THE RESOLUTION ARRIVES AT TAHITI, APRIL 1774

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We sincerely apologise for the failure of RE3 to appear in 1985. We are sure that readers will not want to know the inner details of the endless series of events, domestic and professional, which slowed production almost (but never quite completely) to a halt, but we should like to say that editing and production of RE is very much a personal affair. The task force which produces it rarely exceeds the equivalent of 2 people, so we are very vulnerable to human frailties. This issue was produced with the assistance of Jill Darrell and Barbara Brown (though responsibility for the delay rests entirely with the Editor). The typesetting was done by Lydia Woolley.

The delay means that much of our content is not as newsworthy as it should be. We have included almost all of the original projected content however, in the belief that it still makes interesting reading. (Well, we all read old mags in dentists’ and doctors’ waiting rooms!) If there are significant developments which have taken place since a particular item was written, then why not write an update for us?

We look forward to a better production year in 1986, for which we also wish you many happy reef encounters. We ourselves look forward to the possibility of having firm copy deadline, but we hope we shall have enough copy — and time to turn it into RE4 — by September 1st 1986.

Finally, something about this newsletter’s name. For those who are inclined to add a final ‘s’ to the title, and for anyone else with sufficient curiosity, here is a clue: derived not so much from extraterrestrial happenings for anyone else with sufficient curiosity, here is a clue: derived not so much from extraterrestrial happenings as it should be. We have included almost all of the original projected content however, in the belief that it still makes interesting reading. (Well, we all read old mags in dentists’ and doctors’ waiting rooms!) If there are significant developments which have taken place since a particular item was written, then why not write an update for us?

In the meantime, please don’t give up sending us material. Under the circumstances we hesitate to give a firm copy deadline, but we hope we shall have enough copy — and time to turn it into RE4 — by September 1st 1986.

We have no regular reprint system, but interested contributors should contact the Editor.

June 22nd to July 9th, 1986
SECOND INTERNATIONAL SYMPOSIUM ON INDO-PACIFIC MARINE BIOLOGY
UNIVERSITY OF GUAM, TRUK AND PONAPE ISLANDS.

Subjects to be covered are indicated by the following symposia, but there will also be sessions for contributed papers:

I Behaviour of marine crustaceans: recent advances
II Ecology of marine crustaceans
III Biogeography and evolution of marine crustaceans
IV Recruitment mechanisms of coral reef fish
V Introduced marine species in the Indo-Pacific
VI Recent findings in Acanthaster biology and implications for reef management.

There will be field trips at Guam, Truk and Ponape within the above dates. The proceedings will be published by the Bulletin of Marine Science.

For further details, contact: The Western Society of Naturalists, Professor David H. Montgomery, Secretary Biological Sciences Department, California Polytechnic State University, San Luis Obispo, California, 93407, USA (telephone (805) 546-2446).

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NOTES FOR CONTRIBUTORS

To save time and postage, we shall not normally acknowledge material submitted to us, and, apart from articles for Currents, material will not normally be refereed, or returned for corrections. Opinions expressed, and errors of fact will have to remain largely authors’ responsibility. No published item moreover should be taken as ISRS opinion unless we have clearly indicated this.

Please help us by sending items not more than about 2000 words in length and in double spaced typescript. You can expect some gentle editing for flow and sense, and in order to address our readership as appropriately as possible.

References are by footnote, similar in style to Nature and Science, using World List abbreviations. Please use metric, or imperial-with-metric units, but not imperial units on their own. PLEASE NOTE THAT POORLY PREPARED MAPS AND DIAGRAMS HAVE COST US TIME IN RE-DRAFTING. Illustrations should be of a size compatible with our current format, whether you opt for 1:1 reproduction, or a certain amount of reduction. We prefer originals, but if you send photocopies, ensure that they are reproduced with sufficient intensity of black line to be suitable for camera-ready printing. If you specify reduction, ensure that all the details will still be clear. Diagrams should have legends and/or captions to explain all symbols, abbreviations and shading patterns (etc.). In addition, maps should have a scale, and indication of orientation. Use of an inset map to show broader geographical setting is helpful. PLEASE GIVE YOUR OWN NAME(S) AND FULL ADDRESS(ES) TOGETHER WITH ANY OTHER RELEVANT CONTACT ADDRESS AND TELEPHONE NUMBER FOR READERS, IF THESE ARE DIFFERENT FROM YOUR OWN.

We have no regular reprint system, but interested contributors should contact the Editor.

For guidelines on the kind of material we need, please refer to RE2 (June 1984), p.2.

Brian R. Rosen, Editor, Reef Encounter, Department of Palaeontology, British Museum (Natural History), Cromwell Road, London SW7 5BD, U.K. (telephone: 01-589 6323 extension 316).
Reefs: so what's the problem?

Reef workers are gradually becoming more organized internationally. This must be a healthy situation, not because it leads to more and grander international meetings, nor even because it fosters better exchange, but because it will eventually help to draw attention to the value of working in what some countries see as an esoteric field.

We can make a rough and ready distinction between countries which have reef coastlines, and those which do not, and generally, the significance of reef research is easier to convey to your compatriots if you have reefs on your national doorstep. Even so, some reefal nations are short of their own expertise, but usually manage to invite outside participation. Conversely, some non-reefal countries have scientific and academic links (often a legacy from some bygone empire) which commits them to research in a reefal country. For yet others, what they lack in living reefs, they make up for in fossil reefs, often of economic importance. For the remaining countries, however reef research is becoming ever harder to justify against the pressures of cutbacks in scientific funding. They are being asked to concentrate their effort on matters of local interest, or on projects which, while clearly of universal scientific importance, do not cost the earth to fund. This second effect often leads to increased nation-sharing of major projects. And here lies the point and the challenge to reef workers.

Can we define one or more major scientific problems that unite the maximum range of research carried out on reefs, and which would therefore also improve interest and support? In short, are reefs really a 'problem'? One reaction might be to say that if they are a problem then we should not need to ponder the question: our very doubts give us away. But the matter is not so simple. In the nineteenth century, to be sure, everyone recognized that there was a reef problem, mainly, how did they get there? Since the apparent solution of this through the contributions of Darwin, Daly, some critical boreholes, the karstic approach and plate tectonics, this problem cannot really be said to exist any more. We might now all easily pass for a train-load of passengers without a destination. To be sure, there are lots of busy people getting on and off, changing trains for some other exterior scientific destination. Some even stay on board working out the details, but who, or what does that leave?

Two long established reef themes are geomorphology and diversity. Their pedigree as major scientific problems however is doubtful. Are not the basic geomorphological ideas about reefs worked out, and cannot the rest be absorbed into bigger questions? And diversity, if it really is a reef problem at all, has principally led us in grand circles of competition, food webs, niche partitioning, stability, disturbance and adaptive strategies, looking for an intellectually more satisfying way out. Even the classic geological questions about reefs can be seen simply as special cases of carbonate petrology or facies analysis, and are not, therefore, peculiarly reefal.

Elsewhere in this issue, two authors, Peter Skelton and Boris Preobrazhensky, have offered some very differently expressed views about the nature and purpose of future reef research. To take up this theme therefore, here are three topics which reef workers might unite on (without of course necessarily leaving their own favoured subject).

1. The 'unusual' nature of many reef organisms, both living and fossil, especially the colonial or modular ones: they seem to be immortal, or to have life history patterns so utterly different from the standard unitary organisms beloved by most evolutionary biologists, that our basic models of evolutionary processes will probably prove to be inadequate. At the same time they are also major reef builders.

2. Oil and minerals! The economic importance of fossil reefs is beyond doubt, but the interpretation of ancient reefs and their associated strata not only requires its own geological expertise, but also good up-to-date input from biological studies of modern reefs. Unfortunately, through no real fault of their own, the reef biologists are rarely trying to answer the geologists' questions, while the geologists do not usually have the time, support or expertise to go and find the answers themselves. Sometimes they are content to use well-worn overgeneralisations, or perhaps prefer not to ask any biological questions at all. Therefore, how about a properly coordinated programme of questions? For example, can we truly yet ascribe reliable palaeoenvironmental conditions to most of the common reef organisms through geological time? Have we really yet reached the stage of being able to recognize and distinguish ecological succession from genuine changes of ambient conditions in fossil reefs?

3. Finally and inevitably perhaps, conservation: an understanding of short term changes, both biological and geological (including geomorphological), is clearly a part of conservation research. Conservation, however, is not only an applied problem critical to the protection of reef resources, but also has the promise of revealing trends of general scientific importance on an historical or ecological time scale, and which we would not otherwise expect. This has already happened with respect to Acanthaster plagues, bleaching events, hurricanes and life-history observations of slow-growing reef organisms. The deeper implications are considerable, as for instance in the thought that bleaching events might represent a small scale alternative model for major extinctions in the geological record.

If our organization continues to improve, and if we use it to define and tackle unifying problems, time will eventually be on the side of reef studies.
CURRENTS

The tyranny of uniformitarianism: the present as the key to geofantasies

Peter Skelton

'The present', we are all told ad nauseam as students, 'is the key to the past'. Useful though this elegantly simple dictum is, it is a two-edged sword. While undoubtedly valid at the level of simple physical and chemical processes, it can be seriously misleading when complex systems such as whole environments are considered. For example, the physical laws and constants controlling the transport of sedimentary particles are unlikely to have altered significantly during the Earth's history, and so inferences about original current strengths from observed grain sizes and sedimentary structures, on the basis of analogy with experimental data, can be considered unreliable. Even at this level though, there is scope for uncertainty: witness the debate about the extent to which the Mg"+/Ca"+ ratio of seawater may have changed through the Phanerozoic, and whether or not Palaeozoic marine ooids, for example, were therefore originally aragonitic or calcitic.

Environments of course are shaped by a great many such potentially variable, physical, as well as biotic factors. So, with the many changes in these wrought by time, ancient environments can hardly be expected to have had identical, or in some cases even remotely similar composite characters to those of their modern counterparts. This message is hardly new, and people have been formulating synthetic, often non-actualistic models of what ancient environments were like, based on amalgamations of inferred processes from simple items of geological information ('process-response' models), for some years. Yet, judging by some articles on ancient organic buildups (all too often misleadingly described as 'fossil reefs'), this message is still falling on deaf ears in some quarters.

Naive sedimentology

Flushed with confidence from its many detailed surveys of modern environments, the booming sedimentological palaeoecological programme of the 50's and 60's had a strong, and in retrospect rather naive tendency, to seek precise parallels between ancient and modern environments. The work of Norman Newell and his colleagues on the Permian 'Capitan Reef' of west Texas and New Mexico during this period, which interpreted the layout of facies analogously to those of modern tropical barrier reefs, comes readily to mind. To be sure, this was fine work, but it was very much within the spirit of the 'naive sedimentology' of the time. The work of Dunham and others from the 60's onwards has, on the other hand drawn attention to the many non-actualistic aspects of the Capitan complex, such as the downslope character of the reef in relation to the barrier-bank system.

Irrelevant questions

Certainly, the more I look at the Cretaceous rudist molluscan buildups on which I work, the more I am convinced in many cases of the irrelevance of certain classic key questions of fossil reef analysis and the lack of attention paid to other factors that may only be of marginal importance in today's coral reefs. One such question that appears every time fossil buildups are discussed, with the monotony of a cracked record, is whether or not the structure was 'wave-resistant'. The question seems to lead to endless quibbling about how much binding must have been present, how it should be analyzed, the relative roles of organic versus inorganic binding, where bindstones end and bafflestones begin, and so on and so on. If the structures in question occupied calm water habitats hardly if ever affected by wave currents, as seems to have been the case, say, with the hippuritid molluscan bushes of the Santonian of Provence, then the great 'acid test' of wave resistance simply has no interest: the question is analogous to pondering whether or not modern kelp forests are adapted to withstand the effects of forest fires.

Phoney facies

Yet, on the coat-tails of such empty questions, tends to come the whole paraphernalia of phoney facies labelling like 'fore-reef' and 'back-reef' zones, loaded with tacit assumptions of current strengths, depths, stability and levels of salinity and illumination, and other such parameters. On the other hand, factors that probably were crucial influences on the form and distribution of the hippuritid bushes, such as the frequency and form of muddy water fluxes, receive far less attention in much of the literature. I imagine that this is because such factors have only a subsidiary role in shaping modern barrier reefs.

