

REEF ENCOUNTER

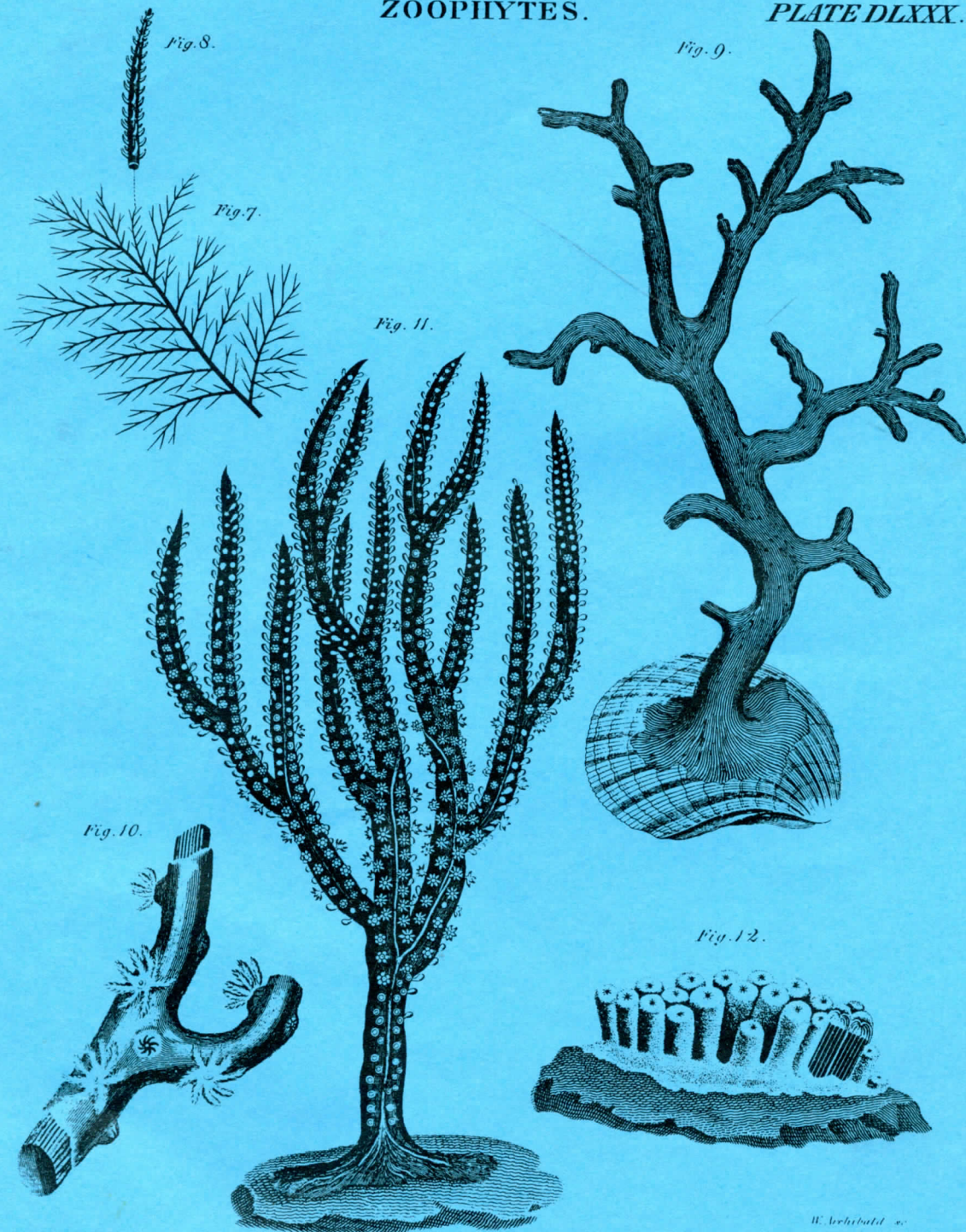
Newsletter of the International Society for Reef Studies

Number 18

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REEF ENCOUNTER No. 18 December 1995

NEWSLETTER OF THE INTERNATIONAL SOCIETY FOR REEF STUDIES

Editor Sue Wells

Associate Editor Callum Roberts

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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:

- i. To hold meetings, symposia, conferences and other gatherings to disseminate this scientific knowledge and understanding of coral reefs, both living and fossil.
- ii. 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.
- iii. 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.

EDITORIAL

We apologise for the lateness of this issue of *Reef Encounter*. This time it was hurricanes (Callum received a direct hit from Hurricane Marilyn and a sideswipe from Luis, and some of our contributors were also affected) and the fact that both editors moved back to the UK. We are not sure what is more disruptive: hurricanes or moving house! Please note our new addresses (on the back cover). We hope never again to be quite so late with an issue (!) and will get things back on schedule as quickly as possible. The next issue will be a 'Special' for the 8th International Coral Reef Symposium. It will be distributed at the meeting for those of you who are able to attend and will be mailed directly afterwards to members who are unable to make it to Panama. Please e-mail us your ideas for the contents of this issue.

We of course aren't going to take all the blame for production problems – some of it has to lie with you, the members! After a couple of years when material has been relatively easy to obtain, we are back to having to plead with our contributors. A new trend has also crept in: 'contributors' who send material that has already been published that they hope the editors will re-write in a suitable format for the newsletter; and 'contributors' who send ideas in and hope the editors will do write the writing. In addition to finding the time for soliciting material, editing and dealing with production, we do in fact write many parts of the newsletter – short book reviews, diary, ISRS news etc. We rely on you, the ISRS members, to write the main articles and features.

Keeping abreast of new research, meetings and initiatives is becoming increasingly difficult and we all seem to be experiencing that 'swamped' feeling. Particular thanks then to Kristian Teleki who has compiled a guide to coral reef information available through the Internet. We need to decide whether to put *Reef Encounter* on the net – please respond to Paul Blanchon's important points in the 'Upwellings' column. As John Ogden points out in the President's Message, it is an exciting and busy time for the reef science and management community, and not least for the Society. Please continue to make *Reef Encounter* the vehicle for informed comment and debate!

Sue Wells
Callum Roberts

**COPY DEADLINE FOR REEF ENCOUNTER 19
(due out June 1996) IS 15 APRIL 1996**

ISRS COMMENT**FROM THE PRESIDENT**

John Ogden

The first few months in office have been busy and productive for your President and officers. I am sure that you are beginning to feel the impact of our management contract with Allen Press which has resulted in a new Membership Directory, more timely mailings, and generally better communications. We are becoming more and more dependent upon the Internet. I have personally found it a tremendous benefit to be within a few keystrokes of the Officers, the Editors, and most of the members of the Council. The downside is the overwhelming quantity and variable quality of communications that can come across the various bulletin boards related to reef science. In response to this flood, we are investigating setting up an ISRS Home Page for members only.

At the excellent ISRS meeting at the University of Newcastle in September hosted by the Centre for Tropical Coastal Management, the officers and councillors present discussed a suggestion by Gray Multer that ISRS sponsor scholarships. I can now report the exciting news that we have entered into negotiations with one of our members who is interested in providing funds for ISRS scholarships for graduate students from developing nations. There are some details to work out, but we are hopeful that the end result will be Society-sponsored scholarships that will spearhead our new "activism."

The members present at the Newcastle meeting endorsed the International Coral Reef Initiative (ICRI). I call on each of you to support ICRI, which embodies the principles upon which our Society was founded and which is rapidly gaining international support. The ICRI *Call to Action* was published in November and the first regional workshop, Tropical Americas, was held in Jamaica in July (see Meeting Reports); other regional workshops encompassing the global distribution of coral reefs have been or will soon be held (see p. 12). We are also supporting the International Year of the Reef (IYOR) by providing regular reports of IYOR activities, presently concentrated in the Western Atlantic, which will provide a stimulus for similar activities in other regions (see p. 13). I urge you to get involved in these initiatives, to attend workshops where possible, and to report developments to the Society in these pages or electronically. The ISRS can provide an effective bridge between science and management that will have a significant impact on the sustainable use of reef resources and will also advance the cause of reef science.

We will have an election for six councillors and two officers in 1996 the details of which are reported in this issue. I hope that each of you will reflect on the broadened mission and responsibilities of the ISRS and identify and nominate councillors who personify the international nature of our membership and who will work willingly and

hard to forward the goals of the Society. I would particularly like to encourage nominations of people from countries and regions which are not well represented on the Council at present.

Not unexpectedly, at an unprecedented membership of about 700, the Society is having growing pains. Serious questions have been raised concerning the small size of *Coral Reefs*, possible dues increases, and the role of our Society in global reef conservation and management. At the Panama Symposium we will have an important general meeting which will take critical decisions affecting our future. We will have a booth to attract new members and to sell our new T-shirts. We will also present some awards including several Best Paper Awards (selected by the editors) and the Society's highest recognition, the Darwin Award (selected by the Council). Past recipients include David Stoddart and Peter Glynn. Please pass your recommendations for nominees to a Council member.

Those wishing to be considered as a venue for the 9th International Coral Reef Symposium in 2000 should contact Dr Clive Wilkinson, Chair of the IABO Coral Reef Committee, Subcommittee on the Selection of the Venue for the 9th ICRS, Australian Institute of Marine Sciences, PMB No. 3, Townsville, Queensland 4810, Australia. Fax: 077-72-58-52; Email: c_wilkinson@aims.gov.au

ISRS NEWS

TREASURER'S REPORT

ISRS has continued to grow this year, as it has every one of the past four! Thank you all for the support you continue to show for the Society.

As you are aware, this growth has both allowed and necessitated contracting with a service to manage the ISRS membership list, a changeover that I hope has been invisible to you. Your reactions are vital in evaluating the service for which ISRS is paying. Please let me know if you are *pleased* in your membership dealings with me and/or our business office; if you have had problems or are aware of any, I would like to know about them. I am accessible electronically (fautin@kuhub.cc.ukans.edu) or by post (Daphne Fautin, ISRS, Kansas Geological Survey, University of Kansas, Lawrence, KS 66047 USA).

Please help ISRS to continue to grow by urging your colleagues to join the Society. An additional incentive right now is that members during 1995 and/or 1996 receive a discount in registration for next year's ICRS in Panama. An enrollment form for ISRS can be found in this issue of *Reef Encounter*. Dues will again remain unchanged in 1996 (the cost of airmail delivery of *Coral Reefs* will increase, an amount that is based entirely on the cost of the service).

By now you all should have received your copy of the ISRS 1995 membership directory. Please check your listing. If it is incorrect, or if you wish to add information (such as an e-mail address), please inform me (preferably electronically).

Please do not send address changes to Springer Verlag if you are a member. The 1996 directory will be produced in time for distribution at the Panama meeting. Therefore, please renew your membership promptly, when you receive your renewal form.

Daphne Fautin

ELECTION OF NEW COUNCILLORS AND OFFICERS

CALL FOR NOMINATIONS

The Society has to elect six new councillors and two new officers this year (the Treasurer and the Recording Secretary). Please send nominations to the Corresponding Secretary (Callum Roberts; address on inside cover) together with a one paragraph statement outlining the experience, background and virtues of the nominee together with disclosure of any financial arrangements they may have with scientific publishers (except for normal authorship of books or chapters). The terms of Councillors and Officers will be four consecutive years. Both are elected to express the views of the Society in decision making and are expected to become fully active in the affairs of the Society. Nominations must be made by at least one member of the Society (who may be the candidate) submitted by April 15th in order that a ballot can be circulated in the next issue of *Reef Encounter* (June 1996). Please support the Society by standing for these positions!

NEW ISRS SOLLINS CORAL REEF ECOSYSTEM FELLOWSHIP

On January 25, 1996, on behalf of ISRS, John Ogden signed a Memorandum of Understanding with the Center for Marine Conservation to implement the ISRS Sollins Coral Reef Ecosystem Fellowship. The MoU specifies that the ISRS will administer the Fellowship which will provide full support to students from developing countries to the level of Ph.D. degree. Over the next few months, prior to Panama where the Fellowship will be announced and materials for application will be distributed, ISRS will develop the criteria for the award and the decision-making process and design, and print and disseminate materials describing the Fellowship. We will then accept and review applications, notify the applicants, and publicise the results. The Center for Marine Conservation will accept the funds from the donor (required for tax reasons) and will participate in the selection process. ISRS will receive 5% of the annual Fellowship monies (estimated at US\$12-15,000) for administrative costs.

STILL AVAILABLE: Copies of THE NORTHERN GREAT BARRIER REEF: a Royal Society discussion organised by Dr Stoddart and Sir Maurice Yonge FRS, 28-29 January 1976, published in 1978, are available from the ISRS Treasurer. Prices: US\$20.00 (surface mail), US\$30.00 (airmail). Payment must be by US\$ money order or cheque drawn on a US bank. Contact: Daphne Fautin, Kansas Geological Survey, 1930 Constant Ave, University of Kansas, Lawrence KS 66047, USA.

FUTURE ISRS MEETINGS

24–29 June 1996

8th INTERNATIONAL CORAL REEF SYMPOSIUM
ATLAPA International Convention Center, Panama City,
Panama

This is being organised by the University of Panama and the Smithsonian Tropical Research Institute. The scientific programme will consist of 5 days of plenary talks, symposia, contributed talks and poster sessions, broken mid-week by one day for short field trips and workshops. Space for posters will be provided. The workshops will provide a forum for discussion and planning for small groups sharing an interest in specific research areas.

