite the high profile of the problem amongst reef researchers, engineers and construction officials on the airport project seemed to have a very limited understanding of the issue. Indeed, until ARK started lobbying, the project had no erosion controls at all (**Reef Encounter** 28 p33). This was all the more disheartening following the well attended Erosion and Sedimentation Control Workshop in 1998 and with the recent production of a handbook on erosion mitigation by the

regional NGO Island Resources Foundation (IRF). Now ARK is trying to raise money to really get the message out. The Association plans another poster campaign and will expand its existing website (www.arkbvi.org) to contain downloadable versions of the IRF manual as well as lists of regional suppliers of erosion control matting and silt curtain. In time, ARK hopes these web pages will become a valuable resource for the wider Caribbean.



Today ARK has 150 members. Most of its funding comes from \$25 membership dues and small donations. That kind of budget gets stretched pretty thin and ARK is always looking for ways to raise funds. The Association recently teamed up with the on-line store Amazon, which donates up to 15% of the price of purchases when shoppers access www.amazon.com through ARK's own web site. So next time you need a book or CD, consider buying it through www.arkbvi.org. You will be making a small but valuable contribution.

Maggie Watson <ReefEncounter@bigfoot.com>



C-NAV

CD-ROM available for sale from the Australian Institute for Marine Science (AIMS) for \$A40 plus postage ISBN: 0 642 32203 1

The ability of community based and government funded coral reef monitoring programs to return consistent, accurate data has just become easier with the introduction of C-NAV. C-NAV is a CD-ROM produced by the Reef Monitoring group at the Australian Institute of Marine Science (AIMS). The group has been conducting "train the trainer" workshops throughout the Asia-Pacific region since the early 1990s to help countries with coral reef based economies establish the baseline information needed for effective management.

AIMS supports the use of standard methods for collecting data, such as the simple descriptive categories recommended by Reef Check and the Global Coral Reef Monitoring Network (GCRMN). The great strength of standard methods is they allow global comparisons and require little expertise. However short training times and high rates of turnover in observers leave the quality of the data open to question. C-NAV provides reference images and clear definitions of lifeforms to help ensure that identifications are consistent throughout these global programs.

C-NAV features short documentary movies, a glossary and a large searchable image database with many of the corals identified to genus or species level. The interactive material allows users



to explore a variety of reef habitats. Quizzes and video footage are provided so that users can practise their skills in identifying the plants and animals according to the Reef Check and GCRMN categories. The name C-NAV (Coral Navigator) was chosen because it reflects the way information is presented. The structure is layered and people will be able to use C-NAV many times and still encounter new material. (Note: C-NAV does not contain information on mobile fauna such as fish. Rather the focus is on non-mobile benthos such as algae and coral)

The experience of global organisations such as Reef Check has shown that getting people involved in a small way in the science of the reef raises the overall level of awareness about coral reef issues in the community at large.

AIMS believes C-NAV will capture the interest of the increasingly diverse group of people interested in monitoring coral reefs and provide effective support for those who are able to get out on the



reef and collect some data.

For more information and ordering details see www.aims.gov.au/c-nav.

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9ICRS Special

Coral Reef Science and Management - Progress And Prospects

This article is abstracted from Bernard Salvat's plenary address to the 9th International Coral Reef Symposium (9ICRS) in Bali, October 2000. The conference assembled close to 1500 participants and almost as many presentations. Coral Reef Symposia are a good opportunity to consider ourselves - the researchers - as well as the research; and particularly to consider the way we exchange information. Bernard Salvat focuses on our society - the ISRS, the International Coral Reef Symposia (IRCS) and the International Coral Reef Initiative (ICRI). And since the way we currently communicate our science builds on the past, a historical context is in order....