Of course, not all current work on fossil buildups is flawed by such facile uniformitarianism. Indeed, even text-book reviews are broadening their outlook to encompass non-actualistic aspects — a sure sign of acceptance of new approaches. This is not the proper place however for a full review and exhaustive argument. Here, I am just trying to make the point polemically that there still seems to be too much loose uniformitarian thinking about reefs.

Hymn-like chants

We still encounter such bald interpretations as rudist buildups being shelf-edge barrier systems, argued simply on their presence alone; linear fossil buildups being
associated with upwellings (I haven't a clue where that notion came from!); and the usual hymn-like chant of 'clear, well-lit water of normal marine salinity in tropical latitudes'. As far as I am concerned, the days of the usefulness of highlighting parallels are over: such thinking is in danger of becoming a strait-jacket. By now, we have grasped the point that the present can be a useful key to the past, but we must now face the fact that the past can only be reached through an elaborate system of combination locks. We need to emphasize composite differences between buildups, both modern and ancient. Only then will we be able to work towards that universally acceptable and unambiguous terminology which reef studies (in a geological context) still need so badly.

Funds?

From the point of view of research funding, moreover, it is only then that we can hope to provide the kinds of reliable facies models that really work, and for which therefore the petroleum industry (for example) might contemplate funding research. Reef geologists should now be thinking in terms of research based on illuminating the non-actualistic diversity of fossil buildups if they have hopes of continuing their studies. We should be selling this approach hard, both for the benefit of those who might provide research funds, and, of course, for ourselves — for who, these days, does not need research funding?


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NEWS

Threat to Shiraho Reef, Ryūkyū Letto, Japan

We have received a considerable amount of material in connection with an airport which is due to be constructed over an outstanding coral reef in the Ryukyu's, Japan, a precursor of which was our reproduction in RE2 (p.8) of a Japan Times headline which reached us through David George. We summarise the main points and events (to October 1984) here, but suggest that you contact Katherine Muzik and Maggie Suzuki if you want further details. Their addresses and other reading are at the end of the article.

This is not just another pretty reef threatened by a few local spear-fishers. Here is a veritable reef epic — a complete concatenation of reef themes ranging from the biology, through local human community structure and issues, crown-of-thorns starfish plagues and adverse effects of large-scale local development, to a suspicion of darker, military motives and an active human protest, culminating to date in scenes which read more like the British coal strike than the usual idyllic pictures conjured up by the mention of coral reefs (see The Compleat Reef Encounter No. 3).

Background

Shiraho Reef, Ishigaki Island, is one of the last healthy reefs remaining in the Ryūkyū Island chain, most of the others having succumbed to "development" and the Crown of Thorns starfish. It is a thriving reef, soon to be covered by a government-built airport, principally for jumbo jets to bring tourists directly from Osaka and Tokyo. Already, thousands of tourists per year come to Ishigaki Island, but a major protest has now developed over the plans for this airport.

It is not only that the Shiraho reef itself rates as "exceptional" by TMRU Reefwatch criteria, but the human occupation of the area is traditional and well adjusted. Shiraho is an ancient village, pretty and peaceful with narrow streets, stone walls and handsome old trees. The tourist trade however has already disrupted the traditional fishing and agricultural basis of the community, causing loss of jobs and deterioration of its old way of life. The Okinawa public nominated Shiraho coral reef as one of the top three out of 400 Okinawa beauty spots in a recent contest organized by the regional newspaper, the Okinawa Times.

Almost all the neighbouring reefs around Shiraho reef are virtually dead, with less than 3% living coral cover. This seems to be a consequence of the intensive land clearance for pineapple plantations, major civil engineering projects and large hotel construction schemes, all of which have greatly increased the levels of terrestrial sedimentation around Ishigaki's shores. The Crown of Thorns, which appears to thrive on reefs which have been disturbed, has completed the destruction of these reefs which human development has started. Shiraho alone remains.

The plans

The airport plan consists of filling a section of reef with "dirt and concrete" by levelling a convenient nearby hill, 136m high, into the sea. The airport will cover an area of 1.3 million square metres, destroying 3.6 km of reef and lagoon. The main runway will be 2,500m long and is to be built directly over the lagoon and reef crest. Surveying, delayed recently by protesters, was re-scheduled to begin again in October 1984.

There is already an existing airport. The need for a new airport has not been adequately demonstrated. There are arguments about whether the tourism would actually increase, as promised, and whether if it were to increase, it would not exceed the ecological capacity of the island. Market produce which is perishable can already be sent on the 6 daily flights to Okinawa; other produce, such as water-melons, will probably need to be sent by ship as before. Even if the need for a new airport were confirmed on these kinds of arguments, why cannot the existing airport simply be enlarged? Or, why cannot another site be found? The airport promoters say 'no'.

Since the commercial arguments for the new airport are readily questionable, protesters have come to believe that the real reason for the airport is not commercial, but military. The location is relatively close to China and the Soviet Union, and is probably suitable too for anti-submarine reconnaissance. A military airbase would also be consistent with the increased militarization of the Pacific that stems from the American-Japanese "Protection of Pacific Sea Lanes" policy.
Military deployment of the new airport is consistently denied by the new airport's promoters. The protesters however point to the unaccustomed speed with which Japan's Finance Ministry approved the allocation of 280 billion yen (about US$125 million) for the airport after only a single initial survey and review, and at a time of government cut-backs in public expenditure, and without local consultation.

Protest

One of the leading figures in the protest against the airport plan is Katherine Muzik, especially in her efforts to draw the attention of English-speakers abroad to the Shiraho reef problem. She first became concerned through her work on sea fans, and she carried out a preliminary biological survey of the Shiraho reef 2,3. She called for wider concern in her article in English in the Japan Times in 1983 1, since when she has ceaselessly written, lectured and talked on TV on the threat to the Okinawa reefs. She expects to talk at the Tahiti meeting on the subject. One result of her efforts has been that Shiraho reef is being listed in the IUCN coral reef directory 4 but she fears her activity, and that of other protesters, has not been enough to avert the airport and save the reefs.

In Japan, Katherine Muzik's protest has been taken up by Maggie Suzuki and the Japanese Friends of the Earth 5. The most dramatic protest action however has been by the local people themselves, as summarised in the FoE article 5 (and see also our Compleat Reef Encounter panel). In July 1983, a "People's Group to Consider the Airport Problem" was formed, and a symposium held. An "Okinawa-Yaemama-Shiraho Save the Ocean, Save our Lives Association" broadened the campaign into a conservation issue for the whole prefecture. Thirty-three local fishermen have filed a lawsuit against the Yaeyama Fisherman's Cooperative, claiming that the latter's decision to relinquish its fishing rights in exchange for 500 million yen (just over US$2 million, and equivalent to just one year's catch value) was irregu-
Ornamental stony corals for CITES?

The excreta that cannot be protected

A BIZARRE debate about whether coral is an endangered species is threatening the world’s coral reefs. Switzerland (and Liechtenstein) say their trade in coral cannot be controlled under the Convention on International Trade in Endangered Species. The rest of the world says it can.

There is a large and growing world trade in coral reef which is threatening the many creatures that live on the reefs as well as the coral polyps themselves. But the Swiss Federal Veterinary Office has written to the Convention’s secretariat. It argues that coral is not an animal, or a skeleton (which is covered by the treaty), but, rather, excreta. It said: “The fact that the coral skeletons are excreta...excludes...these skeletons as parts of the animals. The fact that the skeletons are structures essential for the survival of the polyp colonies does not change this situation.”

Conservationists say that the convention signatories already control the trade in other excreta, such as ambergris (from sperm whales) and musk from deer.

* Update *

Sue Wells has also now sent us an update on progress on the Coral Reef Directory:

TOWARDS A GLOBAL POLICY FOR REEF CONSERVATION

Few international conservation agreements have so far listed coral reefs. The World Heritage Convention lists Aldabra, The Great Barrier Reef, Sierra Nevada de Santa Marta (Colombia, including Tayrona National Park and its coral reefs), and Sanganeb Marine National Park (Sudan) has been nominated. A few MAB biosphere reserves have reefs: Puerto Galera (Philippines), Atoll de Taiaro (French Polynesia), Malindi-Watamu and Kiunga reserves (Kenya), Everglades National Park, including Fort Jefferson NM (USA), Virgin Islands National Park (USA), and the Hawaii Islands Biosphere Reserve.

Awareness and interest in reefs has grown enormously since the advent of scuba diving and considerable conservation initiatives have been taken by individual states like those above. Stoddart 1 has emphasised the worldwide threat to coral reefs and called for action by the international community as a whole to support and strengthen these unilateral initiatives. But there is at present no obvious international structure whereby states might come together to establish a global policy, so how might this be achieved?

Wetlands

Sue Wells 2 has recently argued that the potential framework for doing this already exists in the form of the Ramsar Convention, which can reasonably be argued

as covering coral reefs under its heading of “wetlands”. She writes:

At the翻身 meeting of the Ramsar Convention, IWRB’s Geoffrey Matthews discussed the reasons why wetlands, of all habitats, warrant an international convention and these reasons apply to coral reefs as much as to other categories of wetlands. The IUCN Conservation Monitoring Centre in Cambridge is currently compiling a Directory of Coral Reefs of International Importance. The Neotropical volume will appear early next year [1985] and will provide a basis for the selection of reefs in particular need of conservation in that region.

Unfortunately, only a few of the countries which are party to the Ramsar Convention have jurisdiction over coral reefs, while other countries with outstanding reefs, like the Philippines and Indonesia are outside the Convention. Sue Wells believes however that the Ramsar Convention would have to develop links with competent authorities on reefs and a much broader technical capacity than it has at present. Presumably, too, many more states would need to join the convention. The Tahiti meeting should provide a suitable forum for pursuing these goals.


For further information contact: Sue Wells, International Union for Conservation of Nature and Natural Resources (IUCN), Conservation Monitoring Centre, 219(c) Huntingdon Road, Cambridge CB3 0DL, UK (tel. (0223) 277314 and 277420)

REEF SCIENCE IN AUSTRALIA: AN IDIOSYNCRATIC STEP BEHIND, OR A VISIONARY STEP AHEAD?

Peter J. Smith has submitted an interesting item 1 on the nature of coral reef science in Australia by Richard Bradbury, with a reply by Laurie Hammond 2. Bradbury enquires whether Australian coral reef science is representative of international trends in the subject. Using a statistical analysis of various recent publications, he infers that, as a whole, Australian reef science is indeed in step with international trends, but that his key sampling of Australian reef activity, at a recent symposium at Townsville 3 was itself out of step. Bradbury goes on to argue that there are “influential groups” in Australia “whose perceptions and outlook...seem to be significantly at variance with international trends”
and this small elite controls the “key scientific media such as conferences and perhaps journals”, so giving Australian marine science a misleadingly parochial appearance.

Hammond replied by saying that the symposium concerned really had reflected a properly thought out grant-giving policy, not parochial idiosyncrasy, and that “Australia was in this respect one step ahead of international trends, as highlighted at the Townsville symposium, it was [ergo] out of step”.


ACRS GLEANINGS

At the risk of their being rather dated “news”, the following items, extracted from the Newsletter of the Australian Coral Reef Society (Mid-Year 1984), should be of general interest.

Professor Dorothy Hill, F.R.S., probably best known outside Australia for her outstanding Treatises (1956 and 1981) and numerous other works on Palaeozoic corals, has for some time been working on a history of the Great Barrier Reef Committee, the parent body of ACRS, now incorporated within ACRS.

Isobel Bennett was awarded an Honorary Life Membership of ACRS. (Her book, The Great Barrier Reef (1971) is still one of the best popular reef accounts. Peter Sale, ACRS President, wrote:

As well as contributing greatly towards the GBRC/ACRS over the years, Isobel Bennett has been instrumental in stimulating an interest in marine science in a large proportion of those actively engaged in science on the reef today.

The same Newsletter also contained ACRS’s submissions on zoning of the Far Northern Sector of the Great Barrier Reef Marine Park for GBRMPP, and on the proposal for a Ningaloo Marine Park, together with a proposal from the Marine and Coastal Protection Groups for a National Marine Park at Shark Bay.