During the Symposium, there will be three evening public lectures covering scientific, technical and management issues, and two public forums in which topics relevant to the region will be discussed: policies for the management of coral reefs, and the role of Central American indigenous cultures in reef conservation. An educational exhibition on coral reefs will be displayed at ATLAPA during the Symposium and display space will be provided for publishers and local organisations. All public events will be in Spanish.

Pre- and post-symposium field trips are being organised to Mexico (Cozumel), Belize (Carrie Bowe Caye area), Honduras (Roatan and Cayos Cochinos), Colombia (San Andres and Providencia Islands), Costa Rica (Caribbean coast), Panama (several trips), Ecuador (Galapagos), Curaçao and Bonaire, Brazil (Recife coast and offshore islands). For those who wish to SCUBA dive on trips that offer it, a special application must be made to the 8th ICRS.

Registration fees cover attendance at several social events and (without the late penalty) are \$400 for ISRS members, \$200 for ISRS student members, \$450 for non-members and \$225 for non member students.

Further information from: *Convention Manager, 8th International Coral Reef Symposium, STRI Unit 0948, APO AA 34002-0948, USA.*

In Panama: Tel: (507) 28-4022; Fax (507) 28-0970; e-mail: stri01.naos.brenesm@ic.si.edu

13–19 July 1997

JOINT PACIFIC SCIENCE ASSOCIATION/ISRS MEETING

The Pacific Science Association's Scientific Committee on Coral Reefs (PSA-SCCR) is organising a joint symposium with the ISRS at the PSA Inter-Congress, 13-19 July 1997. This will be one of the major scientific events during the International Year of the Reef. A field trip is being arranged to the exceptionally beautiful Astrolabe Reef and the outstanding Marine Laboratory at Dravuni (max. 16 people), and day trips to Suva Barrier Reef and Bequa Lagoon and Reef will also be organised. Further details available from: *Charles Birkeland, Chairman, Pacific Science Association Scientific Committee on Coral Reefs, Marine Laboratory, University of Guam, Mangilao, Guam 96923, USA. Tel: +671 735 2184; Fax: +671 734 6767; email: birkelan@uog9.uog.edu.*

ISRS T-SHIRTS NOW ON SALE!

These are dark blue with the Society logo in gold. Available for US\$20 (\$16 plus \$4 shipping and handling). Specify Large or Extra Large. Send checks, drawn in US funds only, to: *John Ogden, Florida Institute of Oceanography, 830 First Street South, St. Petersburg, Florida 33701, USA.*



UPWELLINGS

REEF ENCOUNTER ON THE INTERNET?

The following letter was received after one of the editors suggested that putting *Reef Encounter* on the Internet would reduce the incentive for people to join ISRS. The editors would welcome further discussion on the points raised below. Would others like to see *Reef Encounter* on the web?

"Concerning incentives to join ISRS, I think the Society's fears are unfounded and a little antiquated. The reason I wish to join the Society is simply to receive a top quality journal that keeps me up to date with advances in the field – and I am sure that this is the same for the majority of ISRS members. As far as I can see, the purpose of the newsletter is twofold: communication between members and, more importantly, advertising for the Society. If the objective is to attract more members then it would be better to advertise on the widest medium possible (eg the World Wide Web) and target student members who are future newblood. At the moment students get a rough deal, a piece of paper signifying membership, and a newsletter...but no journal. This is no incentive at all to join (and was the reason I didn't join until now). Most students wanting to join the society are doing research themselves and have similar needs to their academic colleagues – to keep abreast of the literature. My suggestion is to provide student members with the journal at cost and post the newsletter on the web to attract new members and to advertise the efforts of reef scientists who are presently addressing global problems of reef deterioration. This can only increase the Society's membership further and provide the money to improve the journal."

Paul Blanchon, Dept. Earth & Atmospheric Sciences, University of Alberta, Edmonton, Canada. Tel: +1 403 492 4205; Fax: +1 403 492 2030; email: pblancho@gpu.srv.ualberta.ca.

CURRENTS

CORAL REEF SYSTEMS AND THEIR EXPLOITATION: TOWARDS A GLOBAL ACCOUNT

Daniel Pauly and Villy Christensen

The editors of *Reef Encounter* asked us to highlight - with emphasis on coral reefs - the key results of our recent study on 'the primary production required to sustain global fisheries' (Pauly and Christensen, 1995). As authors often do when asked to review the work of others, we shall digress, and present extraneous matters related to our work. This is not a problem here, however, since we are both the reviewer and the reviewees.

The above-cited study, rather than asking the old question: 'How much catch can be sustainably extracted from the world oceans, given an estimate of global primary production (PP)?', presented estimates of the primary production required (PPR) to sustain existing fisheries catches, and the enormous levels of discarded by-catch. Our study also differed from earlier attempts, in that we analyzed disaggregated data (39 groups of fish, each with their own catch and trophic levels, in 6 different ecosystem types), a feature which strongly, and positively affected the accuracy and precision of our estimates (Pauly, in press).

For coastal and coral reef systems (which we treated as a single system type, given the state of global fisheries statistics), we estimated a PPR of 8.3% of observed PP, higher than for open ocean systems (2%), but markedly lower than for upwelling (25%) and shelf systems (24-35%), which came close to the high values reported from terrestrial systems (Vitousek *et al.* 1986). We attributed the low PPR of coastal/reef systems to (a) the usually depleted biomasses of, and hence reduced catches from these systems, and (b) the fact that the high fisheries catches in coastal systems often depend on organisms low in food webs (e.g. clupeids, bivalves). We should also have added, with special reference to coral reefs, that fisheries catches are often underestimated in the FAO (nominal) catch statistics upon which our study was based, not to mention the gleaning of small fish and invertebrates by women and children, which hardly ever shows up in such statistics. Yet, it is usually high, and occasionally exceeds nominal catches (Chapman, 1987).

The approach we used differed radically from those used earlier to estimate global fisheries potentials from the 'bottom up', via guessed numbers of trophic levels, guessed transfer efficiencies between trophic levels, and guessed ratios of fish production to potential fish catches (review in Pauly, in press). Rather, besides inverting the traditional approach (and predicting PPR from catches, not catches from PP), we used mass-balance models, representing the trophic fluxes between the elements of 48 aquatic ecosystems, grouped in six ecosystem types, to calculate the parameters values guessed by earlier authors. The accuracy of our results thus depends entirely on the validity of the ECOPATH II approach and software

(Christensen and Pauly, 1992), used to balance these 48 models - which is where we have to digress.

Though the ECOPATH II approach was initially developed for application to a coral reef system (Polovina, 1984), all subsequent applications to coral reefs were the results of work by our direct collaborators, or graduate students (see contributions in Christensen and Pauly, 1993, and Arias-Gonzalez, 1993), suggesting that coral reef scientists -- as opposed, for example, to fisheries scientists in general, or to freshwater biologists - may still have reservations about this approach. Yet it is built around two propositions about which few would be able to argue:

- i. that in a coral reef, as in any other ecosystem, mass-balance must exist, i.e., that the biomass produced by the components of the ecosystem must be either consumed within the ecosystem, exported or otherwise accounted for; and
- ii. that the biomass and rates (of production, mortality and consumption) reported in published accounts of single species within ecosystems must be compatible with the biomass and rates reported for their prey and their predators, for at least the period stated or implied in the relevant publications (Pauly and Christensen, 1994).

One reason for the reservation vis-a-vis the ECOPATH II approach may be our initial emphasis on the 'equilibrium' or 'steady-state' assumption seemingly implied in mass balance models. This assumption, in fact, is not really required, as long as mass balance is retained. Thus, the biomass of a species or group at the end of the period covered by a model does not need to be the same as at the beginning. Neither is it necessary for seasonal changes of biomass, production or food consumption to be ignored: they can be explicitly accounted for.

The latest (Windows) version of ECOPATH II includes routines which allow for considering such changes, and more will follow, for example, to facilitate the construction of seasonal models. Also, the Windows version, while capable of reading and analyzing files generated with the earlier, DOS version, incorporates a new Monte Carlo simulation routine, as required, for example to evaluate the precision of outputs in a (semi-) Bayesian context (Christensen and Pauly, 1995). These routines can be applied to all forthcoming coral reef models, e.g., to the model of Looe Key Reef, Florida, presently being constructed by Judson Venier, a graduate student at the Fisheries Centre, UBC, and, retroactively, to the detailed models constructed for example by Opitz (1995) and Arias-Gonzalez (1993).

As a related issue we are interested in drawing general conclusions on flow patterns in coral reef ecosystems. We are presently stratifying the world oceans into large marine ecosystems (LMEs). Based on information on global reef area from the ReefBase project (McManus *et al.*, 1995), we will then attribute relevant parts of the LMEs to coral reef ecosystems and use published mass balance models within the LMEs to raise flow patterns to both regional and global scales. What we expect is that through this quantification, the global importance of coral reefs for fish productivity will

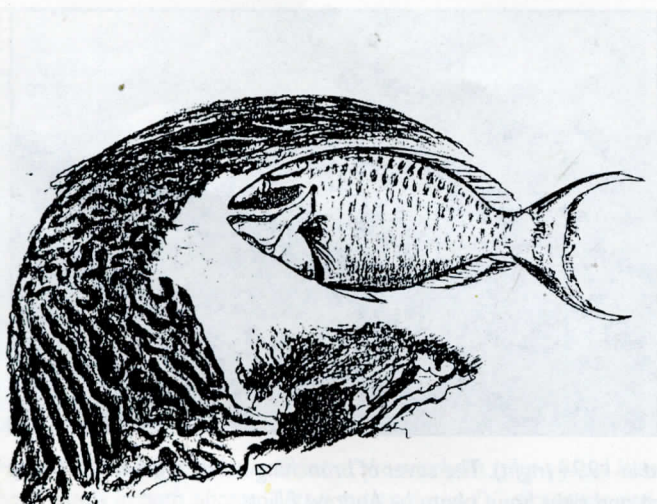
become more apparent, as will the case for protecting reefs. Likewise, this approach, through the possibilities it offers for assessing the impact of different types of interventions, will represent a step towards ecosystem management, an issue whose importance is likely to increase in the near future.

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ICLARM Contribution No. 1242

Daniel Pauly, International Center for Living Aquatic Resources Management (ICLARM), Manila, Philippines/Fisheries Centre, University of British Columbia, Vancouver, Canada; and Villy Christensen, International Center for Living Aquatic Resources Management (ICLARM), Manila, Philippines.



FEATURES

LONG-TERM REEF-FLAT DYNAMICS IN THE GREAT BARRIER REEF: THE HISTORICAL PHOTOGRAPHS PROJECT

David Wachenfeld

Our ability to understand long-term dynamics of coral reef communities is limited by human memory and scarce long-term scientific data. However, many people have expressed concern that the Great Barrier Reef (GBR) is slowly being degraded by a suite of human impacts from water pollution to anchor damage. Evidence for such long-term, broad scale decline has been hard to come by. Old photographs of reef-flats exposed at extreme low tide showing high cover of hard coral have been held up as evidence in support of such claims, the implication being that similar coral no longer exists on GBR reef-flats. These photographs offer an unrivalled opportunity to compare reef-flats as they are today with the same reef-flats as they were many years ago. Prior to this project, a small number of old photos, notably from Stone Island and Low Isles, had been relocated and drastic reductions in hard coral cover observed. In 1993, the Great Barrier Reef Marine Park Authority (GBRMPA) started the Historical Photographs Project with the intention of documenting long-term changes on coral reef-flats using historical photographs. A major function of the project was to use as many photos as possible from as many locations as possible in order to determine the general applicability of perceived declines in reefs.

Using comparisons between modern and historical photographs as a measure of reef-flat change is a coarse tool with several important limitations. These limitations must be considered when analysing photographic comparisons.

1. Historical photographs only show reef-flats. Irrespective of the degree of change observed on the reef-flat, conclusions cannot be drawn about the state of any other part of the reef. In addition, only photographs of reefs that are within sight of a significant landmark can be used in this project. Thus all reefs studied in this way will be close to the mainland, a continental island or a coral cay.
2. Clearly, a collection of historical photographs from a particular location does not represent results of a sampling design incorporating random sampling. Most photographers will have been attempting to illustrate a particular point when taking a photograph and it is impossible for us to know how representative any single photograph is of the whole reef-flat. This problem is worst when only one photograph from a reef-flat exists and is reduced when several photographs from one reef-flat at one time are available.
3. Photographs taken at an oblique angle to the substratum do not allow the substratum to be quantified easily. Without complicated geometric analysis of the photograph, the best that can be achieved is a qualitative,

subjective impression of the substratum shown in the photograph.

4. Comparison of historical and modern photographs only provides two snap-shots of a continuous process of reef change. The comparison provides no information about the state of the reef-flat in the years between the two photographs. Thus, when interpreting two apparently identical photographs of the same reef-flat that are separated by 100 years, it is equally possible to conclude that the reef-flat has remained unchanged over the last 100 years or that the reef-flat has changed but that in recent years it has returned to the state of 100 years ago. In addition, if comparison of modern and historical photographs does show a change in the reef-flat, this supplies no information as to the cause(s) of the observed change.