ICRS - Progress

Looking back 30 years, it was David Stoddart and C.S. Gopinadha Pillai who brought 72 researchers together for the 1st ICRS in Mandapam Camp, India 1969. Of those 72, 47 were Indian nationals, and the other 25 represented 10 different nationalities. Symposia have been held every four years since, and by the 1977 Miami meeting (and at subsequent symposia in Manila, Tahiti, Townsville and Guam) attendance was up to around 600 people. The two most recent ICRS in Panama and Indonesia each attracted over 1000 researchers. However, the balance of nationalities has changed. In Townsville 40% of participants were nationals of the host country. In Bali the proportion was less than 10%. Approximately 100 of the 226 countries of the United Nations participate in our Symposia, but an estimated 20-25 countries with coral reefs – out of a total of about one hundred – still do not participate in these meetings, notably several small island states. So the surge in interest in the ICRS is a good sign, but is not without problems. Meanwhile, despite the rise in attendance, the number of papers published in the Proceedings has remained fairly stable since Miami at 150-350. Many participants now prefer to publish in well known journals. And while in Mandapam Camp a diligent observer could

catch 100% of the presentations, a similar full time effort in Bali would net you only 7%.

ICRS - Prospects

We need to reinstate the earlier level of communication at ICRS. Many readers will have followed the discussion on the coral list following the Bali conference. Extending the length of Symposia is impractical, so the logical step is to decrease the number of simultaneous sessions. That will require difficult choices, as much scientifically as politically. But decisions are needed to ensure Symposia continue to be productive and allow exchanges, and to avoid ICRS becoming occasions for self-satisfaction where each person presents their paper and leaves. Options include drastically limiting the number of presentations per author, whether she/he be first, second or third author; more emphasis on poster presentations; and perhaps discussion-only seminars on particular themes. These could be chaired by convenors, using the participants' abstracts as a basis for organization and reflection, without any formal individual presentations. This idea was implemented in Tahiti in 1988 for four major themes. Importantly this restricts the number of presentations, but not the attendance of nationals at the symposium. It is a very unsatisfactory solution for many reasons but can be partially remedied by a national conference in the days preceding the international symposium. Lastly, a solution might be to limit the number of themes considered by each symposium.

ISRS - Progress

Twelve years after the 1st ICRS, David Stoddart founded our society. Until 1992 the **ISRS** had only 200-300 members. Recently, membership has surged, reaching over 1000 at the 9th ICRS. Members are mostly researchers with very few managers, developers and engineers. Indeed, the **ISRS** constitution orients it strongly towards fundamental research (how-

ever, there is a move to reconsider the Constitution in 2001 see **From the President**). A quick survey of the 2000 membership directory (published before the 9ICRS) shows society membership is dominated by Americans (40%) followed by Australians (10%), Japanese (8%), English (6%), Germans and French (5% each) with other nationalities making up the remaining 26%. In essence, "knowledge and progress are in the North and management problems are in the South" or alternatively "studies are undertaken in developed countries and management of resources is attempted in developing countries". These are provocative statements- but they are necessary- although changes have begun, judging by the themes considered in recent coral reef symposia. The **ISRS** holds an important place in the organization of the ICRS. Since 1992 **ISRS** has nominated half of the members of the selection and organization committee of the symposia. **ISRS** provided considerable support for the Indonesian symposium organizers, and set up a committee to select the location of the next symposium (Okinawa) in 2004.

The Society's quarterly journal, **Coral Reefs** began in 1983 and is published by Springer-Verlag. In 1988, the journal doubled in size and has since disseminated some 40 plus articles a year. [Ed. You can read more in **ISRS News** where the society thanks Terry Hughes for 10 years service with the journal]. Notably, the composition of the editorial board and its evolution reflect the research themes that **ISRS** and Springer-Verlag wish to canvass. **Coral Reefs** remains first and foremost a periodical for fundamental research, and improves its performance year after year. However, this orientation does not focus much attention on environmental and resource management questions, even with some special issues of the journal on Bleaching, Disturbances and Management.

Reef Encounter is the magazine-style newsletter of **ISRS**. Currently produced twice a year, **Reef Encounter** has echoed the controversies concerning fundamental and applied research within the Society and in **Coral Reefs** for almost two decades. **Reef Encounter** does not publish primary research, and by default articles tend to focus on management issues. Editorial policy encourages contribu-

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ICRI has successfully gained global consensus on the importance and necessity of sustainable development of coral reefs.

tions from countries outside US and Europe in an effort to diversify coverage. However, the magazine maintains a research rather than conservation standpoint, reflecting the society's membership.