The Ningaloo Marine Park will be the first Marine Park in Western Australia. ACRS welcomed the original proposal as an “excellent and timely document” and made a series of recommendations intended to strengthen its effectiveness. The Shark Bay proposal would (presumably) make this area the second Marine Park in Western Australia. The proposal stresses Shark Bay’s very large population of dugongs, its largest extent of seagrass beds in the world, the famous stromatolite growths of Hamelin Pool-Faure Sill, and the Human-Dolphin relationship at Monkey-Mia. (Can someone enlighten us on the last of these, before the humourists move in?)

EXPEDITION REPORT: TAHITI

cheveux d’haie de cocos (6). Les femmes sont jolies et, ce qui fait l’éloge du climat, de la nourriture et des eaux, femmes, hommes, vieillards même, tous ont les plus belles dents du monde (7). Ce peuple ne respire que le repos et les plaisirs des sens. Vénus est la déesse que l’on y sert. La douceur du climat, la beauté du paysage, la fertilité du sol parlent

arrosé de rivières et de cascades, la pureté de l’air que n’infeste pas même cette légion d’insectes, le fléau des pays chauds, tout inspire la volupté. Aussi l’air nommé la Nouvelle-Cythere et l’église de Minerve y est aussi nécessaire que dans l’ancienne pour défendre contre l’influence et du climat et des mœurs de la nation.

Bougainville in Taillevent 1777 [see p.32 for details]

He thought he was utterly lost, not knowing where the exclamations of those people would end, who were simultaneously examining every part of his body. After having considered him well, they returned him his clothes, put into his pockets whatever they had taken out of them, and brought the girl to him, defining him to consent those deficits which had brought him on shore with her. All their persiflative arguments had no effect; they were obliged to bring the poor cook on board, who told me, that I might reprimand him as much as I pleased, but that I could never frighten him so much, as he had just now been frightened on shore.

Extract, pp. 218-219, from Bougainville, L. de, 1772.

A voyage round the world performed by order of His Most Christian Majesty, in the years 1766, 1767, 1768, and 1769 (translated by J.L. Forster). London: J. Mourse and T. Davies.

for the scientific significance of these encounters see p.15
On the 7th July 1984, after 12 months preparation, fourteen divers from the Newcastle University Sub-Aqua Club left Heathrow Airport for a six week expedition in order to carry out biological surveys of a Caribbean coral reef. Of the fourteen, half were marine biologists, both research staff and undergraduates; the remainder being undergraduates in a variety of subjects ranging from agricultural economics to marine engineering. This provided a collection of skills and characters that never failed to keep expedition life interesting!

Diadema depletion

Initial planning of a scientific programme began in August-September 1983 when we investigated the feasibility of three areas of research, all to be carried out in the Caribbean: 1. the mass mortality of the long-spined sea urchin *Diadema antillarum*; 2. The progression and possible cause of White Band Disease; 3. The extensive bleaching and coral mortality on the Pacific side of Panama. Then, in reply to one of our letters, we were informed by Tom van't Hof (Project Manager of the Curagao Underwater Park) that the *Diadema* population on Curacao had been substantially depleted, that pre-mortality data were available, and that any help we could give to survey the post-mortality population would be appreciated. Our decision was then made, and this became our main project.

Reefwatch

We were then asked by the Tropical Marine Research Unit (TMRU) at York University to carry out a "REEFWATCH" survey, and by research staff at the Caribbean Marine Biological Institute (CARMABI) on Curacao to perform surveys of reef algae and three species of sponge. In addition, a recent spearfishing ban (July 1983) gave us the opportunity to collect data on the most commonly speared fish within the underwater park e.g. Groupers and Snappers, and to compare these results with data collected from the same sites before the spearfishing ban. We also extended our "REEFWATCH" survey to give more detail of substrate cover and densities of herbivorous fish. We hoped that we could integrate our findings from all the projects to obtain a better understanding of the possible impact of the *Diadema* mortality on the reef system.

After collaboration with the staff at the Caribbean Marine Biological Institute (CARMABI) we decided on twelve sites that covered the entire length of the south coast, and quickly set about testing our methods. These were simple and as objective as possible, as was necessary with a party of divers of mixed abilities, most of whom had never seen a coral reef before.

Irritating urchins

Our study of the remaining *Diadema antillarum* population very quickly underwent drastic change, when we realized that numbers were considerably less than we expected, and more importantly, were virtually confined to the shallow reef terrace (0-4m). This not only meant that our survey methods had to change, but also that measurement of densities and size classes was going to be made considerably more difficult. This was largely due to two factors. Firstly, the nature of the reef terrace, which in addition to containing large
irregular boulders of dead coral is subject to considerable wave action and swell. Secondly, the extremely irritating habit of the urchins to live deep within holes and crevices in these large coral boulders, making it almost impossible to get the prongs of the calipers across their test. We therefore decided to carry out our urchin surveys during the late afternoon and/or early evening which is when Ogden and others have reported that the urchins move out of their holes at the beginning of their nocturnal feeding cycle. Admittedly there are no seagrass beds in Curacao for the animals to graze on, but we were assured that the nocturnal feeding pattern still occurred. This, however, is not the case now and we virtually never found urchins on the open reef surface, even on night dives. Instead they remained very close to the edges of the holes in easy reach of sanctuary, if indeed they came that far. Nevertheless, we attempted our survey, and at most sites managed to gain sufficient data to make reasonable estimates of population densities. We also had some success with the size class analysis at the three sites with the densest urchin populations, but at the expense of some rather sore fingers!

**Sponge counts**

For the other benthic surveys we used traditional transect methods. Two transects were laid at each site, running down the reef from 3 to 40m. Measurements were then made on both sides of each transect at ten fixed depths, using 2m long tape measures attached to poles. Thus, for each site we have accurate measurements of reef cover by the main classes of reef substrates for 8m widths at ten depths. We used a similar method to measure the percentage cover by various benthic algae. We also recorded sponge counts of *Ircinia strobilana*, *Agelius clathrodes* and *Neofibularia nolitangere* against depth.

**Diplomatic diving**

The fish survey (as part of "REEFWATCH") included twenty three easily recognisable species and groups. In addition we added Damselfish and Parrot fish to give an indication of the densities of herbivorous fish; and Groupers and Snappers to determine whether densities of these fish had increased since the spearfishing ban. Divers simply estimated abundances of these fish whilst swimming within the transect area. This soon became a very popular project, and required diplomatic apportioning of the scheduled dives.

**Overall impressions**

What then can be said of the reef around Curacao, that hasn't been said already by Dr. Rolf Bak, the Underwater Park literature or the numerous papers that have come out of CARMABI since 1950? We are still in the process of analyzing our own results, and are not yet ready for publication. All the same, in the four weeks we were there, we gained an overall impression of reef instability in the form of:

1. **Mortality.** Most noticeable was the mortality of numerous stands of *Acropora cervicornis* at the eastern end of the island. The majority of these stands are now completely overgrown with filamentous blue-green algae, and show very little sign of recolonisation. Then there was the recent *Diadema* mortality. Survivors of the previously dense population of this urchin remain in the shallow zone of the reef terrace, and no longer appear to travel far from their safe hiding places in order to find sufficient algal food.

2. **Coral degradation.** Also evident was the degradation of numerous large coral boulders (many of which were considerably excavated) and of gorgonian sea-fans. This was most noticeable at sites such as Fuikbaai and Holiday Beach, where sedimentation was particularly bad. Other factors, such as predation by urchins and reef fish and collapse due to natural causes may also be important.

3. **Algal growth.** Dense mats of filamentous blue-green algae were present at many sites, and in general were most prolific on the reef terrace. This appears to be a comparatively recent event, suggesting that the recent *Diadema* mortality has drastically reduced the grazing pressure.

The question that may now be posed is — will the recent mortality of *Diadema antillarum* and *Acropora cervicornis* allow the algae to get a stranglehold on the reef (with all the possible ramifications of that situation); or will the urchin populations (or some other algal grazer) recover and restore the reef to its previous state?

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2 van't Hof, T. 1984. Reef Encounter (June 1984) 2, 10-11

Department of Zoology, The University, Newcastle upon Tyne, NE1 7RU, U.K.
FEATURES

On the national programme of reef studies in the USSR

Boris Preobrazhensky

Boris has sent us an article about the history of reef studies in the USSR and current national research policy on reefs. Some of this, though certainly interesting, was a repeat of his Manila symposium article, so we reproduce here his new material only, with just a little overlap for the sake of context. Readers should refer to Boris' Manila article for a review of the historical background to reef studies in the USSR, which has been largely geological rather than biological. What follows here concentrates on recent developments.

We have taken a few liberties with Boris' English (though he should certainly be congratulated on his English), but, bearing in mind the official nature of a national policy, we hope that we have remained true to his original meaning. There seems to be a problem in rendering the relevant abstractions accurately from Russian to English.

For comment, see Editorial, p.4

Reefs in the USSR

It is well known that the Soviet Union does not have reefs within its territorial and commercial waters. Even the colonial corals which occur in the rocky sublittoral areas washed by the scant warm currents in the Far East are zoological rarities.

On the other hand, reef complexes are the most common feature of the geological record in the USSR. Reefs cover the vast terrain of our country almost without a break, and there is scarcely a region which has not seen reef-building at some time during its geological history. The most important reef regions of the USSR are, in the Palaeozoic: Urals, Kazakhstan, North-East Siberia, Central Asia, Northern Islands, the Baltic margins and the Donetz Basin; in the Mesozoic: Crimea, Caucasus and the Uzbek Republic; and in the Cainozoic, Ukraine and Moldavia. The most thoroughly explored of these are the reef complexes of the Uzbek Republic, Western Yacutia (in eastern Siberia) and the Urals. Siberian geologists have recently demonstrated the existence of a vast reef complex in eastern Siberia comparable with the Australian Great Barrier Reef.

World importance of reefs

The study of reefs, both ancient and Recent, attracts specialists in many countries primarily on account of the association of reefs with oil and natural gas reservoirs. Reef-associated oil fields are well known in Canada, USA, Mexico and the USSR. There is also a large oil potential associated with Recent reefs of the islands of the Caribbean, Viet-Nam, Philippines, Polynesia and many other areas. Many ore bodies, such as those of...
The great influence of Recent reef systems on the general regulation of world ocean productivity should also be mentioned, for coral seas occupy more than 117 million km$^2$. Coral reefs are amongst the most productive ecosystems and are a potential prototype for marine farming. Reefs are also a peculiar example of natural coastal protection and could therefore form the basis of artificial modelling of protection systems. Reefs are one of the most sensitive indicators of sea level changes. In all, it is clear that the study of reefs is one of the most fundamental problems of the natural sciences. In the scientific world as a whole, however, there has been a distinct discordance in the methods and approaches used in the ecological interpretation of living and ancient reefs.

**Geological reef problems**

Fossil reef complexes present the most difficult problems in geological theory, practical identification, stratigraphical correlation and geological mapping. This is illustrated by reference to the phase-like nature of reef building through geological time, as seen in the reefs of the USSR, since this kind of periodicity is an important factor in geological correlation and mapping, palaeogeographical reconstruction and in the assessment of mineral resources associated with reef complexes. More knowledge is needed of reef biocoenoses, geomorphology, topography, facies, sedimentology and ecological succession. A general ecological and biocenological concept of reefs is needed.

**Location of reef studies**

By the 1950s and 1960s the development of biostatigraphical work in the USSR had generated a huge collective of palaeontologists and palaeo-ecologists working on reef-building organisms throughout the Phanerozoic. More recently however, attention has waned and many working teams have been discontinued. Certain biological and geological institutes have been able to continue nevertheless, especially at the Institute of Geology and Geophysics, Siberian Branch of the Academy of Sciences of the USSR, in the Geological Survey of the Uzbek Republic and in the Institute of Geology and Chemistry of the Academy of the Estonian Republic. A notable large group of researchers has been brought together in the Far-eastern Scientific Centre to work on complex problems in terms of ecorstratigraphic theory, using underwater techniques in multidisciplinary studies of Recent coral reefs. Two important trends are the growth of palaeobiology and the increase in our understanding of the influence of environmental factors on morphology of reef organisms. Of great importance is the use of a Systems approach to develop generalisations about reef facies.