These problems should be considered when reading the following accounts of individual locations. So far, we have collected 92 historical photographs from 22 different locations ranging from Heron Island in the south to Thursday Island in the north. The photographs date from as far back as 1890. In order to be used in the project, historical photos had to fulfil two criteria: (1) they had to be taken by someone on or near a coral reef-flat during an extreme low tide (so that the benthic community is visible); and (2) they had to contain a recognisable landmark. Over the last two years, on each day with suitably extreme low tides, Andrew Elliott and I have revisited the locations and taken new photos, using the landmarks to relocate the sites as accurately as possible. In total, 15 locations have been revisited and a total of 64 historical photographs replicated.

Some locations have not changed...

At seven locations, given the limitations of the technique described above, there is little or no evidence of any change in the reef-flat benthic community.

A 1952 photo of Geoffrey Bay on Magnetic Island shows large colonies of branching hard corals. In 1995, similar coral colonies were found at the extreme south end of the bay. Thus comparison with the historical photo provides no



evidence of change. However, these colonies were far from typical of the reef-flat community, with most of Geoffrey Bay's reef-flat comprising coral rubble and algae with very little living coral. It is not possible to tell from the historical photo whether or not this was also the case in 1952.

For three locations in the Palm Islands, Little Pioneer Bay on Orpheus Island, Juno Bay on Fantome Island and Coolgaree Bay on Great Palm Island, photographs from around 1890 show reef-flat communities of soft corals and massive hard corals. These locations were revisited in 1994 and the modern reef-flats appeared identical to those in the photos from over 100 years ago.

Three photographs from Pickersgill Reef, north of Port Douglas, taken in the late 1960s and early 1970s show diverse reef-flat communities of soft corals, sturdy branching hard corals and smaller numbers of massive hard corals. When visited in 1995 this reef-flat showed large areas of almost identical benthic communities. However, there were also very large areas covered exclusively in much finer branching hard corals.

One photo from Daydream Island taken prior to 1950 shows well developed colonies of branching hard corals. Although preliminary photographs taken of the area in 1994 indicated that no such corals remained on this reef, a more extensive search on an extreme low tide in 1995 revealed that branching hard corals are still present.

One 1969 photo from Border Island shows an algal platform reef-flat and on visiting this location in 1995 the same area of reef-flat had a similar substrate. However, we realised that the historical photo was not taken at an extreme low tide and so the edge of the reef-flat, the zone most commonly associated with coral growth, was not exposed. This zone of the modern reef had a diverse community of branching, encrusting and massive hard corals, soft corals, sponges and algae.

Other locations have changed...

At four locations we found evidence of significant change in reef-flat communities. Two locations near Bowen have both shown declines in cover of hard corals. Photographs of Stone Island taken between 1890 and 1910 show extensive cover of branching and massive hard corals. However, in



Figure 1: The reef flat to the south of Stone Island around 1890 (left) and in 1994 (right). The cover of branching hard corals in 1890 was much higher than that in 1994. Left hand photo by William Saville-Kent and right hand photo by Andrew Elliott.

1994 the reef-flat was dominated by algae and only a small number of very small coral colonies were found (see Figure 1). In 1918 very heavy rainfall caused the death of corals on the reef-flat at Stone Island (Hedley, 1925; Rainford, 1925). However, anecdotal reports from long-term Bowen residents suggest that the reef-flat thirty years ago resembled the photos from the turn of the century. Photos from Bramston Reef, just south of Bowen, taken around 1890 show large numbers of massive hard coral colonies and also some branching hard corals. In 1994, no similar branching hard corals were found and all large massive hard corals were dead although their skeletons were still in place. As at Stone Island, the only hard coral colonies present were very small.

One historical photograph of Fitzroy Island from around 1910 has been found. This shows a high cover of various growth forms of branching *Acropora* and scattered colonies of massive corals. This reef was badly affected by Cyclone Joy at the end of 1990. When visited in 1995, all the coral growth forms visible in the photo were observed, but the cover was much lower. We also saw soft corals on the reef, although they are not depicted in the historical photo.

Three photographs from the reef-flat to the south of Michaelmas Cay taken sometime prior to 1958 show mixed communities of branching hard corals and soft corals. Today, the cover of branching hard corals appears to have greatly diminished and the reef-flat benthic community is completely dominated by soft corals.

Some locations show a mixture of change and no change ...

At the four remaining locations some areas show evidence of change in the reef-flat community and others appear unchanged.

On Hayman Island reef-flat the cover of branching hard corals no longer extends onto the area where the historical photographs were taken in 1946. However, extensive areas of this reef-flat are covered in such corals and there is no reason to believe that conditions for coral growth have significantly changed.

One photo, taken in 1958, from the reef-flat to the north of Green Island shows an extensive cover of branching hard corals, but another photo of the same area from the early

1960s shows only soft corals. The timing of this change in benthic community structure coincides with the reports of the first crown-of-thorns starfish (COTS) outbreaks at Green Island in 1961-62, and predation by COTS seems a likely explanation for the decline in cover of branching hard corals. Interestingly, this area of reef-flat was still dominated by soft corals in 1994. However, the extreme south-east edge of Green Island reef seems unchanged from a series of four photos taken in about 1961. The historical photos show a diverse benthic community of different forms of branching *Acropora*, soft corals and clams. When revisited in 1995 all these elements of the benthic community were still present.

Two historical photographs from Double Island have been replicated. One photo from 1970 shows colonies of branching *Acropora*. Similar patches of coral are common on this area of the reef-flat today, despite a thick layer of mud covering much of the reef-flat. However, the second historical photo, taken further south along the edge of the same reef-flat shows an area completely covered in soft corals. Unfortunately, we have not been able to determine the date of this photo. When visited in 1995 no part of this area of reef-flat was dominated by soft corals. Occasional, solitary adult colonies and several dense patches of small (about 2 cm diameter) colonies were the only soft corals observed. This represents the only case of an observed decrease in soft coral cover.

During the 1928-29 expedition to Low Isles many photographs were taken. Most of these depict banks of coral rubble and similar banks still exist today, although not necessarily in the same places. Other photos from the expedition show massive hard coral colonies on the reef-flat to the south of the sand cay and branching hard coral at the extreme southern edge of the reef-flat. The reports from the expedition also contain written descriptions of this area of the reef-flat. During a visit in 1995 all features of this area of the reef-flat photographed and/or described by the 1928-29 expedition were observed and photographed (see Figure 2). However, in their 1993 study of reefs to the north-east of the cay, Bell and Elmetri (1995) found that there was a markedly lower density of hard coral colonies and higher density of soft coral colonies than was measured during the 1928-29 expedition. Photos taken as part of the Historical Photographs Project support this observation.

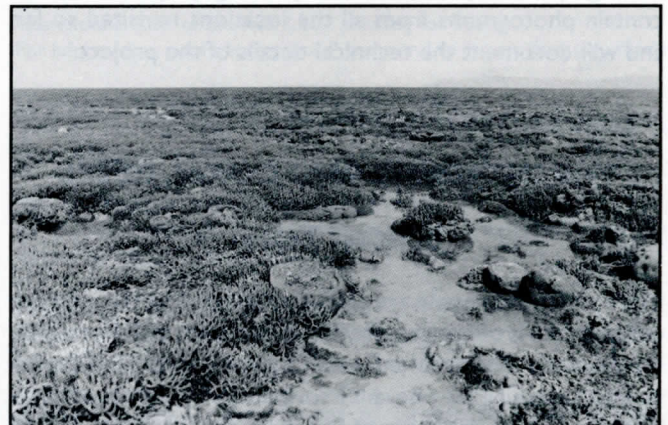


Figure 2: The edge of the reef-flat at the southern edge of Low Isles reef in 1928 (left) and 1995 (right). Note the high cover of branching hard corals in both photos. Left hand photo by T.C. Roughley and right hand photo by Andrew Elliott.

What can these photos tell us about the state of the Great Barrier Reef?

Given the limitations described above, comparisons between historical photos and modern reef-flats can never provide definitive, stand-alone proof one way or the other in the debate over whether or not the GBR is undergoing a steady decline. Clearly, some of the reef-flats studied have suffered heavy mortality of hard corals. Potential causes include cyclones, predation by COTS, water quality, freshwater from storms, reef-walking, anchor damage and climate change. Some of these factors are natural while others could be due to human activity. Unfortunately there is no way to tell from the photos which factors have caused the observed changes. Despite observed decreases in hard coral cover on some reefs, previous studies that have used historical photos primarily or exclusively as evidence of hard coral mortality (e.g. early results from this project, Edean 1976, Bell and Elmetri 1995) are only seeing part of the picture. The Historical Photographs Project represents the most thorough and wide-ranging study of its kind to date but, even so, out of approximately 2,900 reefs in the Great Barrier Reef Marine Park only 15 have been visited. From the results of the Historical Photographs Project so far, the high number of locations that do not appear to have changed since the historical photographs were taken throws doubt on the widely held belief that the GBR is subject to broad scale decline.

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- Hedley, C. 1925. The natural destruction of a coral reef. *Transactions of the Royal Geographical Society of Australasia (Queensland): Reports of the Great Barrier Reef Committee* 1: 35-40.
- Rainford, E.H. 1925. Destruction of the Whitsunday Group fringing reefs. *Australian Museum Magazine* 2: 175-177.

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A GBRMPA Research Publication on the Historical Photographs Project is currently being prepared. It will contain photographs from all the locations revisited so far and will document the technical details of the project.

THE INTERNET AND CORAL REEFS

Kristian Teleki

More and more people are getting connected to the internet and this tool is offering unprecedented access to information for research. The problem is that a great deal of time can be wasted searching for relevant information. To help overcome this I have compiled a list of Internet sites which may be of interest to coral reef researchers to help.

Geographic Information Systems and Remote Sensing

- <http://www.pmel.noaa.gov/toga-tao/home.html>
NOAA/PMEL TOGA-TAO Home Page
- *Tropical Atmosphere Ocean Array, current meter moorings in the Tropical Pacific Ocean, telemetering oceanographic and meteorological data in real time via the ARGOS satellite system.
<http://www.nasa.gov/>
Guide to all NASA Information Services on the World Wide Web
<http://www.geo.ed.ac.uk/home/giswww.html>
Complete listing of GIS Resources on the WWW
<http://www.vtt.fi/aut/ava/rs/virtual/>
The World-Wide Web Virtual Library: Remote Sensing
http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/OC DST/ocdst_main.html
Ocean Color Data and Resources/Imagery
<http://www.satlab.hawaii.edu/index.html#fromvirtual>
Satellite Oceanography Laboratory – Imagery
<http://seawifs.gsfc.nasa.gov/>
Sea viewing Wide Field of View sensor (SeaWiFs) – imagery and data

Search Engines

- <http://www.yahoo.com/>
Yahoo – Search catalog
- <http://webcrawler.com>
WebCrawler Searching Engine
- <http://lycos.cs.cmu.edu/>
Lycos Search Engine by far the best and most comprehensive for searching the Internet
- <http://www.stc.sibirsk.su/mirror/univ.html>
Locate College and University Home Pages

SCUBA

- SCUBA on the WWW
<http://akebono.stanford.edu/yahoo/Entertainment/Sports/SCUBA/>
Entertainment:Sports:SCUBA
<http://www.cru.uea.ac.uk/ukdiving/other.htm>
Other network diving resources

Coral Reef Papers

- <http://pauillac.inria.fr/~clerger/Darwin.html>
Darwin's theory of atoll formation
- <http://gaia.earthwatch.org:70/WWW/Gkobluk.html>
Reef Disturbance Paper – Natural Disturbances
- [gopher://kaos.erin.gov.au:70/00/areas/wha/wha_data/gbreef](http://kaos.erin.gov.au:70/00/areas/wha/wha_data/gbreef)
GBR Report
- <http://kingfish.ssp.nmfs.gov/olo/unit8.html>
Caribbean Reef Fisheries Paper
- [gopher://gopher.greenpeace.org:70/00/campaign/ocean/016](http://gopher.greenpeace.org:70/00/campaign/ocean/016)
Greenpeace Paper – Coral Reefs
- <http://www.cqs.washington.edu/~josh/abstracts/jcl.talk.html>
Remote Sensing correlation of SST w/coral bleaching
- <http://gaia.earthwatch.org:70/WWW/Bgoulet.html>
Reef Disturbance Paper – Anthropogenic borne
- <http://coral.aoml.erl.gov/bib/lit.abstracts.html>
Coral Health – Abstracts
- <http://the-tech.mit.edu/~tomkarlo/essays/bleaching.html>
Global Warming and Reef Bleaching
- [gopher://esdim1.esdim.noaa.gov:70/00/NOAA_systems/education/se21a.asc](http://esdim1.esdim.noaa.gov:70/00/NOAA_systems/education/se21a.asc)
Sea Grant – Coral Reef Ecosystems protected through volunteer programs
- http://www.bev.net/education/SeaWorld/coral_reefs/consr.html
CORAL AND CORAL REEFS – Basic Educational School Material
- <http://kaos.erin.gov.au/portfolio/esd/handbook/contval.html>
Paper on Contingent valuation
- http://kaos.erin.gov.au/life/species/fauna/Wildlife_Prot/notice13.html
Trade in Corals
- http://kaos.erin.gov.au/general/library/serials/serials_gbrmpa.html
Serials list from Great Barrier Reef Marine Park Authority Library
- http://kaos.erin.gov.au/sea/somer/somer_con.html
Our Sea, Our Future: Major findings of the State of the Marine Environment Report for Australia
- http://kaos.erin.gov.au/sea/conservn/jb_cons.html
Jervis Bay Conservation Strategy

<http://kaos.erin.gov.au/sea/conservn/ashmore.html>
Ashmore Reef Plan of Management

<http://kaos.erin.gov.au/sea/conservn/elizandm.html>
Elizabeth and Middleton Reefs Nature Reserve Plan of Management

http://kaos.erin.gov.au/states/cyp_on_line/reports/nrap/nr06_infoback7.html
Australian Marine Vegetation Project

<http://kaos.erin.gov.au/portfolio/esd/csd95/index95.html>
Australia's 1995 National Report to the Commission for Sustainable Development

Research Institutions

<http://www.wcmc.org.uk/index.html>
World Conservation Monitoring Centre

<http://www.rsmas.miami.edu/>
University of Miami – RSMAS Home Page

<http://www.bio.usyd.edu.au:80/OTI/>
One Tree Island Research Station

<http://www.bio.usyd.edu.au/OTI/crri.html>
Coral Reef Research Institute

<http://www.bbsr.edu/>
Bermuda Biological Station for Research, Inc.