International Coral Reef Initiative (ICRI) - Progress

ICRI was launched in 1994 as a response to the alarming future coral reefs face, with the possible loss of most of the world's reef resources in this century. Following a request at the UN Global Conference on Sustainable Development of Small Island Developing States in Barbados in 1994, ICRI was established as a partnership of eight founding countries (Australia, France, Jamaica, Japan, Philippines, Sweden, UK and USA) on the initiative of the US State Department. The objectives were to build a global partnership supporting coral reef issues and to implement a global diplomatic campaign in an international forum.

A first International Coral Reef Initiative Workshop was hosted by the Philippines in May 1995 (**Reef Encounter 17**), with the participation of over 40 governments, along with agencies of the UN system, NGOs, the research community and the private sector. A "Call to Action" and a "Framework for Action" were adopted to work towards sustainable management of coral reefs, and to mobilize governments and stakeholders with four major themes: Integrated Coastal Management, Capacity Building, Research and Monitoring, and Reviewing Progress. Since that time, six regional ICRI workshops have taken place to identify issues and priorities and to implement required actions (Jamaica, Fiji, Maldives, Seychelles, Indonesia and New Caledonia).

ICRI has developed through a Coordinating and Planning Committee (CPC) - a free and informal partnership of governments, governmental organizations (UNESCO-IOC, UNEP and its Regional Seas Units and also SPREP, UNDP), international development banks such as the World Bank, and non governmental organizations (IUCN, WWF, ICLARM, MAC). Also included are secretariats of international conventions (CBD, CDD), existing ICRI National Committees (USA, France, Mexico), foundations (UNFIP, The Total Foundation), scientific associa-

tions (**ISRS**), donors and the private sector, and the resource sector. The secretariat of the Committee passed from the U.S. (1995-96) to Australia (1997-98) and then to France (1999-2000). In 2001-2002 Sweden and the Philippines will co-chair the Secretariat. Since 1995, much progress has been made towards raising awareness of coral reefs, degradation, risks and the importance of reef resources for local communities and developing states, as well as conservation of biodiversity. ICRI has successfully gained global consensus on the importance and necessity of sustainable development of coral reefs. Among its activities, the CPC supports several networks: The existing Global Coral Reef Monitoring Network (GCRMN – see **News**), and under development, the International Coral Reef Action Network (ICRAN – see **Reef Encounter 26**) and the International Coral Reef Information Network (ICRIN).

ITMEMS and ICRS

In 1998, Australia convened the International Tropical Marine Ecosystems Management Symposium (ITMEMS) which reviewed and evaluated ICRI progress and issued a "Renewed Call to Action". The meeting assembled more than 300 participants from 49 countries. The next ITMEMS will be held in the Philippines at the end of 2002. Many researchers and managers are concerned that ITMEMS and ICRS duplicate each other and dilute the overall research effort. Nonetheless, the objective of each type of meeting is very different. ITMEMS aims to evaluate the progress accomplished within the ICRI framework every four years. It mainly concerns the problems of the management of coral reefs and their resources in the broadest sense. The principal objectives of the ICRS are advancement of fundamental knowledge and making such knowledge available for management purposes. Also, ITMEMS comprises mostly discussion groups and seminars, with syntheses of aims and achievements. The ICRS are essentially academic, and communications are presented grouped by a few themes and several mini-symposia. ICRS have become interested in management problems relatively recently: definitely not in 1969, timidly in 1973 and 1977, greatly in 1981 in Manila when the conference theme was "The Reef and Man", and afterwards in growing proportions. This change has been the subject of controversy within **ISRS**. Was

ITMEMS aims to evaluate the progress accomplished within the ICRI framework every four years.