**The collective reef encounter**

From this it has become evident that a complex geological and biological programme was needed for the study of reef ecosystems. The following problems have been identified as priorities for study:

1. multidisciplinary comparative analysis of ancient and Recent reefs.
2. loss of information in the course of fossilization.
3. elucidation of ancient reef topography by inference of palaeoenvironments, etc., from reef organisms.
4. ecological and geomorphological modelling of reef communities.
5. use of ecological, morphological and lithological factors in a dynamic way to classify reefs.
6. use of lithologically homogeneous sequences of thick reef bodies to determine evolutionary phases of reef community evolution.
7. establishing ecological succession and cycles in ancient reef communities.
8. criteria for using reefs for palaeogeographical analysis and reconstruction.
9. transportation, distribution and accumulation of reef material, and the manner of its eventual fossilization.
10. lithostratigraphy of reefs and their associated strata.
11. geochemistry of reef complexes.
12. cavity formation and infilling.
13. tectonic and lithogenetic controls on initiation and development of Recent and ancient reefs.
14. mineralization of reefs.

The last two problems are particularly intriguing. In accordance with the USSR Reef Programme, reef complexes of all ages including the Recent will be studied. For fossil reefs, the best sections in the USSR will be used, especially those of the Baltic district, Siberian platform, Uzbek Republic, Kazakhstan, Caucasus, Crimea and the Omulevsky Mountains (Kolyma River Basin). For living reefs, the most accessible reefs of the present seas will be used, through expeditions from the Far-eastern Scientific Centre. The basis throughout will be multidisciplinary comparative analysis.

**National Structure**

It was with the general theoretical significance of reef studies for biology, ecology, geomorphology and geology in mind, that a National Reef Committee of the USSR was established under the Committee for the Problems of the World Oceans in the Academy of Sciences of the USSR. The programme and the Working Group were ratified by the Conference held on April 29th 1982 in Moscow University, attended by 20 participants from 7 institutes. A year later, the First Conference of the Working Group of the Reef Committee was also held in Moscow and problems of organization were discussed. The National Reef Programme was eventually adopted in Dushanbe by the Fifth National Symposium on Fossil Corals and Reefs, in June 1983.


B.V. Preobrazhensky, Institute of Marine Biology, Far East Science Centre, Academy of Sciences of the USSR, Vladivostok 690022, USSR.
A note on Madrepora cytherea Dana 1846

John Wells

In bestowing specific epithets on the more than 100 new species of stony corals described in the Zoophytes of the United States Exploring Expedition (1838-42), James Dwight Dana used almost entirely descriptive adjectives such as nasuta, recta, formosa, deformis, costata, coronata, speciosa, etc., or nouns in apposition such as discus, pleiades, argus, hystrix, gans, hypomithus, globiceps, lichen. No taxa were named in honour of friends or fellow scientists, and only one proper noun appears: cytherea (Madrepora cytherea, Musca cytherea).

Why? Cytherea is a name of Venus (Aphrodite), from Cythera (Kythera, now Kythera, an Aegean island where Venus is supposed to have risen from the waves, seemingly a far cry from the tropical Pacific whence Dana obtained most of his corals. Dana gave no explanations for his specific names although most are obvious. Both M. cytherea, a species of Acropora, and M. cytherea, a species of Lobophyllia, were found at Tahiti where the "USS Peacock", with Dana aboard, remained from September 10 to October 10, 1839, and here is the clue to the taxon cytherea (= Tahiti, where Dana found 36 new species of reef corals).

Tahiti was rediscovered and named King George's Island in 1767 by Samuel Wallis in the "Dolphin". Eight months later Bougainville in his expedition around the world in "La Boudeuse" and "L'Etoile" (1766-1769) reached Tahiti, followed by James Cook in the "Endeavour" in 1769. The first news of Bougainville's discoveries appeared in France in 1769 in an undated newsletter published before or after two others dated July 20, 1769 and August 1, 1769. entitled "Relation de la découverte que vient de faire Mr. de Bougainville [sic] d'une ile qu'il a nommé LA NOUVELLE CYTHERE.

According to René Primavère Lesson 5:

Bougainville... séjourna en avril 1768 sur la partie orientale de l'île, qu'il se crut en droit de nommer La Nouvelle-Cythere, désirant rappeler par cette designation la beauté des femmes et les facies plaisirs que procure cette refuge.

Lesson 4 remarks from his own experience at Tahiti in 1825:

O-taï par sa nom seul fait palpiter le cœur et retrace à l'imagination mille scènes voluptueuses.
Darwin visited Tahiti in November, 1835, and like others before him, was entranced by the beauty of the island:

Everything which former navigators have written is true: 'A new Cytharaea [sic] has risen from the ocean'.

Lord George Campbell, son of the 8th Duke of Argyll, sublieutenant on the "Challenger", enjoyed the stop at Tahiti in September, 1875:

... far-famed Tahiti, the gem, the queen, the paradise of the Pacific, the South Sea Capua, La Nouvelle Cythere (only a few of the names that have been lavished on it) ... but Tahiti disappointing? No, I must half change my mind already; for that same evening on which we arrived there was a sunset, and bathed in its light — one of the most lovely effects of sunset-colouring on land and sea I have ever seen — I shall ever remember Tahiti.

Tahiti is still a magnet for corallophiles.


John W. Wells, Department of Geological Sciences, Cornell University, Snee Hall, Ithaca, N.Y. 14853, U.S.A.

(see also p.10)

This time, it's the planet

In 1761 and again in 1769 the planet Venus passed between the Earth and the Sun. By observing from different parts of the Earth the passage of the planet Venus across the disk of the sun astronomers hoped to calculate the distance of the earth from the Sun and thus have a means to measure the size of the solar system.

James Cook was selected in 1768 as a Lieutenant to command a scientific expedition to the newly-discovered island of Tahiti where a transit of Venus observation was to be made in 1769.

As promised, here are two poems and an excerpt from a longer poem by the poet Mark O'Connor, based on his experience of the reef environment.

Each poem we've chosen echoes major current biological themes which preoccupy reef workers, and their different style also shows something of the poet's range. The Beginning captures in humorous vein reef workers' own long standing fascination with reef diversity. The Spanish Dancer (actually an excerpt from The Diver) celebrates the beauty of reef life and alludes to behaviour and adaptation. The Fat Man uses an incongruous tourist as a pivot for what we would regard more prosaically as the conservation issue.

We first came across Mark O'Connor's poetry in GBRMPA's newsletter Reeflections in which he also wrote about the challenge of expressing the reef world in poetry. He has written numerous other articles on this and the broader context of language and writing, and has published many of his poems, not all of which are about reefs, separately. Two of his poetry collections are now out of print, but there are two others about to appear. All the poems here are printed by kind permission of Mark O'Connor himself; copyright Mark O'Connor.

The Beginning

God himself having that day planted a garden walked through it at evening and knew that Eden was not nearly complex enough. And he said: "Let species swarm like solutes in a colloid. Let there be ten thousand species of plankton and to eat them one thousand zooplankton. Let there be ten phyla of siphoning animals, and one thousand finned vertebrate types, from white-tipped reef shark to long-beaked coral'fish, and to each his proper niche, and — no Raphael, I'm not quite finished yet — you can add seals and sea-turtles and cone-shell and penguins (if they care) and all the good seabirds your team can devise oh yes, and I nearly forgot it, I want a special place for the crabs! And now for parasites to hold the whole system in check, let . . ."

So for five and a half days God labored and on the seventh he donned mask and snorkel and a pair of bright yellow flippers. And, later, the host all peered wistfully down through the high safety fence around Heaven and saw God with his favorites finning slowly over the coral in the eternal shape of a grey nurse shark, and they saw that it was very good indeed.

The fat man

Poor fat man in the tourist shop you do well to complain of the service, you might well expect for so many dollars a day, more than this island can offer by the way of luxury. I could tell you to take off your garish shirt, which you wear without conviction, and to take pleasure outside in the wheeling of terns, but your senses are mortgaged and your time is money. I wonder how many such places your business has wrecked, thousands of creatures your estate deals have killed, or more cruelly left homeless. No wonder you do not feel at home. Though you hope here to find spiritual peace you are bound to a wheel of invisible gold that your tears, which you do not cry, cannot dissolve, your Albatross can never drop free.

I understand this damnation of yours, you know you should be having a good trip and you half feel you could be having a good trip but it is still a bad trip for you.

The Spanish Dancer

A Spanish Dancer undulates by in its world of similitudes God's blue-and-orange jester. Darkened he shudders under the manta's black triangle. It takes forever to pass, self-possessed and harmlessly vast; lingers, then flicks like an energetic shroud, Dracula's cape to an earthworm. He gasps to the top and breathes, dives while his nerve still holds. . . . In the surface-spray he has lost where those colours were. He trails on forlorn over death's bright pasture, a museum of glittering indo-and exo-skeletons. The moray jaws threaten his hand; the lion-fish raises its spines. When he lingers, the viridian anemone clamps on his finger with sticky friendliness inwardly tensing; its tendrils thicken around him dark, intuitive, suffuse.
UPWELLINGS

Scientific blinkers and the Great Barrier Reef

Ann M. Cameron

Major disagreement exists once again over the Crown-of-Thorns starfish about the extent to which it damages reefs. In Australia, opinion has recently divided into two camps, one represented in effect by Peter F. Sale, president of the Australian Coral Reef Society, who maintains that the current reports of extensive new destruction in the Great Barrier Reef region have been exaggerated (as in the past). The opposite view is led by Ann Cameron of the University of Queensland who claims that the starfish populations have been under-surveyed and therefore under-estimated. Information provided jointly for the Australian media by AIMS and GBRMPA however have contained statements which can be interpreted as tacit admissions that starfish damage is indeed more extensive than was first realised.

Despite warnings by R. Endean and others that outbreaks of crown of thorns starfish (Acanthaster planci) pose a serious threat to the ecosystem known as the Great Barrier Reef, the Chairman of GBRMPA, Mr. Graeme Kelleher, has maintained that his organisation has the situation under surveillance and that all is well. This opinion apparently is held by the majority of ACRS Councillors under the leadership of President, Dr. Peter F. Sale, University of Sydney, although three Councillors (Dr. J. Jell, University of Queensland, Brisbane, Dr. P. Doherty, Griffith University, Brisbane and Dr. D. Williams, Australian Institute of Marine Science, Townsville) refused to sign a letter to this effect, written by Dr. Sale and the rest of the Council, and headlined in the Brisbane Courier Mail newspaper of 7th May 1984 as — Starfish risk on Barrier Reef 'small'.

However, in a media release of 27th August, 1984, Dr. John Bunt, Director of the Australian Institute of Marine Science made the following points (my emphasis added).

1. Of 30 mid-shelf reefs surveyed recently (Dr. Doherty and Williams were members of this trip), good coral cover was found on five "but the majority of the remaining reefs have exceptionally low living coral cover with extensive dead coral. Death appears to have occurred during the last few years'.

2. Of the nine outer reefs surveyed, some had relatively high living coral cover and feeding crown of thorns starfish were apparent only in deeper water; on others, feeding aggregations were apparent in shallow water or live coral was less than 5 per cent and few crown of thorns were present.

These points confirm the information previously supplied to GBRMPA that most of the reefs of the central third of the G.B.R. have been badly damaged by A. planci. However, despite the news-worthiness of Dr. Bunt's statements in the media release this "news" has not received international publicity. Since Australian scientists patently cannot cope with the responsibility of Great Barrier Reef Conservation, despite the efforts of some, and now Dr. Bunt, northern hemisphere workers must demand the conservation of this part of the world's heritage.

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Starfish risk on Barrier Reef 'small'---

We believe that research directed at the Crown-of-Thorns starfish must be well designed, and competently carried out. It would be most unfortunate if the current "crisis" atmosphere resulted in massive amounts of research funds being poured into poorly designed, or impractical projects, simply because they dealt with the starfish. — Peter F. Sale, president, Australian Coral Reef Society, and Associate Professor of Biology, University of Sydney — signing on behalf of the following: Dr J.E.N. Veron, vice-president, ACRS, Australian Institute of Marine Science, Townsville; Dr P. G. Flood, secretary, ACRS, Department of Geology, University of New England, Armidale; Mr M. Chalupka, treasurer, ACRS, Marine Unit, Queensland National Parks and Wildlife Service, Brisbane; Associate Professor II. Heatwole, past president, ACRS, Department of Zoology, University of New England, Armidale; Dr J.T. Baker, council member, ACRS, director, Sir George Fisher Centre for Tropical Biology, James Cook University, Townsville; Dr M.A. Borowitzka, council member, ACRS, Department of Environmental and Life Sciences, Murdoch University, Perth; Dr D.J.G. Griffin, council member, ACRS, director, Australian Museum, Sydney; Dr P. Hutchings, council member, ACRS, senior research scientist, Australian Museum, Sydney; Dr B.C. Russell, council member, ACRS, Curator of Fishes, Northern Territory Museum, Darwin; Dr P. Saenger, council member, ACRS, scientific chairman, Australian Underwater Federation, Brisbane; Dr C.C. Wallace, council member, ACRS, Department of Marine Biology, James Cook University, Townsville.