<http://www.rsmas.miami.edu/groups/crrg.html>
Coral Reef Research Group

<http://gaia.earthwatch.org:70/WWW/Scorlreef.html>
Earthwatch – Coral Reefs

gopher://nmnhgoph.si.edu:70/00/docs/bioprogram/ccre
Smithsonian Coral Reef Program

<http://www.soest.hawaii.edu/>
School of Ocean and Earth Science and Technology, Hawaii – Home Page

<http://www.whoi.edu>
Wood's Hole Oceanographic Institution

<http://biome.bio.dfo.ca:80/>
This page offers access to the information and programs of the Habitat Ecology Section of the Bedford Institute of Oceanography

Coral Reef Pictures

<http://www.actwin.com/fish/pictures/tse-pics.html>
Reef Pictures – downloadable reef images

Miscellaneous Links

<http://www.erin.gov.au/>
Australian Environmental Resources Information Network

<http://www.conveyor.com/oceanvoice.html>
Ocean Voice International

<http://www.cis.ufl.edu/home-page/fl-servers/#edu>
Florida WWW Servers

<http://www.rsmas.miami.edu/soundings.html>
RSMAS News

<http://coral.aoml.erl.gov/>
Coral Health and Monitoring Program Home Page

http://coral.aoml.erl.gov/coral_links.html
Some Coral Health and Monitoring Related Links

<http://www.erin.gov.au/portfolio/gbrmpa/gbrmpa.html>
Great Barrier Reef Marine Park Authority [GBRMPA]

<http://www.io.org/~bunrab/>
Turtle Trax – A Marine Turtle Page

<http://www.nos.noaa.gov/aa/ia/cri.html>
International Coral Reef Initiative

<http://pk.org/pcrf/>
Planetary Coral Reef Foundation

<http://www.tos.org/>
The Oceanography Society

<http://www.actwin.com/fish/ima/index.html>
International Marine Life Alliance

<http://www.actwin.com/fish/con/CRS.html>
8th International Coral Reef Symposium

<http://www.adfa.oz.au/CS/flg/wf93/kq.html>
Kingman Reef, Hawaii – Geog. Info

http://www.jcu.edu.au/dept/Tropical_Marine/
Tropical Marine Studies Homepage

<http://seawifs.gsfc.nasa.gov/JASON/HTML/reef.html>
JASON Project aka The adventures of Dr. Robert Ballard

<http://www.florida-keys.com/flakeys/enviro/fcres.html>
Florida Reef Relief Program

<http://www.dep.state.fl.us/parks/south/pennekamp.html>
John Pennekamp Coral Reef State Park

<http://www.actwin.com/fish/con/PMC.html>
Pacific Marine Conference

<http://infoserver.ciesin.org:80/IC/iucn/IUCN.html>
Organizational Guide to the IUCN

<http://www.fao.org/>
Food and Agriculture Organization

<http://www.lib.kth.se/lg.html>
Guide to environmental sites on the Internet

<http://www.whoi.edu/html/www-servers/oceanography.html>
Guide to Oceanography WWW servers

<http://nmnhwww.si.edu/links.html>
Smithsonian Natural History Web: Related Links

<http://golgi.harvard.edu/biopages/all.html>
The World-Wide Web Library: Biosciences Resources

<http://ecosys.drdr.virginia.edu/Environment.html>
The World-Wide Web Library: Environment Resources

<http://www.nhm.ac.uk/index/life-sciences.html>
Natural History Museums, Collections and other Earth and Life Science Resources

<http://kaos.erin.gov.au/sea/sea.html>
Marine and Coastal Reports Related to Australia

http://kaos.erin.gov.au/other_servers/category/Marine.html
Guide to Marine Servers

<http://biomserv.univ-lyon1.fr/Ecology-WWW.html>
List of WWW sites of interest to Ecologists

<http://www.unep.ch/other.html>
The United Nations Environment Programme

gopher://unep.unep.no:70/11/unep/ocapac
UNEP Regional Seas Program – Documents about the program

<http://www.webdirectory.com/>
Environmental Organization WebDirectory

<http://www.whoi.edu/html/www-servers/oceanography.html>
List of Oceanography sites

<http://golgi.harvard.edu/afagen/depts/deptus.html>
The WWW Virtual Library: Biology Departments and Institutes

<http://www.greenpeace.org/>
Greenpeace International (Amsterdam)

http://kaos.erin.gov.au/general/erin_info/info.html
Environmental Resources Information Network – aims to provide geographically related data of an extent, quality and availability required for planning and decision making.

Listservers

In addition to the above there are several listservers available for email discussion groups which may be of interest. To join these groups, follow the instructions below:

Coral-list – Discussion topics in coral reef science and management
Send the message "subscribe coral-list <your name>" (omit quotes) to majordomo@reef.aoml.erl.gov

International Year of the Reef List – planning for IYOR
For information, send a 'query iyor-l' command to listserv@uriacc.uri.edu

Coastnet – Discussion topics in coastal management
Send the message "subscribe coastnet <your name>" (omit quotes) to listserv@uriacc.uri.edu

Marbio – Topics in marine biology
Send the message "subscribe marbio" (omit quotes) to majordomo@marinelab.sarasota.fl.us

Fish-Ecology – Topics in fish ecology
Send the message "subscribe fish-ecology <your name>" (omit quotes) to listserv@searn.sunet.se

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NEWS

INTERNATIONAL WORKING GROUP ON SCLERACTINIAN CORALS – UPDATE

Work on the systematic revision of genera is proceeding (see *Reef Encounter* 17). As a follow up to the lists of genera that have been returned, a new revised list will be prepared, giving the names of possible reviewers, and will be distributed to those who expressed their interest in assisting with the revision. Proposals for the revision procedure are under preparation and will be distributed as a basis for discussion. Please request copies of these if you do not have them.

An example of a genus description has been prepared by H.Loesser and B.Kolodziej (Krakow). This contains one plate and some text pages. The format, based on proposals made by Roniewicz & Gill 1982 (*Fossil Cnidaria Newsletter*, 11.2), still has to be discussed, so that those involved in the revision can have an input. The example, including comments and recommendations, will be sent automatically and free of charge to all reviewers and to all participants at the two meetings in Paris and Luxembourg. If you did not attend either of these, and have not yet expressed your interest, please contact H.Loesser and ask for a copy.

Before the systematic description of genera starts, we need to consider how the revision will be distributed. It would be possible to distribute the material by e-mail only, as text- and graphic-files, perhaps through a closed usergroup on the Internet. The advantage of this is the low cost, but the disadvantage is that some countries are still not fully linked to the Internet. Alternatively, the material could be distributed as printed material. The advantage of this is greater accessibility, but the costs would be higher than using e-mail, and a small fee would have to be paid by those who did not participate in revision of the material. Additionally (or exclusively), the material could be distributed on an annual basis on CD-ROM.

Please send your comments on any of these ideas to: *Hannes Loeser, PF 192409, D-01282 Dresden, Germany. e-mail: h.loeser@link-dd.cl.sub.de ; fax: +49 351 30951 / +49 351 335203.*

INTERNATIONAL CORAL REEF INITIATIVE

The International Coral Reef Initiative (ICRI), described in *Reef Encounter* 17, has successfully held a number of international and regional meetings over the last year, engendering much governmental and non-governmental support for sustainable reef management. The World Bank and other multi-lateral development banks are major partners in ICRI, the principles of which are being incorporated into many of their coastal management activities. With other international organisations such as the United Nations Environment Programme, they are assisting in the regional

workshops, international meetings and preparation of materials.

At the global workshop in Dumaguete in the Philippines, 29 May–2 June 1995, the participants adopted a *Call to Action* and a *Framework for Action*, the latter responding to the global problems identified in the former. These, as well as a report of the workshop and the *State of the Reefs Report*, are available from the ICRI office (address below). A one hour documentary, *The Fragile Ring of Life*, shown at Dumaguete, received the 1996 Earthwatch Film Award and is available in English, Spanish, French, Urdu and Arabic, from any U.S. embassy, through the U.S. Information Service. ICRI was endorsed by numerous organisations (including ISRS) and international conferences in 1995.

Several of the proposed regional workshops have been held and others are planned. A report of the workshop for the Tropical Americas follows, and workshops were also held for the South Asian Seas in the Maldives, and for the Pacific in November 1995. Workshops planned for 1996 include the East Asian Seas (February), Red Sea and Gulf (May, in Egypt), and Western Indian Ocean/Eastern Africa. The results and conclusions of all the workshops will be presented at the 8th International Coral Reef Symposium in June 1996, and will be circulated to all relevant United Nations bodies and conferences, particularly the Commission on Sustainable Development (CSD). It is hoped that by raising global concern over coral reef decline, national governments will become more convinced of the value of funding coral reef management. Participants at the workshops will be able to make stronger cases on their return for setting appropriate national and local priorities.

Consultation on Coastal Resource Management in the Tropical Americas: An International Coral Reef Initiative, Montego Bay, Jamaica, July 5–8, 1995.

Thirty-one countries, plus several territories and states, were represented in Jamaica by 100 participants, most with management or policy backgrounds. The overall objective was to use regional collaboration to improve the protection and management of coral reefs and other coastal zone resources. Specific objectives focused on four subjects: coastal management, capacity-building, research and monitoring, and review. To achieve these objectives, participants attended panels and contributed to working groups. Panels, consisting of two to three speakers who gave presentations, focused on co-management, fisheries management, marine protected areas, land-based pollution, research and monitoring, and financing coral reef initiatives. Working groups covered these same subjects in addition to education and the legal framework for integrated management, and used the information generated during the panel sessions and the personal experience of participants to establish lists of problems, goals, objectives, and activities.

The activities defined by working groups ranged in scale and approach and included the development and implementation of erosion control practices, the promotion of fisheries practices that protect habitat, and the development and distribution of hands-on, activity-based teaching materials

on coastal marine resources for school children. Each working group came up with a list of at least four major recommendations and several groups made the same suggestions, highlighting the interconnectedness of topics such as integrated coastal zone management, marine protected areas, and education. The common recommendations included:

- the review of current practices and identification of successes, gaps, and overlaps;
- the empowerment of resource users and other stakeholders;
- education/training for the general public, the media, managers, and key economic and political sectors;
- the use of economic instruments and analyses to broaden the strength and appeal of coral reef conservation actions;
- the consideration of coastal marine resources in land management decisions;
- the collection of data from natural and social sciences;
- the promotion of adaptive management measures;
- cooperation among organizations, agencies, and governments and the sharing of information;
- assistance for governments in ratifying and implementing international treaties related to coastal zone management;
- and
- the funding of these activities.

While few would deny the value of activities such as these, participants at this workshop were frustrated by the lack of budget to follow up on ICRI activities. Without a budget, participants had no choice but to phrase goals broadly with the hope that some existing agency would be inspired by the rhetoric and pursue the activity on its own. This situation was particularly frustrating when it came to broad-scale coordinated activities which were typically beyond the scope of existing organizations and budgets. In sum, the Consultation on Coastal Resource Management in the Tropical Americas will be of limited value unless it is followed up by funded activities.

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For copies of the report of the Jamaica meeting, contact: Franklin McDonald, Executive Director, Natural Resources Conservation Authority, 53 1/2 Molyneux Road, Kingston 10, Jamaica. Tel: +1 809 923 5155; Fax +1 809 923 5070.

Information on the South Asian Seas, East Asian Seas and Western Indian Ocean/Eastern Africa regional workshops available from: Ian Dight (UNEP, Nairobi) Fax 254-2-622788.

Information on the Pacific workshop available from: SPREP, Apia, Western Samoa, Fax: 685-20231; e-mail: sprep@pactok.peg.apc.gov

Information on the Red Sea and Gulf workshop from: John Wilson (USAID-US), Fax: 1-703-875-4639; e-mail: jwilson@USAID.gov

Information on ICRI in general from: Peter Thomas, ICRI Co-ordinator, United States Dept of State, OES/ETC, Room 4325, 2201 C Street, NW, Washington D.C. 20520. Fax: 1-202-647-5247; e-mail: pthomas@state.gov

INTERNATIONAL YEAR OF THE REEF (IYOR)

The International Year of the Reef was, like ICRI, described in the last issue of *Reef Encounter*. At that time it was thought that the main emphasis would take place in 1996. Although it will still be launched at the 8th International Coral Reef Symposium, the main activities will now take place in 1997. However, much has already taken place in the form of preliminary work towards the main components of this initiative.