ISRS to limit itself to pure or fundamental research and increasing knowledge, or was it to embrace the applied fields of management? **Reef Encounter** and **Coral Reefs** give two different answers. All **ISRS** Presidents in their messages in **Reef Encounter** have argued for this widening of the scope of the Society and its activities (for example, **From the President**, p. 3) but the debate remains, with a journal mainly oriented towards basic research and the organization of four-year symposia dealing for a large part with management issues. It is clear that a strict separation between the ITMEMS and ICRS is difficult, and would be scientifically and intellectually sterilizing. ITMEMS will identify research or scientific activities to be undertaken by looking upstream; in other words towards the scientific community and therefore **ISRS** and the ICRS. The latter will consider management problems by looking downstream, that is towards ICRI and ITMEMS. More cooperation and coordination should be developed.

Seeking Political Influence

We are lucky that coral reefs are beautiful, and therefore easy to sell to the media as well as to the politicians. This is one reason why ICRI is focusing on coral reefs above associated systems such as mangroves – the issues are easier to win at the political level. Coral reefs also benefit from a somewhat quieter approach between countries and international agencies than, for example, tropical rain forests. Beauty and serendipity are the international political draw-cards of coral reefs. We must use them. In each appropriate international meeting we must argue and convince participants to add into conventions "and specifically for coral reefs". To increase the attention on our tropical ecosystem we need to target and tackle all organizations of the United Nation system through our governments and their institutions. NGOs have, and will continue to have, more and more importance in the debate for conservation and sustainable development. Even governments recognize this now.

A Call for Participation

As scientists, what can we do to look after coral reefs? Fundamental, basic research should not be forgotten. As we all know, the results will form the

basis for future applications. The ICRI CPC is preparing a resolution requesting governments to balance funding for basic and applied research. Two research fields are particularly promising. Firstly, we do not know enough about zooxanthellae, which appear to be as important, if not more so, than the coral host - particularly since they give another perspective on acclimatization and evolution when we consider global climate change and bleaching. The second field concerns recruitment in time and space for fishes as well as invertebrates. In both fields, new tools will allow us to better understand situations and events, and make predictions.

As to management, we have to go back to the field and listen to local community needs and problems, to have clear statements from managers about problems, and to transform these into questions. With good questions, formulated by managers more than by scientists, research can look for answers. Funding bodies need to understand that scientists in applied fields of research are working on good and relevant questions for the sustainability of reefs in the future.

But we can still do more as individuals. Firstly, of course, we should support **ISRS**, which notwithstanding its current healthy membership, always needs a broader base from which to oversee the ICRS and engage with the ICRI Committee. More

A strict separation between the ITMENS and ICRS is difficult, and would be scientifically and intellectually sterilizing.

than that – we should form national coral reef societies, of which there are presently only four (Australian, French, Japanese and Brazilian). These ‘academic type’ societies should include engineers and managers, and cover issues from fundamental research to management. Within our own countries we should lobby governments and agencies to establish national ICRI committees. Only a handful of governments (USA, France and Mexico) have established such committees of researchers, resource users and politicians. Quite frankly, coral reefs need all our lobbying support. The difference from twenty to thirty years ago is that now when one talks about coral reefs in government circles people are aware of what it is all about. And the lobbying must go on. This behind-the-scenes activity is absolutely essential to ensure a long term sustainable research effort at a worldwide scale. We increasingly need top class research to provide policy makers and managers with the information they need to save this coral reef ecosystem which we all love. And “top class research” there is a plenty! So, from that standpoint, the future of coral reef research is rather bright. It is in your hands. It is in good hands.

*Bernard Salvat, Organizer ICRS Tahiti 1985,
President ISRS 1992/1994, ICRI Chair 1999/2000
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Acronyms:

| | |
|---------------------------------|--|
| CBD | Convention on Biological Diversity |
| CDD | Commission Développement Durable (Commission on Sustainable Development) |
| ICLARM | International Center for Living Aquatic Resources Management |
| IUCN – World Conservation Union | International Union for Conservation of Nature and Natural Resources |
| MAC | Marine Aquarium Council |
| SPREP | South Pacific Regional Environment Program |
| UNDP | United Nations Development Program |
| UNEP | United Nations Environment Program |
| UNESCO-IOC | United Nations Educational, Scientific and Cultural Organization - Intergovernmental Oceanographic Commission. |
| UNFIP | United Nations Fund for International Partnerships |
| WWF | World Wide Fund for Nature |

Does Your Science Pass the Grandma Test?