Ann M. Cameron, University of Queensland, Department of Zoology, St. Lucia, Brisbane, Australia, 4067.
Starfish claims misleading

The figure of 14 percent refers to a survey which included only about 20 percent of the reefs of the Great Barrier Reef. The critical issue is not how many reefs are under attack at a particular time during one survey, but how many reefs have been devastated during this latest wave of outbreaks.

This figure is obviously more than 14 percent because starfish are not found in dense numbers on reefs, the corals of which they have killed already.

_Brisbane Courier Mail, May 16th 1984_

It is unscientific to assert that "there is no evidence whatever that man's activities" have played a role in _A. planci_ outbreaks. The relevant experiments for testing this hypothesis have simply not been done.

However, it is noteworthy that the classic cases of echinoderms known to have outbroken (and destroyed their ecosystems in the process) are those of herbivorous sea urchins in kelp beds. These outbreaks followed upon human interference, namely, removal of the predators of the sea urchins.

_Extract from letter from Ann Cameron to Australian Coral Reef Society, June 5th 1984_

At Council's March meeting we discussed the treatment by the media of the new outbreaks of _Acanthaster_ on the Great Barrier Reef. All Council members agreed that the coverage was unnecessarily alarmist, and that there was a danger of it leading to unjustified "corrective" action being taken. The great majority of Councillors were able to sign a letter which was sent to a number of newspapers in an attempt to air a more balanced view. Most papers published our letter in whole or in part, and it led to a number of enquiries by the press. I believe it served its purpose, although I recognise that the "Crown-of-Thorns problem" will continue to elicit strong, and sometimes divergent opinions among reef scientists.

_Peter F. Sale_
_August 1, 1984_ _Extract from Presidential Address to the Australian Coral Reef Society in the Annual Report, 1984_

_Cairns coral killed_

The crown of thorns starfish has killed most of the Great Barrier Reef coral off Cairns, the director of the Australian Institute of Marine Science, Dr John Bunt, said today.

_Extract from letter from Ann Cameron to Australian Coral Reef Society, June 5th 1984_

At Council's March meeting we discussed the treatment by the media of the new outbreaks of _Acanthaster_ on the Great Barrier Reef. All Council members agreed that the coverage was unnecessarily alarmist, and that there was a danger of it leading to unjustified "corrective" action being taken. The great majority of Councillors were able to sign a letter which was sent to a number of newspapers in an attempt to air a more balanced view. Most papers published our letter in whole or in part, and it led to a number of enquiries by the press. I believe it served its purpose, although I recognise that the "Crown-of-Thorns problem" will continue to elicit strong, and sometimes divergent opinions among reef scientists.

_Peter F. Sale_
_August 1, 1984_ _Extract from Presidential Address to the Australian Coral Reef Society in the Annual Report, 1984_

_Receipt of Annual Report 1984_

It was resolved (Chaloupka/Wallace) that the Annual Report be received.

There was brief discussion of the possibility of amending the Annual Report. Ann Cameron proposed (seconded Peter James) that paragraph 7 of the Presidential Address in the 1984 Annual Report of the Australian Coral Reef Society Incorporating the Great Barrier Reef Committee be deleted and replaced by the information that "most of the reefs on the Central Section of the Great Barrier Reef have been severely damaged by _Acanthaster planci_ predation, this information being available from the Great Barrier Reef Marine Park Authority".

This motion was defeated

It was resolved (Mather/Bennett) that the Annual Report be adopted.

_Brisbane Telegraph, September 3rd 1984_
GREEN PIECE

One of the things that struck some of us who could not get to the Tahiti meeting, was the fine opportunity it offered, with its conservation-conscious theme, to raise the little matter of nuclear testing in the Pacific. You must be able to hear the Mururoa tests on Tahiti, they are so near at hand. It looked like a chance to put conservation matters in perspective. Perhaps it is time to devise a Richter-like scale (exponential if you remember) for environmental threats, and put nuclear testing on atolls (or anywhere else for that matter) somewhere near 10. Reef conservationists could have assumed their rightful place at the forefront of conservation campaigning, since the ultimate conservation issue focuses on none other than an atoll. How splendid! What theatrical good luck for the reef lobby! Never mind a few passing local misdemeanors committed in ignorance by local fishermen trying to make ends meet, or even the trading of corals for aquarists’ amusement. This time, it was The Big One — or should have been.

In the event, the big opportunity was met by a small murmur — mostly a letter initiated not a million miles from here, and sent to the Meeting. It seemed to have caused more embarrassment than anything else. Well of course, the subject was a hot one. The host nation to the conference was the same as the one responsible for the tests. Perhaps happy, sun-loving reef-explorers did not fancy limpet mines on their Scuba tanks, for in the event, it was Greenpeace’s ill-fated Rainbow Warrior which made the point and upstaged us all.

So, back to problems of reef monitoring, and zoning. There might still be time for someone to add Homo sapiens to the little red book of endangered species, or perhaps, more appropriately, to add The Whole Earth as a threatened environment.

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LETTERS

Dear Editor,

A recent paper in Coral Reefs was on mollusc ecology in one of the very few reef systems of the Indian Ocean which are totally unspoiled. As it involved the collection of several thousand specimens, its author felt it worth mentioning that after identification and measurement, molluscs were returned alive. An expert referee deleted those last four words, and added in the margin “Sweet! but who gives a damn”.

Those who have seen enough reefs know that we should give a damn, but from the coincidence of this event with a circular from our Chairman saying that funds are needed from other sources, I have discovered a potential money spinner. I propose that the Society instigate an annual award for the reef-scientist-who-should-know-better. (An improved acronym is welcomed.) Candidates should be told of their candidate-ship in advance, however, so that they would have time to buy off their nomination with a donation to the Society. Thus a scientist whose clumsiness with rotenone wiped out an entire school of fish would have an honorable chance to keep his secret, while one whose past career involved flogging reef organisms to tourists could even be worth an annual consideration. A modest sum may even be elicited from the mollusc expert who is not adverse to reef stripping.

A trophy must be prepared for those who decline to part with some of their grant or travel budget (or valuable mollusc collection) for this purpose, and it must have a suitable conservation theme. A briefcase made from leatherback turtle hide has been suggested, as has a sperm whale tooth (mounted on Phillippine hardwood of course). Best might be an Acropora skeleton from Muroorua lagoon, set on a plinth so that its warm glow is fully appreciated by the recipient.

Yours sincerely,

Charles Sheppard

* “ex” is an unknown quantity; “spurt” is a drip under pressure.

For the acronym, how about: REEF Scientist WHO Should Know Better = REEFSCWOSHKNOB?

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Dear Sir,

Seeing the account of the Leopard Reef Expedition by Frances Green in the 1st edition of Reef Encounter (RE1, Oct. 1983) prompted me to dig through the files and check our holdings.

Unlike the photographs which have appeared and then disappeared, some of the corals which were collected are safely in store at Sunderland Museum and available for examination.

Several members of the expedition including Jon Moore visited Sunderland Museum in 1979 to examine the corals previously collected by the 1973 and 1975 Joint Services Expedition to Chagos prior to their visit later in the year to Kenya.

John Bainbridge, Keeper of Natural Sciences, Sunderland Museum, Borough Road, Sunderland.
MEETING REPORTS

ADVANCES IN REEF SCIENCE
Miami, USA, October 26-28, 1984

Elizabeth H. Gladfelter

The Atlantic Reef Committee (ARC) and the International Society for Reef Studies (ISRS) held a joint meeting “Advances in Reef Science”, hosted by the Rosentiel School of Marine and Atmospheric Sciences of the University of Miami on 26-28 October 1984. The meeting was sponsored by the ARC of RSMAS, the U.S. Geological Survey and the Marine Sanctuaries Division of the U.S. NOAA program. About 150 participants from 15 different countries represented many fields of reef sciences including geology, biology, geography, physical oceanography, chemistry, reef management and mapping. There were four plenary talks (each given before a related scheduled talk session), 69 short research presentations, and a poster session. A very attractive feature of this meeting was the virtual absence of concurrent sessions (only one part of one afternoon) giving all the participants the option to attend all the sessions. This resulted in an active interchange of ideas about how reefs function from a variety of different viewpoints.

The plenary talks were given by members of the sponsoring groups. Alina Szmant-Froelich of RSMAS presented the results of her extensive research program on the history of the Florida reef tract. Finally, Peter Glynn of Caribbean reef corals. “Coral reef management in the tropics” was presented by the program director Nancy Foster. Gene Shinn of USGS presented an integrated picture of the geologic history of the Florida reef tract. Finally, Peter Glynn of RSMAS generated discussion about “Coral reef and recent disturbances: cause for concern?” by presenting some results of an interdisciplinary investigation of the recent bleaching of zooxanthella-bearing organisms and subsequent effects. Scheduled talks included sessions on coral reproduction and growth, community ecology, reef management and mapping, history of reef development, corals under stress, coral metabolism and coral growth.

Ample opportunity for informal discussion was provided by the various social activities associated with the meeting. In addition to two evening beer parties in the RSMAS dining area, there was a Friday evening picnic at Crandon Park on nearby Key Biscayne. Friday afternoon the RSMAS research vessel Calanus was available for tours. Finally the ISRS held their annual general meeting on Saturday afternoon.

Before and after the meeting, there were field trips to local Florida reefs. After the meeting a few lucky participants went on longer field excursions, one to Yucatan Peninsula in Mexico and one to use the PC-8 submarine at the Discovery Bay Marine Laboratory in Jamaica. The meeting was well run. Thanks are due to the members of the organizing committee, Bob Ginsburg. The general consensus of the participants was that as usual in Miami, the meeting was well run. Thanks are due to the members of the organizing committee and the many capable RSMAS graduate students who assisted throughout the activities. The geographic and academic diversity of the participants, along with the opportunity for informal discussions resulted in a very productive and stimulating coral reef meeting.

Elizabeth H. Gladfelter, West Indies Laboratory, Fairleigh Dickinson University, Teague Bay, Christiansted, St. Croix, U.S. Virgin Islands, 00820

THE 289TH MEETING OF THE CHALLENGER SOCIETY
Edinburgh, December 13th, 1984

Steve Howard

This one-day meeting held jointly with the Scottish Marine Biological Association (SMBA) and the Tropical Marine Research Unit (TMRU), York University, presented the results of surveys which investigated marine habitats and the flora and fauna of the coast of Oman.

The SMBA survey was conducted in North Oman in the vicinity of an oil refinery at Mina al Fahal and concentrated on describing the hydrography of the area, intertidal and shallow sublittoral benthos, and obtaining data on the primary production of inshore phytoplankton. The dominating hydrographical feature was the presence of upwelling along a considerable portion of the coastline, reducing surface water temperatures to as low as 18°C in some areas during September-October. Daily surface temperature variations of 5°C were recorded, thought to be due in part to oscillating opposing currents giving rise to movement of pockets of cool water. High nutrient levels were associated with the upwelling, permitting locally high primary productivity.

TMRU surveyed South Oman limestone and metamorphic rock coastal habitats and detailed presentations were given of algae, molluscs, crustaceans and inshore fish. Coral growth in the North and South Oman was minimal, probably as a result of upwelling of cool water along the coast. Changes in monsoon had a marked effect on intertidal algae when offshore winds resulted in drying out of the splash zone, reducing algal cover from 100% to zero within two weeks. Several new species of algae were recorded by Sue Hiscock (TMRU), one of which was the dominant alga at one study site, and in general, taxa recorded were more typical of temperate latitudes. John Taylor (British Museum) discussed the distribution of molluscs and offered a fascinating theory concerning the maintenance of Miocene relic flora and fauna along the Oman coastline, maintained within the tropics, by the upwelling waters.