Robert Ginsburg and his Miami colleagues are taking the lead role in the scientific programme, and scientists from around the world are becoming increasingly involved. The IYOR Organizing Committee is establishing regional working groups in various reef areas that can develop their own activities. Suggestions of appropriate regions and volunteers to participate are welcome.

An IYOR Conservation and Public Awareness Committee was set up during the ICRI global workshop in the Philippines. It comprises representatives of conservation organizations (WWF-US, Environmental Defense Fund, International Marine Life Alliance-Philippines, Center for Marine Conservation, Coral Forest, Palau Conservation Society, Coral Reef Alliance-CORAL), scientists (Smithsonian Institution, ICLARM), educational institutions (Reef Environmental Education Foundation), aquariums (American Association of Zoological Parks and Aquariums (AZA), Waikiki Aquarium) and government institutions (Great Barrier Reef Marine Park Authority) and is co-chaired by Stephen Colwell and Sue Wells. It will act as a clearinghouse for IYOR activities, and will help coordinate and promote coral reef research, education and conservation programs.

Stephen Colwell of CORAL is doing a great job putting together the basic requirements of an international campaign. An IYOR logo is being produced by artists at the Scripps Institute and will be available shortly. A suitable slogan has yet to be found – if anyone has a good idea please contact Stephen Colwell. A Listserver for IYOR has been established, specifically to link individuals and organisations that are planning to take an **active** role in the initiative and to discuss logistics; contact Stephen for information about this.

The following is a progress report and update on future plans for each of the main ICRI components:

THE COMPLEAT REEF ENCOUNTER

No.18

'The International Coral Reef Initiative (ACCRUE) hosted an international workshop 29 May to 2 June 1995 in Damaged City, Philippines to develop an action plan for urgent global, regional, national co-operation ...'

Network Newsletter Vol. 10, No. 4, July 1995

1. Assessment

ICRI provided a starter grant of US\$ 15,000 for IYOR reef assessment activities and this is supporting the following:

- a review of the status of coral reefs in the Pacific and Indonesia that is being done under the auspices of the Pacific Science Association's Coral Reef Committee, led by Charles Birkeland and Rick Grigg;
- a reconnaissance of the reefs off Tanzania with emphasis on their current condition organized by Tim McClanahan;
- a resurvey of the reefs in El Nido/Bacuit Bay National Marine Reserve and Tourist Zone in the Philippines, led by Gregor Hodgson, to a) assess recovery of the reefs from excess runoff produced by logging that was discontinued in 1986, b) evaluate the effects of tourism and over-harvesting of lobster, *Tridacna* and grouper, and c) determine the conditions of reefs outside the zone of excess sedimentation;
- a resurvey, by University of Miami scientists and graduate students, of the reefs off Abaco, Bahamas, that were described in some detail in the late 1950s and early 1960s by John Storr (*Geological Society of America, Special Paper 79, 1964*).

Another resurvey of previously-studied reefs took place in December, 1995 when Peter Glynn revisited reefs he studied some twenty years ago off the south coast of Puerto Rico, funded through the Miami 'Bal de Mer'. The results of many of these studies will be presented at a special one-day session on: 'Assessments of Coral Reefs for the IYOR, 1997' at the 8th International Coral Reef Symposium in Panama. The UNESCO workshop on reef assessment, held in Indonesia in 1994, was an early contribution. The launch of the first version of ReefBase at Panama will also be a contribution to this component of IYOR. Plans for future assessment work will continue to be made and anyone who would like to contribute a study is invited to participate.

A second part to the assessment component is encouraging the involvement of non-professionals (in a professional manner) in data gathering. Through the Universities of York and Miami, a report on the role of non-professionals and volunteers in reef assessment was produced as a contribution to IYOR (see Bookshelf, p. 23), which summarises the discussions and recommendations of the workshop on the same topic held at the ISRS meeting in Luxembourg in 1994. Since then, there has been further expansion of volunteer and non-professional programmes worldwide. The ReefBase project at ICLARM is initiating its Reef Aquanaut programme (see p. 17); the University of York is working with non-professionals, including both overseas volunteers and local people, in the Indian Ocean; the Florida-based Reef Environmental Education Foundation (REEF) programme has expanded and now has over 60 dive operators and resorts involved in fish survey work. Further work is needed on standardisation of methods used and co-ordination of these initiatives.

2. Monitoring

This component has yet to be developed, but IYOR will be supporting the various national, regional and international initiatives. Please contact the organisers if you would like to link directly with IYOR.

3. Education

In the USA, the American Association of Zoological Parks and Aquariums (AZA) has become a major supporter, and will help to launch IYOR in the public sector at their annual meeting in Hawaii in September 1996. A common curriculum on coral reefs for all zoos and aquariums will be developed through AZA.

In October, a one day course on coral reefs was offered to the general public by the University of Miami, especially teachers, funded by local initiatives including the Batchelor Foundation and money raised through a 'Bal de Mer'. The course, entitled 'Cities under the Sea', consisted of lectures, demonstrations and exercises designed to provide a comprehensive introduction to the biology and geology of coral reefs. Ernesto Weill presented the biological aspects and Robert Ginsburg handled the geology. The enthusiastic response of those who took the course has encouraged the planning of additional courses with field trips.

An educational slide show and video, 'The Underwater Rainbow', is being prepared by CORAL with the support of the dive industry for divers to use in schools, clubs etc as a way of expanding the general public's knowledge of coral reefs. The slide show will be packaged in a presentation kit, complete with background materials, so that divers, teachers and other interested individuals will be able to make a presentation without any previous training in marine biology or special knowledge of coral reefs. Plans are underway to link with Jean-Michel Cousteau's organisation which is running an 'Ambassadors of the Environment' program to give dive masters and divers a basic education in reef ecology.

Numerous other educational programmes relevant to reefs are underway around the world, and there is scope for many more. If you are running such a programme, or have plans to develop one, consider linking it to IYOR in 1997.

4. Outreach and Collaboration

The Directory of NGOs involved with coral reefs, produced by Jeanne Kirby for Greenpeace-USA as a contribution to IYOR, has provided a very useful starting point for increasing involvement of the coral reef community. The 167 NGOs listed in the Directory are now on a database at CORAL, which will be expanded as IYOR activities are developed and will be placed on the World Wide Web for general public access.

CORAL has produced a full colour 1997 calendar for IYOR and will be preparing a travelling photo exhibit. We are hoping that many other organisations will produce such materials for 1997 (calendars, stickers, cards etc.) and prepare displays and exhibitions (even graffiti!) in schools, museums, aquariums and other, perhaps less conventional, public venues.

5. Conservation

Practical conservation efforts will be an important part of IYOR. We hope there will be an increased effort to designate marine protected areas with coral reefs and improve their management, to nominate coral reef areas where appropriate under international conventions such as the UNESCO World Heritage Convention, to involve local communities in management activities, and to take action in cases where reefs are known to be under threat.

There is a great deal of preparatory work that needs to be done now in order to make IYOR a success, and we invite you to review your own organization's programs and goals and see how you can participate. In particular, we need to expand IYOR activities to other countries where coral reefs occur, and where people depend on them for their livelihoods. ICRI has created a ground swell of interest in coral reefs. Through IYOR, we can use some of that momentum to build additional interest, understanding and support for coral reefs.

For more information on IYOR contact :

IYOR Programme Coordinator: *Dr Robert Ginsburg, RSMAS/ University of Miami, 4600 Rickenbacker Cswy, Miami FL 33149. Fax: (305) 361-4094/4632. E-mail: rginsburg@rsmas.miami.edu*

Conservation and Public Awareness Committee co-chair: *Stephen Colwell, The Coral Reef Alliance, 809 Delaware St., Berkeley, CA 94710. Tel: 510-528-2492; Fax: 510-528-9317; Email: CoralReefA@aol.com.*

EXPEDITION TO THE FLORIDA KEYS – DAMAGE FOUND ON DEEP CORAL REEFS

It is perhaps surprising that expeditionary science can still make major contributions in a part of the world that most people would assume is well known. It is more surprising that this type of science can be funded. Yet, this past summer, a multidisciplinary group of scientists from the U.S. and Australia surveyed reefs in Florida, from south of Miami to the Dry Tortugas. The primary habitats included in the effort were offshore coral reefs at depths between 45 and 63 feet. These deeper reef environments are largely unstudied and represent an important resource in the Florida Keys National Marine Sanctuary. A multi-agency effort was coordinated to secure ship time and funding to support a program that resulted in visits to 20 sites.

The objective of the program was to provide sufficiently detailed information about a large number of reefs to document community structure throughout the Florida Keys. Video transects were taken at each site that will be used to

determine the number and percent cover of: 1) major coral species and other major benthic sessile invertebrates; 2) fleshy, coralline, and turf algae; and 3) dead coral, sand, and hard bottom. Additional work included: close-up algal photography; general site video and photography; fish censuses; algal collections for C:N:P and taxonomy; sediment samples for total N and P, and grain size analysis; microinvertebrate quadrat censuses; water samples for nutrients; and coral cores for growth studies. Methods and statistical design were based on Aronson *et al.* (1994) and Miller and Hulbert (1994).

The results of the expedition will be presented late in 1996, but several discoveries are of immediate interest. For example, the Keyswide expeditionary team discovered large brain and star corals at depths below 50 feet off Long Key in the middle Florida Keys that had been growing luxuriantly for at least 100 years. Many of the corals were partially or completely dead, recently smothered by fine sediments falling on the reef from the shallows. While the source of the sediments has not been identified, it is suspected that the large plumes of cloudy water from Florida Bay have increased sediment loads to lethal levels. By contrast, the deep reefs of Alligator Reef, just a few miles to the north and more isolated from Florida Bay water, still had spectacular coral growth.

Local residents and scientists have long known that Florida Bay waters move to the southeast through the major passes between the Keys and over the reefs of the middle Keys. Yet large corals have obviously thrived there in times past. Beginning in 1987, when large areas of seagrass died in Florida Bay, scientists suspected that decades of water management changed conditions in the Bay. The changes have accelerated, and today water inimical to coral growth regularly washes over offshore areas of the middle Keys. As part of the regional plan to restore the Everglades, the U.S. Army Corps of Engineers is planning a major effort to improve the quantity and quality of water delivery to the ecosystems of the Everglades and in Florida Bay.

Documenting recent changes along the Florida reef tract and developing management priorities are major goals of the Management Plan of the Florida Keys National Marine Sanctuary. The Plan is currently under public review. The Keyswide Coral Reef Expedition, which is part of the Sanctuary's ecological assessment program, was supported by the Sanctuary, the Munson Foundation, the NOAA National Undersea Research Center at the University of North Carolina at Wilmington, the Harbor Branch Oceanographic Institution, the National Park Service, and the Florida Institute of Oceanography. Data from the expedition will provide the first ecological picture of the entire reef tract.

Other participants included scientists from various institutions in Florida, as well as the Reef Survey Team from the Australian Institute of Marine Science. Dr. Terry Done, Australian team leader, said that the Expedition "provides a unique opportunity to understand the striking parallels between the Great Barrier Reef and the Florida reef tract." A key issue for both countries is understanding the impact of

sewage and land use practices on the long-term health of coral reefs. The participating scientists anticipate major international cooperative efforts to share data and information to help solve these problems.

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- Miller, S.L. and A.W. Hulbert. 1994. *Recommendations for long-term coral reef monitoring in the Florida Keys National Marine Sanctuary: Panel Report.* National Undersea Research Center, University of North Carolina at Wilmington. 13 pages.

Steven Miller (National Undersea Research Center at the University of North Carolina at Wilmington, 514 Caribbean Drive, Key Largo, Florida 33037), Richard Aronson (Dauphin Island Sea Lab and U. of South Alabama, P.O. Box 369-370, Dauphin Island, AL 36528), John Ogden (Florida Institute of Oceanography, 830 First Street South, St. Petersburg, FL 33701).

MADANG TUNA CANNERY - CORRECTION AND UPDATE

The last issue of *Reef Encounter* (p.13) carried a short news item on a tuna cannery that was being planned for Madang in Papua New Guinea. We would like to apologise for publishing incorrect information on the source of funding for this project. The editors have received letters both from the Global Environment Coordination Division of the World Bank and the International Finance Corporation (IFC), explaining that financing is through IFC which is "the private sector development branch of the World Bank", as well as other sources. The cannery is not being funded through the Global Environmental Facility (GEF), which is an independent financing mechanism funded by the international community and implemented by the World Bank, the United Nations Development Programme and the United Nations Environment Programme. The project should not be confused with the existing GEF project in Papua New Guinea on 'Biodiversity Conservation and Resource Management' which is being implemented by UNDP. An apology has been sent to the World Bank.