International Coral Reef Symposia share knowledge and ideas amongst scientists and managers, but do they interpret the role of science for a wider audience? 9ICRS certainly made a sizeable media splash compared to earlier meetings.

While Nancy Baron, from the science communication organization Sea Web found only a handful of references to the 1996 Panama meeting, the Bali conference generated well over 100 articles (and still counting) through media outlets from Associated Press to the Xinhua General News Service. Nature, New Scientist, News Week, The Economist, Scientific American, BBC Pacific Islands News Service, The Jakarta Post, and The Philippine Daily Inquirer were amongst many outlets covering the conference.

Sea Web acted as the 'mediator', organizing scholarships for 15 of the 46 journalists who hailed from Australia, Malaysia, the Philippines, Papua New Guinea, South Africa, the UK, and the US. Sea Web staff surveyed all the meeting abstracts in advance and put together a program of press briefings ranging from Destructive Fishing Practices to The Marriage of Traditional Knowledge and Science in Reef Management.

But the flow of information wasn't just one way. At the beginning of the week Sea Web hosted a half day media training session for scientists. This time it was the journalists on the podium and the scientists asking tricky questions like:

'Why do journalists always seem to balance considered scientific opinion against unsubstantiated rhetoric from pressure groups?'

Answer – 'journalists have to consider all viewpoints, but if a viewpoint really is a consensus, scientists need to drop some of the maybe's and probably's and present the story as a definite finding'

and:

'How do editors decide what is newsworthy?'

Answer – Does the story pass The Test? Call it the



'So What Test' the 'Cocktail Party Conversation Test', the 'Grandma Test' or whatever you like. Basically, is the topic new, engaging and understandable? Would it interest your Grandma? But

also, making the news can be a matter of luck. Did you know for instance that many of the top science magazines have a policy not to report on last week's news? If your paper came out when the schedule

was already full, they won't be interested in covering it next time around. Even though you may have spent months revising your work and discussing it with colleagues, once published your findings are 'newsworthy' for only a very short time – so build your relationships with journalists and give them prior warning!

Scientists then pitched ideas for stories to journalists and received friendly comments on how they did. The feedback was valuable. Later in the week one journalist told me he'd just been to an excellent briefing by someone tutored at the workshop who had obviously taken the advice to heart.

Of all the press briefings, the one on Climate Change was the most dramatic and provided the most varied panel of experts. The

scientists involved did indeed present a convincing consensus in fields from water chemistry to satellite observations. The potential for reefs to succumb to global change subsequently hit the headlines, becoming one of the most reported aspects of the conference. Undoubtedly, climate change isn't the only important reef story. Researchers whose reefs suffer dynamiting or quarrying just hope their reefs will last long enough for climate change to be an issue. But the reason the story was big news was because scientists presented it that way, and the journalists listened. So take heart - you do have a lot of say in what gets reported if you can explain your science to Grandma.

Maggie Watson attended 9ICRS as a researcher, and also covered the conference for New Scientist. Email <Maggie@Xpertext.com>

9ISRS Field Trip Notes

Dragons, Manta Rays And Reefs - Komodo National Park

After the 9ICRS Bali, we were among 23 fortunate participants on a six day trip to Komodo National Park. The Park is best known for its endemic large monitor lizards, the Komodo Dragons (*Varanus komodoensis*), which can grow up to 3 m from the snout to the tip of the tail. These giants are related to the land iguana *Varanus bengalensis* and the water monitor *Varanus salvator*. But the park also contains rich marine life and many beautiful dive sites, to which we were led by Lida Pet-Soede and Peter Mous, both experienced fishery biologists who work in the region.