Steve Howard, Oil Pollution Research Unit, Orielton Field Centre, Pembroke, Dyfed SA71 5EZ, UK
BOOKS

Oligocene Reef Tract Development, Southwestern Puerto Rico
by S.H. Frost, J.L. Harbout, D.K. Beach, M.J. Rea/ini and P.M. Harris

Sedimenta IX, University of Miami, 1983, 144 pp. 54 figs. $11 plus $1.75 postage.

This modest paper-backed book is one of the most significant documents on Caribbean Tertiary stratigraphy. It offers both detailed measured sections and carefully thought-out reef models. These studies are the product of successful collaboration between academia, Northern Illinois University and the University of Puerto Rico, and industry represented by Gulf Oil and Exploration Company and Phillips Petroleum Company. This book was prepared for a field trip sponsored by the SEPM Cenozoic Reef Research Group in 1983. But it is more than a field guide; it is also a source of stratigraphic, paleoecologic and sedimentologic data and interpretations.

Oligocene seaward reefs and associated deposits are fully developed and exposed along the Penuelas-Guanica tract in the Ponce-Juana Diaz Embayment on the southwest coast of Puerto Rico. This Late Oligocene carbonate shelf was controlled by the interaction of tectonics, eustasy, water mass characteristics, and the constructional potential of the shelf and reef communities. During the Early to Late Miocene, deep shelf chalks buried the older shallow sediments. Diagenetic and weathering effects have been minimal, so that these strata provide a reliable model for the exploration of similar Tertiary reefs elsewhere.

Three detailed measured sections document the Upper Oligocene to Lower Miocene stratigraphy of Puerto Rico. The sections can be found by following the topographic maps provided and the outcrop photos. The distribution of coral and large foraminiferan genera are related to the facies and environmental interpretations. Four cycles of reef growth are recorded in the Upper Oligocene strata. Each cycle begins with deep fore-reef sediments with *Lepidocyclina* and interbedded reef rubble. The fore-reef corals are *Hydnophora*, *Leptoseris*, *Fungophyllia*, and *Porites*. The reef frame community consists of *Porites*, *Goniopora*, *Antigorgia*, *Montastrea*, *Diploria*, *Meandrina*, *Porites*, *Siderastrea*. Each cycle ends with wave destruction of the reef and deposition of rubble and sand.

Porosity is not well developed in these reefal and associated facies. The authors suggest three factors that may have prevented fresh water from the island entering these strata. The down-dip flow of water may have been captured by underlying sandstones. The overlying strata are poorly permeable deep water lime muds. And the reef sediments were relatively muddy and cemented early. Original pores are filled with lime mud and some early marine cement in the form of peloidal mud and isopachous rims of bladed calcite. Fine-grained equant spar fills the remaining voids. As is the case with most carbonate reservoirs other processes operate in the subsurface environment to create and preserve porosity for hydrocarbons.

On the north side of Puerto Rico a key reference section near Lares documents the Late Oligocene through Early Miocene carbonate shelf history. Here the island slope was much more gentle than on the southwest side. Consequently a broad, low relief marine platform developed upon an alluvial plain. The range of distinctive positional environments spans from the fresh to brackish swamp, estuarine and mangrove swamp, beach, carbonate sand shoals to inshore coral thickets and c coppices. An inshore fringing reef tract developed upslope from the small patch reefs. Branching *Porites* dominate these small biostromes, and massive *Porites*, *Colpophyllia* and *Favites* are the frame builders of the fringing reef. The two reef models from Lares and Penuelas-Guancan represent the full range of environments, fossil assemblages and lithic associations for mid-Tertiary reefs in the Caribbean and western Tethys.

The Holocene reefs and associated sediments on the southern insular shelf of Puerto Rico provide an excellent analogue for the Oligocene reefs. One day of the trip was spent examining the sediments on the shelf. The sediments are controlled by proximity to shore and physical energy conditions. Nearshore sediment tracts are dominated by terrigenous sand and mud. Progressively offshore carbonate mud and sand become more important. Near-shore patch reefs in turbid water are characterized by massive head corals of *Montastrea*, *Diploria*, *Meandrina*, *Porites*, and *Siderastrea*. This community also forms fringing reefs around islands on the middle-shelf platform. An older submerged barrier reef system is preserved at the edge of the shelf. It was established during a lower sea level and has been drowned by the most recent rise. Now it is encrusted by coralline algae and sparse sponges and gorgonians. The final part of Sedimenta IX is a road log to the localities. It seemingly is easy to follow the road systems in Puerto Rico because most instructions refer to the road numbers. However the fine maps show the sites of the measured sections clearly. Throughout the book numerous photographs document outcrops, corals, foraminifers, and petrologic features. With these photos one would be able to make preliminary identifications of many of the species. However, some of the photos are not very clear; either they are overexposed or have low contrast. Aside from that, the book is well done and both the authors and the publisher have made an important contribution to the knowledge of Tertiary reefs. This study will be useful to both the explorationist and the theoretician.

Bob Scott, Amoco Production Company, 4502 East 41st Street, Post Office Box 3385, Tulsa, Oklahoma 74102, USA.

The larvae of Indo-Pacific coral reef fishes
by J.M. Leis and D.S. Rennis


Not surprisingly, rather few ichthyologists have given their attention to the problems of larval fish taxonomy. The taxonomy of adult specimens is difficult and intriguing enough to satisfy most workers, who are outnumbered many times over by the 20,000 or more extant species of bony fishes; and anyhow, the classification of adults had to reach a fair level of refinement before the problems posed by larval forms could be tackled in any realistic way.

The difficulties facing systematists of fish larvae are great. In many species larval forms have particular and peculiar characteristics associated with their nursery
environments and ways of life, both of which often differ markedly from those of the adults. On the other hand, obedient to the dictates of von Baer's law, early larval stages of different species can be remarkably similar and show few obvious features linking them with their later forms. These in turn are often bizarrely unlike juvenile and adult members of their species. Essentially the problem is to develop an identification system which is both discriminating at the larval level but congruent with systems of classification and identification worked out for adults. A tough proposition, but one which has, over the last twenty years or so, attracted an increasing number of students.

Leis and Rennie must be welcomed to that group, the more so since their efforts are concentrated on the fishes of the Indo-Pacific area, a region rich in species and one with an abundance of taxonomic problems at all stages of a fish's life history. Here, as elsewhere, the work of ecologists is being hampered by lack of knowledge regarding life-histories, an especially acute problem for those studying the complexities of coral reef biology.

The authors of this book, aim, through a Gestalt or 'integrated image' approach, to guide would-be identifiers to at least a family level identity for their specimens. Some 49 families of coral reef teleosts are dealt for those studying the complexities of coral reef biology.

The family descriptions are very comprehensive and detailed, and are backed by figures illustrating various stages in larval development. Each gives a brief account of adult forms, spawning habits, and details of development up to the time of hatching. This is followed by a long account of larval morphology (including morphometric features and pigmentation) and, probably most important of all, a section detailing various diagnostic characters to be used in discriminating between families whose larvae are similar. Finally, there is a table of meristic features for Indo-Pacific genera belonging to the family under consideration, and information on the range and nature of the material on which the larval descriptions are based.

The introductory chapters include clearly written notes on the terminology of developmental stages (very necessary to avoid losing one's bearings in a semantic jungle), collecting methods and techniques of identification. In addition there is an illustrated glossary of anatomical and morphological terms, and a longish section supplying background information on the different features used in the family descriptions and diagnoses.

In the final analysis, any review of this book should be based on the pragmatic criterion of its utility. That, unfortunately, I am unable to do, either on the basis of preserved or of field-caught specimens. Looked at in all other respects, however, it would seem to be a model of its kind. It certainly cannot fail to be an important stimulus to further research, and a source of encouragement to the faint-hearted who might otherwise have found excuses to busy themselves in other fields of systematic ichthyology.

Humphry Greenwood, Dept. of Zoology, British Museum (Natural History), Cromwell Road, London SW7 5BD, UK.

The Corals of Hong Kong
by P.J.B. Scott

Hong Kong University Press, 139 Pokfulam Road, Bethanie, Hong Kong. 112pp. HK$85.00 (approx £7.35), ISBN 962-209-033-8.

This is a pleasant and informative paperback book with numerous colour illustrations. Although it is 'intended for the growing generation of swimmers, snorkellers and divers who escape from the horrors of the overcrowded city', it will also be of interest to more experienced reef and coral specialists because it contains an account of Hong Kong's coral environments, previously not widely known.

Sections 1 to 4 take up about a third of the book and provide background information about corals and their habitats around Hong Kong, together with mention of other organisms. The remaining, larger part of the book is devoted to Section 5, a taxonomic guide to Hong Kong corals. The coral biology is handled competently and clearly. I would quibble only with two little items which have an undue air of certainty about them: that 'ahermatypic corals had been pushed out by competition with the more successful hermatypic species', and that reef diversity is explained by 'relative environmental predictability and ecological stability'. These are only single points of view in areas fraught with different ideas, most of which are just as difficult to test. Much more too, is now known about coral reproduction, but I imagine this work has appeared too recently for Scott to have been able to incorporate it into her text.

The taxonomic section consists of short, clear descriptions pointing out salient identification features. Each species description occupies a page and is supported by one or two colour pictures of the living coral and a black-and-white picture of its dried skeleton. Some of the colour pictures are excellent, like that of Cyathelia but many of the black-and-whites are relatively uninformative (e.g. the poritids), giving only the most general notion of skeletal features. There is no identification key or grouping of the corals for identification purposes, so readers unfamiliar with corals will just have to flip the pages until they find something similar to what they wish to identify. Fortunately this should not be too difficult because the total coral fauna is small, with only one or two species within each genus (50 species in all, including azooxanthellates; 26 zooxanthellate genera and 4 azooxanthellate genera). One peculiarity in this taxonomic section which attracted my attention is that Oulastrea is mentioned under Cyathelia as being a member of the same family (Oculinidae), though Scott actually places Oulastrea itself in its customary, uncertain position in the Faviidae.

The book concludes with a glossary, reading list and index. Even though I would claim to be a specialist, I should certainly be pleased to have a copy of this book with me if I ever go to Hong Kong.

Brian R. Rosen, Department of Palaeontology, British Museum (Natural History), Cromwell Road, London SW7 5BD, U.K.
In recent years, with the development of SCUBA and the ease of travel to formerly inaccessible places, coral reefs have provided a fertile and stimulating meeting ground for the natural historian and the marine scientist. This book is aimed at providing the non-scientist with a view of how a coral reef works, illustrated with photographs from coral reefs all over the world.

The problem facing anyone attempting to present a short integrated account of something as complex as a coral reef is organization. Instead of the usual approach of treating the major groups of organisms first and then moving to interactions, the author discusses only corals and plants as discrete groups. Other reef organisms are introduced under broad and overlapping headings dealing with habitats, diversity, interactions, diel cycles, reef caves, the deep reef and so on. This organization is at times awkward and disjointed. Interesting topics, such as the prevalence of gorgonians on Caribbean reefs compared to Pacific reefs are covered under inappropriate headings and the photographs are occasionally out of phase with the chapter headings and text.

While not a "coffee table book", a clear dependence is placed on photography to illustrate the text. Many of the color photographs are excellent, but the black and white photographs are of uneven quality apparently because of poor reproduction from color transparencies. Inexplicably, the poorer of these are given the most space (pages 30, 36, 49, 99, 102, 137, 140, 145) and their inclusion is not always explained in the text. The location or even the ocean is not mentioned in most of the photographs legends. This is an attempt at generality but is a serious annoyance to anyone with experience on coral reefs. There is only one reef diagram in the book, in spite of relatively long discussions of features such as geomorphology of coral reefs and atolls, zonation, lagoons, food chains and energy pyramids which would all benefit from diagrammatic treatment.

The author is a keen observer and has had wide experience on coral reefs. Some of his accounts, such as energy flow and recycling, are clear and stimulating. The corals, however, are given short shrift and major questions in coral biology and ecology such as calcification, and autotrophy vs. heterotrophy in corals, are covered under inappropriate headings and the photographs are occasionally out of phase with the chapter headings and text.