The news item raised a number of environmental concerns about the project, in particular that effluent discharge from the cannery would damage the scientifically important marine communities in Madang lagoon. The World Bank and IFC have both stressed that the project has conformed with the necessary environmental assessment procedures. According to IFC, discharges into the lagoon were never part of the proposal, but were to be treated by a dissolved air flotation process and released 1000 ft from the shore at a minimum depth of 25 ft, the exact location and depth to be determined to ensure adequate dispersion. Some of the scientists working in the area, where the Christensen Research Institute is sited, are however still concerned, and there is a need to obtain a copy of the Environmental Impact Assessment. The World Bank has said that this is available. The most recent reports from

Madang are that the foundations for the cannery have been laid but that construction is at a standstill because of financial problems, and that a Philippine-owned cannery is going ahead, using a land-fill site for its waste disposal. It is hoped that the situation can soon be clarified.

REEFBASE

CURRENT STATUS AND CALL FOR MATERIALS

As described in *Reef Encounter* 17, ReefBase is a database designed to summarize information on the uses, ecological status and management of coral reefs globally, regionally and nationally, and to make this information available to people involved in reef management and those concerned with the future use and conservation of coral reefs. The initial project phase resulted in production of a preliminary CD-ROM in October 1995 which was tested within ICLARM. A beta version will be sent to international reviewers for testing from February to March, 1996. ReefBase 1.0 will be officially released in June, 1996 at the International Coral Reef Symposium in Panama. It will contain the following:

1. Selected information on management status, ecological zonation, fisheries and other human uses for some 6,000 coral reefs. The information is available in a user-friendly software system and data can be accessed using searches, queries, and/or an active dot geographical display system with zooming capabilities. This information includes:
 - reports of natural and anthropogenic stresses to coral reefs, of which well over 1000 have been entered in the data base.
 - records of coral reef fisheries and mariculture production (several hundred have been entered), which may make ReefBase the most comprehensive collection of such information currently available.
 - records concerning the use of coral reefs by tourists (over 2000 entered), making Reef Base one of the world's most extensive guides to coral reef diving.
 - Information on marine protected areas (over 400). ReefBase can display these data geographically relative to other factors such as stresses, fishery harvests and tourism uses, to help prioritise marine protected area establishment and management.
2. Maps, at various scales, covering all known coral reefs in 108 countries or island states, plus detailed maps of selected reef sites. The maps show simple bathymetry and the distribution of coral reefs and mangroves, the latter using data produced by WCMC for the World Mangrove Atlas (see p. 2). It is intended that there should be at least one map per country, and several for larger countries, on the first publically released version of ReefBase.

ReefBase has become a central feature of ICRI, for which it serves as the official Resource Center. It provided substantial

material for the ICRI *State of the Reefs Report*, which was presented as a keynote address at the first ICRI Workshop in May, 1995. The *Framework for Action* calls for a strengthening of efforts to consolidate and disseminate information important to reef management – a strong statement of support for the ReefBase effort.

Around the world, programmes are being designed which will contribute data to a hierarchical system of national and regional databases, with ReefBase as the final mechanism of consolidation. In addition, the upcoming Global Coral Reef Monitoring Program of the International Oceanographic Commission is expected to operate in close collaboration with ReefBase, which could provide a major means of data dissemination. ReefBase is also expected to play an important role in the 1997 International Year of the Reef, providing information for the planning and implementation of projects. ReefBase collaborated with the University of Rhode Island in the project Rapid Assessment of Management Parameters (RAMP) which developed guidelines for the conduct of surveys on social and cultural aspects of coral reef management. This resulted in a set of data fields for filing pertinent information in ReefBase; a manual of the methods developed and instructions for submission of results to ReefBase will be distributed with the first ReefBase version on CD-ROM. ReefBase is also developing a volunteer diver reef survey project, the ReefBase Aquanaut Program, which will gather information for ReefBase using a simple standard method of reef analysis to be taught during weekend training courses by certified trainers. Preliminary trials on a standard field method are currently underway, and final recommendations will be available at the 1996 International Coral Reef Symposium.

REEFBASE NEEDS YOUR HELP!

There are several ways in which you can help ReefBase improve the management of the coral reefs of the world.

1. Send us your papers, books and reports, information from which will be incorporated into ReefBase. The materials themselves are also valuable to people who come to ICLARM or contact us with requests for information. Most coral reefs are in developing countries, and scientists and managers from these countries need access to information particularly urgently. ReefBase needs to greatly expand its set of published material, but perhaps the most valuable information resides in unpublished reports (the kind that are sitting amid the shelves and filing cabinets of many of the readers of this article!). Help the world get some more mileage out of those project reports!
2. Send us your maps and charts. ReefBase should eventually have a detailed map available for every known coral reef. We are digitising from maps based on sources ranging from sketches to high-quality satellite or aerial photo data and extensive ground-truthing. We can work with all kinds of material. If you have done surveys on a reef leading to a sketch map, or have produced a map of a reef

or coral community from aerial or satellite imagery, please send us copies. We are particularly interested in receiving copies of charts of tropical shelf areas on which areas unsuitable for trawling have been marked, sediment charts, and maps showing administrative boundaries for marine protected areas or other marine zoning in areas which might support coral. Two major datasets have recently been obtained: Florida (provided by the Florida Marine Research Institute) and the Great Barrier Reef (provided by GBRMPA). These represent the state-of-the-art in coral reef mapping of relatively large areas. It is hoped that later versions of the ReefBase CD-ROM will include full GIS datasets, although questions of data ownership and quality still have to be resolved.

3. ReefBase information is available for incorporation into other databases or information analysis programs. For people starting up new research projects, a quick check of information in ReefBase on a proposed study site might save substantial amounts of effort and money, and several researchers have found our list of over 10,000 references to be helpful. In exchange, ReefBase would welcome your data sets. As a research program closes, an excellent way to ensure that optimal use will be made of the data collected is to deposit it with ReefBase. ReefBase has already incorporated data from the Australian Coral Reef Ecology Database and several other ongoing databases.
4. Send us your coral reef photographs. Photographs are an extremely effective way of communicating vital information, and we are aiming to obtain photos for each of the world's coral reefs. All photographers will be clearly credited in the database. Please send us copies as prints, slides, tapes or digital files of:
 - Aerial photos of coral reefs (see box on next page), and satellite images.
 - Underwater scenic photos and video transects; please include as much information as possible on the location, zone, depth and date, and chart coordinates (Global Positioning Systems – GPS – are highly recommended for use on the dive boat).
 - Photos of reef uses and users, including fishing gear, fishers, gatherers, villages, reef constructions, tourists, beach resorts etc., with locations and dates.
 - Photos of reef stresses and abusers, including coral diseases, bleaching, storm damage, overgrowth by algae, pollution, siltation, anchor damage, damage from fishing gear, people trampling or smashing corals, or piling up dirt for runways or roads, etc. Before and after pictures are especially valuable and please give locations and dates. Diagrams and computer animations illustrating the effects of reef stresses are particularly welcome.

If we use 20 or more of your photos in ReefBase, we will send you a free copy of the ReefBase Version 1.0 CD-ROM (one per photographer; one video transect, diagram or animation counts as a photo).

For further information, please contact: *John W. McManus*, ReefBase Project Leader, International Center for Living Aquatic Resources Management (ICLARM), MCPO Box 2631, 0718 Makati, Metro Manila, Philippines. Fax: (63-2) 816-3183. Email: j.mcmanus@cgnet.com

For matters related to maps and charts: *Mark Spalding*, ReefBase Project Co-Leader, World Conservation Monitoring Centre, 219 Huntingdon Road, Cambridge CB3 0DL, U.K. Fax: +44 (0)223 277136 Email: mark.spalding@wcmc.org.uk

Tips for photographing coral reefs from aeroplanes:

- the best time to shoot is 10 a.m. to 2 p.m. for depth penetration;
- avoid glitter bands on the water by shooting from the aeroplane side away from the sun;
- don't lean the camera against any part of the plane - vibrations may affect the picture;
- do underexpose by 1/2 f-stop;
- set the camera on infinity, particularly with auto-focus cameras;
- turn off your flash
- use higher speeds and wider f-stops than usual, as depth of field is not a problem;
- when possible, use a skylight, A-1 or UV haze filter;
- from light planes use a polarizer turned to maximum effect;
- be careful when using polarizers in commercial planes which may have windows already polarized - the combination may form rainbows or vignettes on the picture;
- for shooting while piloting an ultralight, try mounting the camera on your helmet;
- be ever vigilant - perfect conditions and excellent views of reefs occur unexpectedly.

MEETING REPORTS

LARVAL SUPPLY AND THE RECRUITMENT OF REEF FISHES

International Larval Fish Conference: Session on Coral Reef Fish Larvae
Sydney, Australia, June 26th-July 2nd 1995

Variable replenishment is a common characteristic of marine fish populations that reproduce via pelagic larvae. Interannual variability in this function limits society's ability to have constant harvests from wild stocks and can extinguish stocks that have been depleted through overfishing. While these lessons of history have been learned mostly from industrialised fisheries in the temperate zone, such as the spectacular collapse of the once bountiful cod off Newfoundland (see *New Scientist* 16 September 1995 pp. 24-29), recent research has shown similar dynamics in unexploited fish populations

from tropical and temperate reefs where it is easier and cheaper to research the mechanisms underlying this crucial phenomenon.

The reef fish session of the International Larval Fish Conference showed just how far we have progressed towards understanding the early life history of these animals. It is not long ago since larval fish ecology was obtained exclusively from towed plankton nets where catches are dominated by the smaller more passive stages. With the exception of Trnski (all names refer to presenters), who asked which fish can complete their life cycles inside a closed atoll lagoon, alternative approaches dominated the sampling. None is more illustrative than Leis who described catching pelagic juveniles with light-traps, then following them in the sea on SCUBA. Direct observation reveals that the presettlement stages are active, sensorily aware, capable of controlling both vertical and horizontal movements. This message was amplified by Stobutski's forced swimming of tropical reef fish in which she showed that presettlement surgeonfishes can swim the equivalent of 100 km without rest in just eight days. The potential revealed by these behavioural studies was matched by several presentations (Carleton, Doherty, Kingsford) reporting non-random distribution and abundance of pelagic juveniles at various spatial scales around tropical reefs.

Light-traps and fish torture chambers were not the only new technologies on show. Dufour described how he has used stationary fyke nets to estimate larval flux through the surf zones of reefs in French Polynesia. McIlwain applied the same technique successfully to the first monitoring of fringing reefs in remote north-western Australia but raised doubts about its applicability to the platform reefs of the Great Barrier Reef. From the Bahamas, Shenker described the daily flux of larval fish monitored using stationary bag nets moored across channels with swift tidal currents. A common theme to emerge from this monitoring of larval supply was the need to understand the processes that underlie the delivery of massive but short-lived bursts of replenishment, for which Thorrold described some oceanographic mechanisms.

Brave innovation was personified by Jones' description of a tag and release project applied to larval fish in the open sea. His team put chemical tags into nine million damselfish eggs on the northern GBR, recovered 15,000 with light-traps and actually found one marked individual among the first 1000 processed.

A perennial reason why ecologists are attracted to reef fishes is that they are amenable to observation and experimental manipulation from early in life. Presentations from the GBR (Finn, Sweatman), Hawaii (Frederick) and Moorea (Schmitt) described the fate of colonists in the period immediately after settlement. Again, the theme of active habitat selection was evident and new information on migration rates suggested that post-settlement mortality may often be overestimated. In the modern manner, even more conventional recruitment studies (Caselle, Cowen) were data rich - allowing the contributions of larval supply, habitat selection and post-settlement regulation to be assessed over a hierarchy of spatial and temporal scales. In addition to the usual coin of "abundance", Kerrigan reported

on clear differences in the biochemical condition of successive year-classes, which yields clues to the scale of the controlling process(s), and Booth asked whether these factors can be correlated with survival after settlement.

The empirical database was complemented by novel analyses of indirect proxies like fish otoliths and fish genes to probe dispersal. Wellington compared the pelagic larval durations of congeneric damselfishes among locations in the eastern Pacific and concluded that there was no obvious ecological consequence from length of larval life. Murdoch, however, showed that the age and size at settlement of conspecifics can vary with reef density on relatively small spatial scales. Shafer used elemental composition of otoliths from Hawaiian gobies as environmental recorders. Planes compared allozyme variation in GBR fishes with their dispersal potential and suggested that the active behaviour of fish larvae may allow them to retard rather than enhance hydrodynamic dispersal.

Each subtheme was strengthened by multiple contributions on the same subject. The Caribbean and the GBR have long been independent centres of excellence and debate in reef fish ecology. The studies from the eastern Pacific added new perspectives from oceanic reefs. Only the Indian Ocean was unrepresented, providing a challenge for future convenors. Early in the planning phase, I removed the word "coral" from the title of the session in order to admit two synthetic studies of temperate reef fishes, which I think offered valuable contrast. Breitberg summarised her experimental and observational work on naked gobies to show how habitat structure, flow and larval behaviour interact to produce patterns in settlement; a theme reiterated in several of the tropical talks. Thresher summarised 10 years of recruitment data on clinids from the bottom of the world, with breathless forays into side issues like otolith microchemistry, stock-recruitment relationships and climate. His conclusion that there had been a qualitative shift over time between internal and external control of replenishment alerted us to the complexity that can be found even in simple systems.