Our vessel, the Sea Safari V, took us to dive sites in Banta, Pulau Gililawalaut, Pulau Pentamerala and the southeast corner of Komodo Island, Pulau Tatawa, Pulau Sabayor east of Komodo and to the southern tip of Rinja. Dives sites varied from fringing coral reefs, to rock walls and rock pinnacles covered with densely packed marine life, multi-hued soft corals, sponges, basket stars and gorgonians. Currents were often quite strong and changed direction and intensity rather suddenly, but attracted larger pelagics. Cannibal Rock in the passage between the southern point of Rinja and Nusakode was particularly notable for the density of marine organisms and several beautiful angelfish *Genicanthus lamarcki*.

While all our night dives were filled with colorful invertebrates, some of the most colorful and memorable dives were off the Red Beach on the east coast of Komodo at Pulau Pentamerala and the wall on South Rinja. The sand at Red Beach contains tiny red particles of Organ Pipe Coral (*Tubipora musica*), a common species on the fringing reef off the beach. The wall of South Rinja was memorable for its colour, but perhaps more so for the washing machine-like current and the bumps and crashes with buddies and others! But one of the greatest aquatic highlights of the trip was snorkeling with Manta rays around south Komodo Island in late afternoon. Mantas were common here, and more than six animals could often be seen at any given time, including a jet-black

Manta which was a ghostly site in the fading light and shadows of late afternoon.

After much suspenseful watching and hypothesizing about the dragons' intentions and the deer's fate, it transpired that the dragons' interest was in a dead fish hidden from our view!

On the fourth day of the trip we finally encountered the famous Komodo dragon. It was early in the morning and a low tide exposed the shallow corals, making it a steep climb up the pier in Teluk Salawi Bay where we entered the park. Led by two guides we hiked past large vine covered trees

occasionally festooned with wild orchids. Yellow Crested cockatoos flew overhead. The first dragon was spotted resting on a small grass hillock and was soon surrounded by people pointing cameras in an excited photo shoot. Not far away, another dragon rested near a dry riverbed, where it once was the fashion to entertain tourists by feeding a dead goat to the hungry lizards. That practice has now been stopped, except for political visits... Returning to the park entrance we saw a Draco gliding lizard and two spotted deer amongst the trees. And back at the pier, to our surprise we were led to four lazy dragons sleeping and drooling right under a ranger's hut. Once again the cameras were out!

But despite our impressions the dragons didn't only laze in the sun. Later the same day we were lucky to witness two Komodo dragons moving about amongst the rocks on the southern shore of Rinja. Even more exciting - a dying deer, injured by a pair of abandoned poacher's dogs, had also made its way to the rocks, where it sat waiting out its last hours. The two hungry dragons prowled around, as if smelling the deer's blood. After much suspenseful watching and hypothesizing about the dragons' intentions and the deer's fate, it transpired that the dragons' interest was in a dead fish hidden from our view!

As always with such adventures the time flew by too quickly. But the trip will remain a vivid memory of reefs, dragons, manta rays and much more – thanks to our fellow passengers, the trip leaders, the dive masters, Amir the trip's guide, and the crew.