While the book has several notable sections and attempts a novel organization, it will not prove to be very useful to the experienced coral reef naturalist. The beginner will have to supplement it with a more organized account of corals and coral reefs taken, for example, from any of several recent texts on marine ecology.

John C. Ogden, West Indies Laboratory, St. Croix, U.S. Virgin Islands.

*We are told that this book has now been remaindered in the UK and is priced at £3.99.
Coral Reefs, Seagrass Beds and Mangroves: Their Interaction in the Coastal Zones of the Caribbean
Edited by John C. Ogden and Elizabeth H. Gadflyter

Contact: Marine Information Centre, Division of Marine Sciences, United Nations Educational, Scientific and Cultural Organization, Place de Fontenoy, 75700 Paris, France.

Recent Advances in the Paleobiology and Geology of the Cenozoic
Edited by W.A. Oliver, W.J. Sando, S.D. Cairns, A.G. Coates, I.G. Macintyre, P.M. Bayer and J.E. Sorauf

Contact: Palaeontological Research Institution, 1259 Trumansburg Road, Ithaca, N.Y. 14850-1398, U.S.A.

Scleractinia of Eastern Australia Part V Family Acroporidae
J.E.N. Veron and Corden C. Wallace
Contact: Australian Institute of Marine Science, P.M.B. No.3, M.S.O. Townsville, Queensland 4810, Australia.

Diving and Marine Biology: the Ecology of the Sublittoral
G.F. Warner

Australia's Biosphere Reserves: Conserving Ecological Diversity
Australian National Commission for Unesco, 1983, Australia $4, (plus 80c postage in Australia or $1.50 overseas). This outlines the characteristics of biosphere reserves and describes the 12 areas from Australia which have been accepted into the international network.

Contact: Mail Order Sales, Australian Government Publishing Service, GPO Box 84, Canberra ACT 2601, Australia.

Comparing Coral Reef Survey Methods

Contact: Marine Information Centre, Division of Marine Sciences, United Nations Educational, Scientific and Cultural Organization, Place de Fontenoy, 75700 Paris, France.

Indo-Malayan Zoology. An international journal devoted to the biology, ecology, systematics and biogeography of Indo-Malayan and Melanesian animals.

Coral Reefs
Volume 4 Number 1 1985

M.-G. Seto
(Morality) and growth of juvenile coral Pocillopora damicornis (Linnaeus) 27

Coral Reefs (1983) 2: 173

International Society for Reef Studies
Reer Encounter

The first Society Newsletter is now published and we are eagerly awaiting any news and views, information on

With best wishes for Christmas and the Financial Year.

Yours sincerely,

P. Spender Davies
The Treasurer

Edited by Jean Bouillon and Michel Jangoux,
A.A. Balkema Publishers. First issue was due early May 1984, and twice yearly thereafter, each issue about 160pp. Annual subscription Hfl 65, US$25.00, £15 p.a. There is a special price of Hfl 35, US$13.50, £8 for individuals whose institute or firm already subscribes.

Contact: A.A. Balkema Publishers, P.O. Box 1675, Rotterdam, Netherlands (Submit manuscripts in English or in French with English abstract, to editors at: Laboratoire de Zoologie, Universite Libre de Bruxelles 60, av. F.D. Roosevelt, B-1050, Brussels, Belgium.

Journal of Coastal Research. An International Forum for the Littoral Sciences
Editor-in-Chief Charles W. Finkl, Jr., Consulting Editor Rhodes W. Fairbridge.
Coastal Education and Research Foundation (a non-profit corporation). First issue was due in January 1985, and quarterly thereafter. (We have no information about subscription costs.)

Contact: Editorial Office, Journal of Coastal Research, P.O. Box 2473, College Station, Ft. Lauderdale, FL 33303, U.S.A. (telephone (305) 523-6768)

REEF. Current Awareness Bulletin
Great Barrier Reef Marine Park Authority. Free mailing. This regular list of recent publications about the Great Barrier Reef aims to offer a complete coverage of the subject. Items appearing in this Bulletin are part of the REEF bibliographic database which has been developed by the Great Barrier Reef Marine Park Authority in conjunction with CSIRO (Australia) and is held on CSIRONET.

Contact: The Editor, REEF Current Awareness Bulletin, Great Barrier Reef Marine Park Authority, P.O. Box 1379, Townsville, QLD 4810, Australia [tel. (077) 71 2191]

Understanding Reefs. A Field Course on Film
Julia Hubbard
Six discrete units, 30 minutes each, U-Matic video/16mm colour cine film formats. The units are: I The Fore Reef, II The Reef Crest, III The Patch Reefs, IV The Inner World, V The Marginal Areas, VI The Influential Lagoon. Recorded on location in Florida for research classes at London University, but includes additional material from East Africa, Australia and the Arabian Gulf.

The primary aim of this film is to convey the intimate relationship between the ecosystem and the sediments with which it must contend. The films are concerned with the genesis and distribution of carbonate rocks in all their aspects. Main emphasis is placed on familiarising the viewer with the ecosystem and the handling of data pertaining to both living, recent and fossilised or ancient materials, with particular reference to those aspects which can not be gleaned from a study of the literature.

Contact: Julia Hubbard, King's College, London, Strand, London WC2R 2LS, UK. [telex: 24655 BLPES G; telephone: (01) 836 6545].

But W. Kym Murphy, project manager of the site for Disney's WED Enterprises, and Ken Green, site project manager for United Technologies of Hartford, Conn., which is sponsoring what is to become the world's largest salt water aquarium tank, can make the blueprints and dusty terrain spring to life when they talk about it.

There will be a 260-seat restaurant where diners feeding on fish can look out onto underwater diving feeding the fish.

The sides of the tank, which is 200 feet in diameter, will be covered with a coral reef that Murphy says in being constructed in Chicago, "where all coral reefs come from." It is being made from molds of real coral.

Researchers will begin collecting

MICHAEL JANUSONIS

Providence Journal 27.10.1984
The REEFWATCH project is a joint venture under the aegis of the British Admiration Society and Reef Fish Numbers,
BROKEN CORAL – this is intended to cover damage where coral has been broken or eroded, either from natural causes such as storms, or from man's use of the reef (ie. coral broken by anchors, combined effects of divers or snorkellers kicking or intentionally breaking off corals, or by the use of explosives by fishing vessels or other localities. (Where is the damage? What is the apparent cause?)

DEAD CORAL – this refers to coral which appears to have died recently but which is still in position on the reef and not broken off. The skeleton will appear whitish and will not yet have been covered by a mat of algae. It should still show the intricate pattern or latticework and will be stark to the touch (ie. it should neither have been eroded nor substantially recolonised by other organisms. (Where is the dead coral? What is the apparent cause?)

OIL SICK – ignore any tiny thin spills of only a few square metres (these may simply have come from very small inputs from nearby reefs). Considerable – several small slicks or one large one; Extensive – oiling of the whole area with oil such as might occur near an oil terminal or following a major spill. (How big? From where? When? What?)

SEWAGE OR WASTE – indicate here if you can see or know that sewage, rubbish or other pollutants are entering the water within 100m of the site or near enough to be drawn into it by the flow of water. (Is there from a sewer, rubbish dump, factory, etc.?)

OTHER – (Please explain what this is.)

Your assistance with this project is greatly appreciated. If you have any comments on the project design or if you are in need of further information or advice please contact:

Reefwatch Coordinator,
Tropical Marine Research Unit,
Department of Biology,
University of York,
YO10 5DD,
England, U.K.

JUNE 1983

Is Reef Typical

Among best

Fairly good

Moderately good

Limited

Can't tell

Attractiveness

Exceptional

Pretty good

Moderately good

Limited

Poor

Dive Site Rating

Exceptional

Pretty good

OK

Not very good

No good

Coral Cover

Almost complete

Fairly good

Very low

Coral Variety

Exceptional

Good

Moderate

Poor

Almost none

Algal growth

Extravagant

Abundant

Numerous

A bit limited

Not noticeably

Pelagic Fish Nos.

Superabundant

Abundant

Numerous

A bit limited

Very low

Benthic Fish Nos.

Superabundant

Abundant

Numerous

A bit limited

Not noticeably

Environmental Impacts

Fishing

Spearfishing

Diving

Shell collection

Bream

Deer

Coral bleaching

Coralline seaweed

Additional Comments

Attach supplementary notes, if necessary

Key Words

Project

Reef

Rating

Land Reclamation

Shell

Bream

Deer

Coral bleaching

Coralline seaweed

Name(s)

Address

Country

Telephone

Approximate no. of prawns being removed in previous week

Extensive

Moderate

Few

1-2

Name

Please return to: Reefwatch Coordinator, Tropical Marine Research Unit, Department of Biology, University of York, YO10 5DD, England, U.K.
WEST INDIES: JAMAICA
DISCOVERY BAY MARINE LABORATORY,
22 AUGUST 1984*

The Discovery Bay Research Foundation is happy to announce that the Discovery Bay Marine Laboratory is extending its research capability through the acquisition of a manned observation submersible. This vessel, Perry PC-BB, is now operating at the laboratory, and is leased until June 1986. The submersible can take one or two observers to any depth down to -800ft (224m) for up to 8 hours. PC-BB is equipped with a 36 inch wide observation dome, an externally mounted pan-and-tilt camera, and a hydraulic manipulator.

A major factor in the success of this laboratory in coral reef science has been that the narrow north Jamaican island shelf allows easy access to coral reefs throughout their depth range. However, the physiology of deep diving severely limits one's time and availability at depth. The submersible provides the opportunity to work on the fore-reef slope, and the wall, with a clear head and ample time to observe and experiment. For the non-diving marine scientist, the submarine offers the chance of a first-hand view of his study environment.

In addition, the normally inaccessible deeper structures and communities on the wall and island slope on the fringes of the deep sea will now be available to study. These were described initially, following the short visit of NEKTON in 1972, thus we are in the advantageous position of having a baseline of observations to work from.

Nine projects have already been initiated this season on: social behaviour of deep reef fishes, sclerosponge reproduction, endolithic fungi, echinoderm feeding and reproduction, sedimentation, gastropod ecology, and deep water coral biology. The response of funding agencies to proposals has been excellent.

Rate schedule for scientific use of PC-BB: US$350 per two-hour dive, US$600 per six-hour day, US$4000 per five-day week; additional charges are made for use of external camera, onboard recorders etc. Rates for individuals, including the use of the submersible, pilot, chase/tow boat and manipulator (minimum dive duration, two hours) US$175 per two-hour dive. Day rates assume one submersion and one surfacing - a surcharge of US$50 will be made for each additional surfacing.

Extras: camera—video—onboard recorders. Externally mounted pan and tilt camera unit rates are as follows: 36 roll exposure roll with strobes US$30; 100 foot roll of bulk load film (investigator to supply film) US$50; onboard cassette recorders (investigator to supply cassettes) US$15.

If you are interested in participating in this exciting new programme please write to: M.C. Rosemyth, Submarine Research Programme Coordinator, Discovery Bay Marine Laboratory, PO Box 35, Discovery Bay, St. Ann, Jamaica. In order to coordinate and maximise research effort we request that you send an outline of your proposal before you apply for funds to use the submersible.

*We apologise that because of delays in the production of RE3, the information about rates in this announcement may be out of date, and interested readers should check this and other information for themselves.

WEST INDIES: ST. CROIX
NEW DIVING FACILITY FOR WEST INDIES LABORATORY AT ST. CROIX

The National Undersea Research Programme at West Indies Laboratory, Fairleigh Dickinson University, announces the arrival of a new underwater habitat which will eventually replace the currently operational Hydrolab. The facility, formerly known as "AEGIR", will expand the capabilities of the programme by providing scientists working underwater with greater depth capability, longer excursion times, increased laboratory space and greater mobility. This mobile underwater habitat was previously used in scientific missions by the U.S. Navy in 1970-73 and later by the University of Hawaii. Since 1973 it has been maintained by the State of Hawaii.