With 25 speakers, a coherent theme, innovative techniques, truly new understanding, and a considerable degree of consensus, I would say that the reef fish session was an outstanding success. I wish that I could take more credit for it but where is the conductor without the orchestra or for that matter the audience, which remained large and curious for more than eight hours. The best compliment that I can give to those who presented papers in Sydney is to repeat a comment overheard in the corridor from a spectator who thought that "those reef fish people really had their s— together at this meeting"; and didn't we have fun!

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This report first appeared in *Stages*, the newsletter of the Early Life-history Section of the American Fisheries Society, and is reproduced here with permission.

18TH PACIFIC SCIENCE CONGRESS – CORAL REEF COMMITTEE REPORT

A small but energetic group of coral reef scientists met at the 18th Pacific Science Congress in Beijing, China during the week of June 5–12 1995. Seventeen papers and six posters were presented. The highlight of the meeting was a keynote address delivered by Dr David Stoddart of the University of California at Berkeley who reviewed the history of coral reef science in the 20th century, with emphasis on the Pacific region. Dr Yossi Loya of Tel Aviv University presented a plenary lecture on the second day of the symposium on century long climate change in the Sinai as revealed by coral isotope geochemical records. Another provocative paper on environmental change in Hong Kong and the potential impact on corals of the area was given by Professor Brian Morton of the University of Hong Kong. Also noteworthy were five papers delivered by Chinese scientists on the Nansha Islands, also known as the Spratly Islands, situated in the South China Sea. These islands are currently the subject of complex ownership and jurisdictional disputes between several countries in the region (see *Reef Encounter* 16).

The general theme of the meeting included the status, health, management and conservation of coral reefs. Professor Kyoshi Yamazato presented a summary of the Dumaguete meeting held the week before in the Philippines regarding the International Coral Reef Initiative (ICRI) and its *Framework for Action*, further elaborated on by Paul Holthus of The Nature Conservancy. Professor Yamazato also described the status of coral reefs in South-East Asian seas.

Other important news to emerge from the 18th Pacific Science Congress in Beijing included plans for two future Intercongresses (VIII and IX) to be held in Fiji and Taiwan in 1997 and 1998 respectively. The 19th Pacific Science Congress will be held in Sydney, Australia in 1999. Plans for the Pacific Science Committee on Coral Reefs for the Fiji Intercongress include a symposium on the ICRI and the International Year of the Reef. Dr Charles Birkeland was elected as the new chairman of the PSA Scientific Committee on Coral Reefs at the Beijing meeting, replacing Dr Richard Grigg, who has served as chairman for the last eight years. Future correspondence regarding committee business should be directed to Dr Birkeland at the University of Guam [address under ISRS News].

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INTEGRATED MARINE CONSERVATION IN THE INDIAN OCEAN

The Indian Ocean Conservation Project (IOCP), a three way partnership of the Indian Ocean Marine Affairs Cooperation Secretariat (IOMAC, Sri Lanka), Fauna International (Sri Lanka) and the New England Aquarium (USA), held its first

workshop in Mombasa, Kenya, from November 28–December 1, 1995. The workshop 'Integrating Marine Conservation in the Indian Ocean – 1996 and Beyond' brought together 60 participants from 11 Indian Ocean countries (Australia, Comoros, India, Indonesia, Kenya, Mauritius, Oman, Seychelles, South Africa, Sri Lanka, and Tanzania), and Canada and the USA.

The objective of the workshop was to identify priorities for conservation in the areas of coral reefs, marine mammals, sea turtles and pelagic fisheries for the Indian Ocean. The dominant theme that emerged was that conservation in the region will only be tenable so long as it incorporates human use of marine resources, through protecting the species and ecosystems on which people depend. The workshop strongly emphasized that conservation activities must be set in the context of local development, and developed along lines consistent with local cultural values and attitudes.

For coral reefs, this meant recognizing that local communities' access to basic resources such as fish and coral rock must be preserved, but managed sustainably. To achieve this, planning for resource management must involve local people and their values from the beginning. At the local conservation level, several recommendations were made:

1. That community conservation projects should be established in which a feasibility phase and each subsequent phase of the project are repeatedly verified at the local level to ensure they match local priorities and needs.
2. That information used by local people in finding and using their resources be incorporated in the management framework. By recording this information on maps it becomes available for the modern planning process, while also empowering local peoples in the ownership and control of information that is important to them.
3. That degraded habitats be rehabilitated to revive productivity in previously over-used locations.

Recommendations for research centered around various survey methods to obtain baseline data for management and long-term monitoring. Field surveys of reef biodiversity, aerial surveys (for habitat features and photographic mapping), and interview/mapping surveys of indigenous/local information were recommended. These would be incorporated into management decision making through simple databases and GIS.

Regional cooperation through the IOCP network was seen as important to the region, in sharing experiences and information from culturally and biologically similar reef areas. A regional coral reef database for the Indian Ocean, training workshops (in coral reef biogeography and systematics, protected areas management and marine resource management), and coordinating with other international and global coral reef programs (ICRI, IYOR, ReefBase) were also recommended.

For more information contact: David Obura, New England Aquarium, Central Wharf, Boston MA 02110, USA. Tel: +1 617 973 0274/5229, Fax: 720 5098, email: iomarine@tiac.net; or Anouk Ilangakoon, Fauna International, 218/11 Baudhaloka

Mawatha, Colombo 7, Sri Lanka; Telfax: +94 1 580236; email: faunasl@sri.lanka.net. For surfers: <http://www.neaq.org/CON/con.io.html>

CENTRAL AMERICAN CORAL REEF MONITORING WORKSHOP

With the participation of representatives of the seven Central American region countries, a Coral Reef Monitoring Workshop was held July 24–28, 1995, in Belize City, Belize. Sponsored by the Wildlife Conservation Society, through its Paseo Pantera project, and co-hosted with the Fisheries Department of Belize, the event brought together coral reef specialists and managers from Panama, Costa Rica, Nicaragua, El Salvador, Honduras, Guatemala, Belize and Mexico. The event was coordinated by Dr. Archie Carr III of the Wildlife Conservation Society, and technical expertise was provided by Dr. Caroline Rogers from the U.S. National Biological Service, Virgin Island National Park, and Dr Jorge Cortes from the University of Costa Rica.

Regional coral reef monitoring is one of the objectives of the initiatives being developed through the Central American Commission for Environment and Development and the aim of the workshop was to develop ideas for such programmes. The workshop included a series of country reports on the status of coral reefs in the seven states, as well as on the extent of monitoring in each country. The extensive coral reefs in the Central American region, from the Yucatan to Panama are threatened as a result of human actions in the coastal zone and on the reefs. Presentations were also given on existing regional programmes such as CARICOMP and on remote sensing and its application to reef monitoring.

Among the recommendations from the workshop, the need for a basic monitoring programme was stressed, with better links between neighbouring marine parks, marine laboratories and other institutions involved in reef research and management in order to share experiences. It was felt that often regional expertise was ignored in favour of calling in international experts as consultants, although a striking finding of the workshop was the lack of trained personnel within each country for carrying out monitoring programmes. The existence of large numbers of manuals was acknowledged but it was recognised that these are no substitute for hands-on training. A brief outline of a monitoring program including mapping, data collection of physical and biological components, and the establishment of permanent sites was prepared. Finally aspects of data management, communication and information exchange between countries, training and funding were discussed, and it was agreed that a simple newsletter should be produced in English and Spanish to facilitate communication between the countries.

The workshop concluded with a visit to the new University College of Belize Marine Research Centre at Calabash Caye on Turneffe Atoll.

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Further information from: Dr A. Carr, Wildlife Conservation Society, 4424 NW 13th St, Suite A2, Gainesville, Florida 32609, USA. e-mail: wcsfl@freenet.ufl.edu

CORAL REEFS AND THE WORLD BANK

On June 23, 1995, the World Bank hosted a one day workshop entitled 'Sustainable Financing Mechanisms For Coral Reef Conservation'. Over 100 representatives from the World Bank Group, private businesses and organizations, government agencies, NGOs and institutions attended. The workshop had two purposes. The first was to formally launch a joint publication by the Great Barrier Reef Marine Park Authority, the World Conservation Union (IUCN) and The World Bank. *A Global Representative System of Marine Protected Areas*, edited by Graeme Kelleher, Chris Bleakley and Sue Wells, provides the first global inventory of marine protected areas (MPAs), and offers recommendations for those in need of improved protection and management, as well as the designation of new areas. The four volume report is accompanied by maps showing the distribution of MPAs in 18 regions. The report is the culmination of nine years' work by IUCN's Commission on National Parks and Protected Areas, and 18 regional working groups, comprised of scientists and resource managers. The groups developed recommendations for each region considering marine biodiversity, biogeographic variation, national and regional-level priorities and protection status.

The workshop's second purpose, which took up most of the day, was to discuss various options and opportunities for the sustainable financing of conservation efforts for coral reefs and related ecosystems. Panelists invited from Australia, Egypt, the Philippines, the U.S., the U.K. and the Caribbean, presented case studies and shared common experiences. A broad range of topics were covered, including the establishment of trust funds, partnerships with private enterprise, the NGO community and governments; income-generating opportunities in areas such as eco-tourism, the viability of user fees, bioprospecting and use of technology, and the application of various management strategies.

The panelists made presentations in three separate categories: Financing and Sustaining Coral Reef Conservation Initiatives; Income-Generating Opportunities and Environmental Limitations; and Creating Planning and Investment Frameworks through Partnerships. The sessions were followed by group discussions. Representatives from the International Coral Reef Initiative (ICRI), which held its kickoff meeting in Dumagette City, Philippines, just two weeks prior to the workshop, also attended and discussed ways in which sustainable financing might be integrated into the ICRI process.

Several common issues were identified by the workshop participants, including:

- direct involvement and ownership by local communities is critical to long-term support and viability of marine protected areas. National policies also have to be congruent with local initiatives.
- partnerships between private users, user groups, local

communities and governments are likely to be more effective than single or limited donor support;

- the need to specifically earmark funding for specific areas and purposes, rather than generic contributions to general funds. Willingness-to-pay by users was found to be closely linked with distrust in government spending;
- eco-tourism offers an obvious source of fiscal support for coral reefs and MPAs of interest; however, there are also areas in need of protection from excessive human use or impact that require sustainable support. Multiple-use zoning may be one tool to address such concern.

During the group discussion, a challenge was issued by the World Bank's Vice President for Environmentally Sustainable Development, Ismail Serageldin, for workshop participants to identify 5-6 developing countries with national commitment and priorities for coral reef conservation. Once identified, the Vice President agreed to meet with each country's finance minister during The World Bank's Third Annual Conference: "Effective Financing of Environmentally Sustainable Development" in October, 1995 in Washington, D.C., to consider funding opportunities for projects involving coral reef conservation. Thus far, representatives from the workshop have identified Belize, Costa Rica, Tanzania (Zanzibar), Madagascar, Indonesia and the Philippines as candidates for consideration.

Sustainable financing is emerging as a frequent theme throughout the global conservation community, and The World Bank is to be commended for supporting this effort specifically for coral reefs. Regionally, the Caribbean Natural Resources Institute and others have held workshops this spring and summer to address sustainable financing of marine protected areas. The challenge now is to continue dialogue on sustainable financing through networking and future forums with other organizations and institutions.

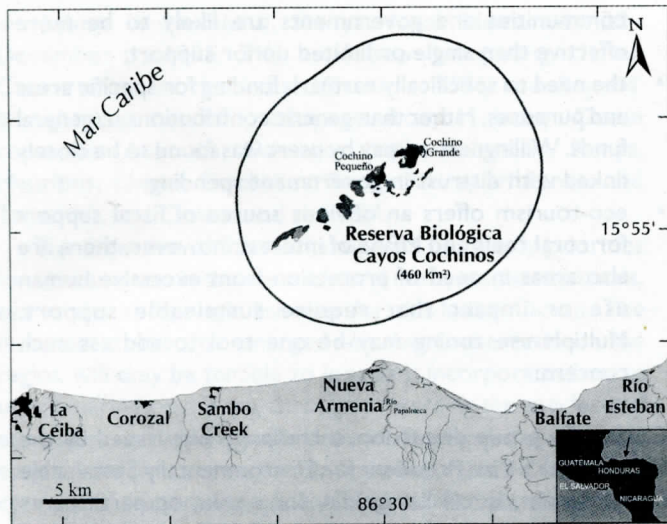
The proceedings of the workshop are available from the World Bank, Environment Department, 1818 H Street, N.W., Washington, D.C. 20433, U.S.A. Copies of the MPA report are available from the Great Barrier Reef Marine Park Authority, GPO Box 791, Canberra, ACT 2601, Australia, and IUCN Headquarters, Rue Mauverney 28, CH-1195, Gland, Switzerland, and the World Bank at the above address.

Further information from: Andy Hooten at 76260.2413@compuserve.com; tel. 1-301-942-8839.

WHO'S WHO?

A NEW RESEARCH FACILITY AND PROTECTED AREA IN HONDURAS

The Cayos Cochinos Biological Reserve, a 460 km² archipelago that includes two forested islands and 12 sand cays, as well as surrounding coral reefs and seagrass beds, was created by the Honduras Government in 1993, with the assistance of the Honduras Coral Reef Fund, the Smithsonian Tropical Research Institute, and the AVINA Foundation.