Arjan Rajasuriya Email <arjan@nara.ac.uk>, Emma Whittingham and Dan Wilhelmsson

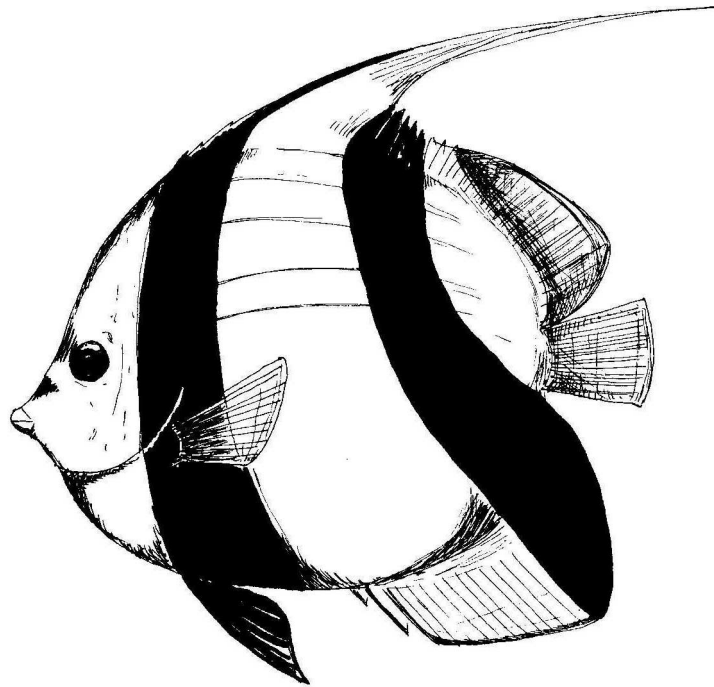
Tukang Besi Archipelago - Spawning Seagrasses and Diverse Reefs

The 9ICRS field trip to the Tukang Besi archipelago (October 17-22, 2000) took us on 12 dives at five separate reefs: Hoga, Ndaa, Tomia, Karang Koromaha, and Karang Koka. We experienced various reef types including fringing reefs, atolls, and lagoons, reef flats, crests, and both inner and outer reef slopes. At Hoga, an afternoon spawning of the seagrass *Enhalus acoroides* had occurred, and for the first three nights of the trip, isolated spawnings of numerous species were observed. The reefs were in excellent to pristine condition, with the exception of an unusual ridge reef in a channel off of the island of Tomia. This reef, having some influence from a small town directly onshore, showed signs of disease and had been blast fished in spots. Blast fishing was also minimally evident at several other sites, and occurred while diving at Karang Koka. Also notable at all sites was a lack of large

some of the most diverse and healthy reefs anywhere in the world

pelagics, sharks of any type, and large reef food fish. There was no significant bleaching or signs of eutrophication at any site, and coral coverage at several sites was extremely high. High rates of recruitment of coral, fish, and invertebrate species were evident. Trip leader, Mark V. Erdmann, remarked that several sites were in even better condition than his last visit several years ago. The isolation of the reefs from human influence and the cold water upwellings from the Banda Sea have apparently contributed to their continued success. This area, from my experience, represents some of the most diverse and healthy reefs anywhere in the world and should be an area for the greatest efforts in conservation and protection.

Eric Borneman, Email <EricHugo@aol.com>



The UCLA Ladan Mohajerani Memorial Symposium and Student Awards

Many of you are aware of the tragic plane crash following the Bali Symposium that claimed the life of Ms. Ladan Mohajerani, the enthusiastic Program Manager of ReefCheck (see <http://LadanMohajerani.com>). She was making a substantial contribution to coral reef monitoring and conservation and her passing is deeply regretted. Her family was grateful to the dozens of

coral reef workers from around the world who wrote about how she had touched their lives. As a tribute to her, an annual student marine science symposium will be held at the University of California, Los Angeles and student awards will be given in her name. For more information contact Dr. Peggy Fong, Email <PFong@ucla.edu>.

DIARY

Biodiversity of Tropical and Temperate Reefs in the Indo-pacific

A session during the 10th Pacific Science Inter-Congress, June 1-6, 2001, Hilton Guam Resort & Spa, Tumon, Guam USA

Presentations in this session will compare and contrast phyletic, geographical, ecological, behavioral and chemical diversity of organisms of tropical and temperate reefs (or associated habitats) of the Indo-Pacific region. Attention should be given to the use of innovative methods for measuring and comparing biodiversity. Presentations may also focus upon threats to biodiversity and novel strategies for countering these threats.

For more information see the Websites: www.10psicguam.org or www.10psicguam.com or contact Terry J. Donaldson, Senior Scientist, International Marinelife Alliance, University of Guam Marine Laboratory, UOG Station, Mangilao, Guam 96923 USA. Tel: (671) 735.2187 Fax: (671) 734.6767 Email: <donaldsn@uog9.uog.edu>