The underwater laboratory system arrived at St. Croix on October 17th 1984 transported from Hawaii by the Military Sealift Command's 522 ft. heavy lift ship "Transcolombia". It was unloaded at the container port and is now awaiting engineering survey and refurbishment.
The design of the new underwater laboratory is the result of the combined efforts of various individuals with a great deal of experience in the fields of diving, marine engineering, and undersea work systems. The laboratory will accommodate six scientists/aquanauts for two weeks plus another week reserve to a maximum depth of 120 feet (36.6m). It is 72 ft. (22m) long, 53 ft. (16.2m) wide and draws 8 ft (2.4m) of water. Its habitable volume of 2,800 cubic feet (79.4 cubic metres) consists of three main chambers: a laboratory, a living quarters, and a wet porch for entry and exit. The habitat was designed for mixed gas diving to 580 feet (176.9m), but it will be certified and used primarily for shallow dives on air to a maximum depth of 120 feet (36.6m). The habitat is mounted on two 9 ft. (2.7m) diameter x 72 ft. (21.9m) long pontoons which act as main ballast to achieve shallow draft while it is surfaced. The hulls and additional ballast tanks can be flooded so that the habitat can achieve negative buoyancy when anchored below the surface during diving missions.

Scientific operations using the new facility will begin in 1986 in St. Croix. Eventually, a mobile support base will allow moves between the Virgin Islands and perhaps internationally. The focus of the National Undersea Research Programme at West Indies Laboratory is to understand basic processes occurring in tropical marine ecosystems. The justification for Caribbean research lies in recognition that over 20 mostly developing nations share a relatively small geographic area and all have a great dependency on marine resources. The Caribbean Basin Initiative declared by the Reagan Administration identifies the following needs in science and technology: basic marine science endeavours, coastal marine resource development, and marine resource planning. All of these needs will be addressed by the NOAA-sponsored National Undersea Research Programme.

Contact: John C. Ogden, West Indies Laboratory, St. Croix, U.S. Virgin Islands.

INTERNATIONAL

INTERNATIONAL SUBCOMMISSION ON JURASSIC STRATIGRAPHY: CORALS AND SPONGES WORKING GROUP

The International Subcommission on Jurassic Stratigraphy has decided to establish a multidisciplinary programme for stratigraphic correlation tables between the different fossil groups.

A Corals and Sponges Working Group has been created, which, so far, has 22 people. The first meeting of this Working Group took place in Erlangen, Germany, on September 5th 1984.

During this first meeting, it was noted that in our current state of knowledge, it is not possible to establish, in the Jurassic, fine zonation based on Scleractinia or sponges. A better definition of the species concept in these groups is needed first, which will depend on more accurate studies of skeletal microstructure and on phenotypic and genetic variation in both living and fossil species.

But, paradoxically, it has been shown that identifications of species using the type concept, based on both qualitative and quantitative features, give results reliable enough to classify and correlate strata at the level of the
System, the Stage, and sometimes the Substage of formations from which corals and sponges have been collected.

To get a better understanding of species, and to establish stratigraphic sequences based on corals and sponges, the Working Group proposed that specialists should prepare data cards for computerized treatment, and has devised a format for these cards.

Information from: Mrs. L. Beauvais, Laboratoire de Paléontologie des Invertébrés, Université Pierre et Marie Curie, Tour 24-25, 3ème étage, 4 place Jussieu, 75230 Paris Cedex 05, France.

**DIARY**

**continued from p.3**

**August 31st to September 6th, 1986**

**NINTH INTERNATIONAL MALACOLOGICAL CONGRESS**

**EDINBURGH, SCOTLAND**

This meeting is organised by Unitas Malacologica, the International Malacological Union, members of which are entitled to reduced Congress fees, as well as publication concessions.

The provisional programme consists of the following symposia:

1. History of Malacology
2. C.M. Yonge Commemorative: The Bivalvia
3. Higher classification and phylogeny of the Prosobranchia
4A. Applied malacology — 1. Medical aspects
4B. Applied malacology — 2. Agricultural aspects
4C. Applied malacology — 3. Food and fisheries aspects
5. Cold-water Mollusca
6. Introduced species
7. Evolutionary biology of Opisthobranchia
8. Molluscs as threatened species: their exploitation and conservation

In addition, a Curators' Colloquium is planned, together with six specialist group workshops, including: Mollusc Conservation Group; and Shells and other skeletal structures of Mollusca: ecological and ecophysiological problems.

There are excursions during and after the Congress (but there are of course no real reefs in Scotland!).

Contact: Congress Office, Ninth International Malacological Congress, Royal Museum of Scotland, Chambers Street, Edinburgh, EH1 1JF, Scotland.

**Autumn 1986**

**ISRS MEETING (Somewhere in Germany)**

Details to be announced.

**1987**

**January 27th to 30th, 1987**

**CANADIAN REEF RESEARCH SYMPOSIUM, BANFF, CANADA**

The Canadian Society of Petroleum Geologists and the University of Calgary are organizing a meeting which is intended to be part of the Canadian Reef Inventory...
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DAY FOR KNIGHT: Sir David Lean, aged 76, director of such films as Brief Encounter and Lawrence of Arabia, yesterday received his knighthood from the Queen in an investiture at Buckingham Palace.

THE GUARDIAN
Wednesday October 31 1984

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7. Reefs versus reef mounds: the evolutionary pitfalls of reef communities.

The registration charge will be $125 Canadian, and the estimated cost per head, $240 Canadian. Because of the season, there will be no symposium field trips.

For further details, EITHER write to: Canadian Reef Research Symposium, C/O The University of Calgary, Conference Office, Faculty of Continuing Education, 2500 University Drive, N.W., Calgary, Alta, T2N 1N4, Canada, OR telephone: Dr. Jeff Packard (Geological Survey of Canada) Calgary 403-284-0425, or Dr. Rand Harrison (Alberta Research Council) Edmonton 403-438-0555

Spring 1987
BRITISH ECOLOGICAL SOCIETY
Details to be announced.

The meeting will be devoted to two ecological themes: Life histories and trophic patterns on and around coral reefs. Although speakers will be mostly from Britain, it is possible that two will be invited from elsewhere.

The meeting organizer is Dr. John Taylor, but interest enquiries may be addressed to the Society:
Dr. Adrian G. Marshall, Department of Zoology, University of Aberdeen, Aberdeen, Scotland, AB9 2TN, U.K.

August 20th to 30th, 1987
XVI PACIFIC SCIENCE CONGRESS, CORALS AND CORAL REEFS: ANCIENT AND MODERN, SEOUL, SOUTH KOREA.

Possible headings include:
1. Morphology and structure of coral reefs
2. Biotic distribution of reef organisms
3. Reef ecosystems: structure and function
4. Community studies and system modelling
5. Coral reef resources management and pollution
6. Commercial aspects of coral reef fisheries
7. Ahermatypic corals.

For further details, contact: Professor E.D. Gomez, Marine Science Center, University of the Philippines, Diliman, Quezon City, Philippines.

October 1987
SOCIETY OF ECONOMIC AND PETROLEUM GEOLOGISTS, SYMPOSIUM ON CENOZOIC REEFS: GEOLOGY MEETS BIOLOGY, MALLORCA

This will be a three-day meeting followed by a four-day field trip to the Tertiary reefs of southeastern Spain. The emphasis will be to bridge the gap in understanding between biologists and geologists studying Cenozoic reefs and to better integrate the findings of reef researchers from several countries. The fieldtrip will be coordinated by Mateu Esteban, and will provide a unique opportunity to study a spectrum of facies relationships with great detail on sedimentology, ecology and diagenesis.

For further details contact: Clif Jordan, Mobil Research and Development Corporation, 13777 Midway Road, Dallas, Texas 75234, USA.

1988

August 1st to 5th, 1988
FIFTH SYMPOSIUM ON FOSSIL CORALS, SPONGIO-MORPHS AND REEFS (PROVISIONAL TITLE)
BRISBANE, AUSTRALIA.

The Australian Organizing Committee (Chairman, Dr. J.S. Jell) recently changed the date of this meeting from 1987 to 1988, following a questionnaire sent to members of the Council of the convening body, the International Association for the Study of Fossil Cnidaria. This new arrangement means that the Townsville meeting (below) will follow this one almost immediately in the second half of August. 1988 is also Australia's Bicentennial, so reefs ancient and modern are obviously going to be a major part of the celebrations. Provisional subject sessions are:

1. Intraspecific variability in corals
2. Distribution patterns of corals and spongiomorphs across so-called extinction intervals

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THE GUARDIAN Wednesday October 31 1984

Yesterday received his knighthood from the Queen in an
such limbs as brief accounts and lawrence of Arab's
day for Knight Sir David Lean aged 76 the director of
3. Frame-building organisms: associations in ancient and modern environments
4. Early diversification and dispersal in the major coelenterate and spongimorph groups.

Possible field excursions either before or after this meeting (but before the Townsville meeting) are:

For further details, contact: Dr. J. S. Jell, University of Queensland, Department of Geology and Mineralogy, St. Lucia, Queensland, Australia 4067.

August (second half), 1988
SIXTH INTERNATIONAL SYMPOSIUM ON CORAL REEFS,
TOWNSVILLE, AUSTRALIA
Details to be announced, but see notes on the Brisbane meeting, above.

1989

July 9th to 15th, 1989
INTERNATIONAL COELENTERATE CONFERENCE
LONDON, U.K.

After a somewhat nomadic existence, the date for this meeting has now settled down. It is not, as leaks from early Committee deliberations may have suggested, either 1987 or 1988.

It is intended that this meeting will also cover Ctenophore work. Subject sessions:

1. Classification of the phylum
2. Ecology, especially reproductive and population
3. Development
4. Physiology and behaviour 1: neurobiology, luminiscence, pharmacology, immunology and nematocysts
5. Genetics and evolution: phylogeny, classification, genetics and speciation
6. Fine structure and function
7. Growth and form
8. Skeletons and biomineralization
9. Physiology and behaviour 2: feeding, digestion, intracellular symbiosis, animal associations

A first mailing is in preparation for early 1986.

For further details, contact the Committee Secretary: Dr. P. F. S. Cornelius, Department of Zoology, British Museum (Natural History), Cromwell Road, London SW7 5BD, U.K. (telephone 01-589 6323, extension 453)

ANNOUNCEMENTS: additions from p.30

The Canadian Society of Petroleum Geologists in cooperation with the University of Calgary is pleased to announce the Canadian Reef Inventory Project, a two-part endeavour:

1. A MAJOR RESEARCH SYMPOSIUM ON REEFS
2. THE PUBLICATION OF A CANADIAN SOCIETY OF PETROLEUM GEOLOGIST MEMOIR

* Provitational title is "Canadian Reef Inventory: Case Histories of Proterozoic and Phanerozoic Buildups of Canada and Adjacent Areas"
* The memoir will contain concise case histories of reefs of all ages from within, or immediately adjacent to, Canada's national borders.
* Each article will follow a prescribed format, tailored to either surface or subsurface reef occurrence.
* Manuscripts are to be submitted by February 1st, 1987. Publication is anticipated in early 1988.
* The editors of the memoir are: H.P. Jones (Memorial University, St. John's), H.J. Geldzitter (Geological Survey of Canada, Calgary), and G.E. Tissot (Petro-Canada, Calgary).

Should you wish to receive future fliers or additional information on either of the above mentioned projects, please contact Dr. Jeff Packard (Geological Survey of Canada, Calgary, 403-294-3025) or Dr. Rand Harrison (Alberta Research Council, Edmonton, 403-448-0355), or write Canadian Reef Research Symposium care of the address given below.

The University of Calgary, Conference Office, Faculty of Continuing Education, 2500 University Drive N.W., Calgary, Alta. T2N 1N4

The Canadian Society of Petroleum Geologists

Proposed New M.Sc. Course In Tropical Coastal Management

We anticipate that the course will commence in September 1987
Dr. Barbara E. Brown,
Department of Zoology,
University of Newcastle upon Tyne, Newcastle upon Tyne NEI 7RU,
United Kingdom.

illuminations

COVER


p.4 Part of an illustration on p.35 of Gibbons, R., 1950 [above]. By permission of the publisher.

p.11 Map by Jill Darrell.

p.12 Cartoon devised by Ian Macintyre, realized by A. Macintyre.


p.14 Fig. 17 in [Ravikovich, A.T., 1984. Recent and fossil coral reefs]. Moscow: Akademia Nauk. [In Russian].

p.15 Part of Botticelli's The birth of Venus. (upper)

p.16 (lower right)

p.19 Cartoon by Brian Rosen.


p.28 Drawings reproduced from Discovery Bay publicity material.

p.29 Drawing reproduced from West Indies Laboratory publicity material.