The reserve lies 25 km to the northeast of La Ceiba, on the northern coast of Honduras. The archipelago, part of the Bay Islands, is an excellent representative of Caribbean reef and seagrass ecosystems. The islands are inhabited by the Garífunas (black caribs), and their main activity is fishing for sustenance and business. A small scale tourist operation is managed by foreign investors. A set of urgently required regulations was implemented to stop over-fishing of key resources by commercial fishermen and to limit new construction for tourism. The regulations are enforced by a team of civilian and Navy rangers, trained in conservation and protection of natural resources as well as social welfare, who patrol the Biological Reserve and interact with local communities. The Smithsonian Tropical Research Institute has been working closely with the Government of Honduras, at their request, to develop an integrated management agenda and long-term scientific monitoring program for the Biological Reserve. The program covers the ecological, biological and anthropological aspects of the archipelago that are important elements for sustainable and scientific management.

Recently, a new biological research station on Cochino Pequeño (Small Hog), one of the forested islands, was opened to national and international students, scientists and managers, with interests in tropical ecology, biology, and anthropology. The new field station includes a solar powered laboratory and living space for 15 scientists, housing for a station manager, a new pier with wet-lab facilities (including a seawater aquaria system), a computer and instrument room, offices for students and researchers; and a dining facility that doubles as an auditorium. Boats are also available. Hydrographic and meteorologic monitoring equipment on the island is maintained by the U.S. National Oceanic and Atmospheric Administration.

The facility can be used for field courses in tropical marine ecology or other related activities. Fellowships for graduate students can be requested under the Smithsonian Institution Fellowship Program. We encourage proposals related to management of marine resources, ecological and anthropological modelling, conservation

biology, basic and apply biology and ecology, and archeology.

Further information from: Smithsonian Tropical Research Institute, c/o Honduras Project, Unit 0948, APO AA 34002-0948, U.S.A. or P.O. Box 2072, Balboa, Republic of Panama. Telephone in Panama (507) 228-4022, 228-4060, 228-0636; fax (507) 228-0517, 228-0516; e-mail stri01.naos.guzmanh@ic.si.edu

BOOK SHELF

PARROTFISH GRAZING ON CORAL REEFS: A TROPHIC NOVELTY

J. Henrich Bruggemann

PhD-thesis (with a summary in Dutch), University of Groningen, The Netherlands, 213pp, ISBN 90-9007984-X. Available from the Dept. of Marine Biology, University of Groningen, P.O. Box 14, 9750 AA Haren, The Netherlands. Fax: +31 50 635205. Price US\$20 + US\$5 (airmail).

Parrotfish (family Scaridae) are not only colourful ornaments of coral reefs, they also play vital roles in the functioning of these ecosystems. In spite of their prominence as grazers, secondary producers and reef bioeroders, quantitative data on their contribution to these processes are very scarce. This lack of data inspired a study on the feeding ecology of two Caribbean parrotfish species, *Scarus vetula* and *Sparisoma viride*, which was performed on the well-protected reefs of Bonaire, Netherlands Antilles.

The thesis contains new data, conclusions and ideas resulting from six years of research on these large herbivores. Novel methods were developed to quantify food intake by fish, and combined with detailed observations of their feeding behaviour in the field. In spite of large differences in feeding mode and algal resources harvested, daily food intake by *Scarus vetula*, the 'scraper', is similar to that by *Sparisoma viride*, the 'excavator'. Allocation of energy and nutrients to growth was quantified for free-living *S. viride*, using capture-recapture methods. The erosional impact of parrotfish grazing varied with fish feeding mode and size. Large differences in erosion rates were found between reef zones, and on the level of individual food and substrate types. Comparison of carbon production by algae and consumption by herbivores showed herbivore populations at Bonaire are probably limited by food resources. Moreover, food competition is probably a major structuring force in herbivore population dynamics.

This book, handsomely illustrated by Dick Visser (some of the illustrations are reproduced in this issue), aspires to contribute some new ideas on the role of plant-herbivore interactions in the functioning of coral reef ecosystems.

TALES FROM TUBBATAHA

Y. Arquiza and A. White

136 pp. ISBN 971-91447-0-X. 1994. Details on availability from Alan White, CRMP, Colombo, Fax 941-500-207; e-mail: crmp@sri.lanka.net

Subtitled 'Natural History, Resource Use and Conservation of the Tubbataha Reefs, Palawan, Philippines' this describes and explores the conservation issues surrounding these coral atolls sprawled in the middle of the Sulu Sea. Information has been collated from numerous scientific and socio-economic studies since the first survey of 1982. It ends with action-oriented strategies for the sustained management of this national park which has now been designated a World Heritage Site.

OCEAN YEARBOOK, VOLUME II

Ed. E.Mann Borgese, N. Ginsburg and J.R. Morgan

676 pp. ISBN 0-226-06614-2. 1995. The University of Chicago Press, Chicago and London. Price US\$77.00.

The *Ocean Yearbooks* are produced by the International Ocean Institute (IOI) which operates out of Malta, Halifax (Canada) and Hawaii. They are published jointly with the William S. Richardson School of Law and by the University of Chicago Press, bringing together on an annual basis ecological and economic data on all major uses of the oceans and the political and legal issues involved. Intended as a reference book for libraries and

institutions, the principal aim is to put at the disposal of developing countries the complex information on multiple uses of the oceans that are often inaccessible in such countries. This latest issue includes a range of articles on themes as diverse as living resources, transportation, coastal management and military activities. An extensive set of appendices provides reports from the various regional and international organisations and committees related to ocean science and management, tables of data relating to the environment, and information on a range of other topics.

CORALS IN SPACE AND TIME

J.E.N. Veron

321 pp. ISBN 0 86840 390. 1995. The University of New South Wales Press. Available from Australian Institute of Marine Science, Fax 6177-716135. Price Au\$34.95 plus Au\$4 postage.

This merits a full review which we hope to organise for the next issue – as Frank Talbot says of it on the back cover “Darwin would have approved”. Charlie Veron uses his 25 years of study to attempt to answer two basic questions: ‘Why do corals occur where they do?’, and ‘How is their distribution related to evolutionary processes?’ Integrating taxonomy, evolution, palaeontology, biology and biogeography, it will be of interest to a wide range of students, teachers, and researchers in the marine sciences.

COASTAL PROBLEMS: GEOMORPHOLOGY, ECOLOGY AND SOCIETY AT THE COAST

Ed. H. Viles and T. Spencer

350 pp. ISBN 0 340 53197 5 (Pb)/0 340 62540 6 (Hb). 1995. Edward Arnold, London, Melbourne, Auckland.

This brings together material vital to any attempts to understand and manage the world's coasts. The first chapters provide concise descriptions of the main coastal processes, with more detailed coverage of particular coastal types: beaches and dunes, cliffs and platforms, wetlands, coral reefs, and ‘cold’ coasts. The final chapter presents a holistic approach to management. Extensive use is made of case studies drawn from around the world. This should provide a very useful text for students and coastal management practitioners alike.

REEF ASSESSMENT AND MONITORING USING VOLUNTEERS AND NON-PROFESSIONALS

S.M. Wells

57 pp. 1995. Compiled in association with the Tropical Marine Research Unit, University of York and Coral Cay Conservation, UK. Printed by Rosenstiel School of Marine Science, University of Miami, USA. Price US\$15.00 inc. postage and packing, payable in advance. Available from Comparative Sedimentology Laboratory, c/o Robert Ginsberg, University of Miami, RSMAS/MGG, 4600 Rickenbacker Causeway, Miami FL 33149, USA.

Initially prepared as part of a review of the volunteer programme REEFWATCH that was established at the University of York, this report provides information on about a dozen reef research and assessment programmes that use volunteers and non-professionals. It also includes the guidelines and recommendations that were drawn up at the workshop on ‘Volunteer Programmes in Applied Marine Research and Reef Management’ held during the ISRS European meeting in Luxembourg in September 1994. The focus is on the scientific aspects of such programmes, particularly the methods used in data gathering and their limitations and successes. The report concludes that non-professionals can play a useful role in research and assessment, provided the programme is designed with their limitations and capabilities in mind.

CORAL REEF ECOSYSTEMS

G.J. Bakus

232 pp., 1994. ISBN 81-204-0766-0. Oxford and IBH Publishing Co. PVT. Ltd., New Delhi, Bombay, Calcutta. Available from A.A. Balkema Publishers, P.O. Box 1675, 3000 BR Rotterdam, Netherlands, Price £30.00 (plus 6% VAT for private customers living within the EU); and A.A. Balkema Publishers, Old Post Road, Brookfield, VT 05036, USA, Price US\$45.00.

The slightly deceptive title of this book disguises its true value. It comprises a 57 page descriptive ‘monograph’ on the coral reef ecosystems of India and its adjacent islands including the Maldives and Sri Lanka, a region for which reef information is extremely scattered and sparse. The paper is one

of a series on the coral reefs of India, and is part of the Indo-US Marine Bioactive Substances Programme which started in 1984. It is followed by a bibliography over 40 pages long, which must be one of the most extensive compilations of literature relating to Indian coral reefs. The rest of the book contains some 30 Appendices covering oceanographic data and species checklists for the different island groups. If you want to know something about reefs in India and adjacent areas, start with this publication.

MARINE PROTECTED AREAS: PRINCIPLES AND TECHNIQUES FOR MANAGEMENT

Ed. S. Gubbay

232 pp. 1995. ISBN 0 412 59450 1. Chapman and Hall, London, New York, Tokyo. Price 15 pounds sterling.

This is a series of papers covering the selection, setting up and techniques for the management of marine protected areas. Principles are supported by case studies drawn from all the main marine regions of the world, including those with reefs: Oman, Saudi Arabia, the Philippines, Australia and Florida. There is a rapidly growing body of literature on MPAs, filling a long felt gap, and this is a particularly practical addition.

MARINE PROTECTED AREAS AND SUSTAINABLE FISHERIES

Ed. N.L. Shackell and J.H.M. Willison

300 pp, 1995. ISBN 0-9699338-0-0. Science and Management of Protected Areas Association (SAMPAA), Wolfville, Nova Scotia, Canada. Available from: SAMPAA, Centre for Wildlife and Conservation Biology, Acadia University, Wolfville, Nova Scotia BOP 1X0, Canada. Fax 902-542-3466; email: bondrup@max.acadiau.ca Price Cdn/US \$30.00, cheque or money order payable to Science and Management of Protected Areas Association.

This book is the proceedings of the symposium on marine protected areas and sustainable fisheries held during the Second International Conference on Science and the Management of Protected Areas in Nova Scotia, May 1994. This event, organised by SAMPAA, included participants from academia, industry, government and NGOs from several countries. The publication contains papers covering a wide range of case studies relating to the role of protected areas in ocean management, and in particular promoting their concept in fisheries management. Although not surprisingly focused on northern climes, many of the case studies provide relevant and useful information on and discussions of marine protected area principles in general.

ANNOUNCEMENTS

UPDATE – CORAL REEF RESEARCHERS' DIRECTORY

The *Directory of Coral Reef Researchers of the Pacific* is being updated to be world-wide in scope. The International Coral Reef Initiative and the South Pacific Regional Environment Programme are providing funds to support this effort. All researchers who have previously been contacted will receive a copy of the current entry for verification and e-mail address addition. Additional researchers will receive original questionnaires. Since questionnaires will be sent out before the end of this year, a final draft is anticipated to be completed by the time of the International Coral Reef Symposium in Panama in June 1996. In addition, it is planned to have this directory on the web. For further information contact: L. G. Eldredge, *Pacific Science Association*, P.O. Box 17801, Honolulu, Hawaii 96817; Tel: +1 808 848-4139; Fax +1 808 847-8252; email: psa@bishop.bishop.hawaii.org.

WORLD MANGROVE ATLAS

The first draft of a World Mangrove Atlas was presented at a meeting at the Australian Institute of Marine Sciences in Townsville, Australia in September 1995. The atlas is being produced by the World Conservation Monitoring Centre and will be printed early next year. Mapped data have been prepared for over 100 countries and are held on the GIS at WCMC and will be linked to coral reef maps on ReefBase (see p.16), as well as to other data-holdings at WCMC. Further information from: Mark Spalding, *World Conservation Monitoring Centre*, 219 Huntingdon Road, Cambridge CB3 0DL, UK. Fax (44) 1223-277136; e-mail: mark.spalding@wcmc.org.uk

MEMBERSHIP

The annual subscription for individual membership of ISRS is currently US\$60, 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\$70. Student membership costs US\$10 and benefits include all of the above except the journal *Coral Reefs*.

Members outside Europe should add US\$20 for airmail delivery of *Coral Reefs* (copies will otherwise be sent surface mail).

Renewals received between 1 March and 30 April will cost

US\$20 for a student member, US\$70 for a full member and US\$80 for a family membership. Those received after 1 May will cost US\$25, US\$80 and US\$90 respectively. New memberships will be at the base rate of US\$10, US\$60 and US\$70 regardless of what time of year they join.

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 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 and in double-spaced typescript or, preferably, on diskette or by e-mail using Wordperfect or DOS-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. Diagrams should have legends and/or captions to explain all symbols, abbreviations and shading patterns etc. Maps should have a scale and indication of orientation. Use *World List* abbreviations in references. Please use metric, or imperial-with-metric units, but not imperial units on their own. Do not forget to give your name and full address, or any other contact address where applicable.

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

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