

Pacific Island Meeting-Proceedings

Introduction

Thinking about the needs and the means for securing the conservation of islands and areas of special importance to science in the Pacific Ocean may be said to date back at least to the discussion on Charles Darwin's report of his visit to the Galapagos Islands. The founding of the Pacific Science Association in 1920 through initiation of regular international meetings focussed attention on the desirability of a more systematic approach. The Fourth Pacific Science Congress (1929) called for a review of existing collections from the Pacific region, and a summary of these, mainly in the botanical field, was provided in Part II of the report of the Standing Committee for Protection of Nature in and around the Pacific to the Sixth Pacific Science Congress (1939). Part I of this report summarised at length information gathered, mostly in reply to a questionnaire, concerning the state of conservation in many Pacific areas from Alaska to New Zealand. No immediate follow-up was possible owing to World War II, but in 1948 two Conferences were held under the auspices of the Pacific Science Board of the U.S. National Research Council on conservation in Micronesia—one in Honolulu in April and the second in Washington, D.C., in May. The final report was compiled by Harold J. Coolidge, Executive Secretary of the Board, and published by the National Research Council in 1948.

At the Eleventh Pacific Science Congress in Tokyo (1966) the opportunity was taken to hold a series of reviews of progress in conservation of the countries surrounding the Pacific and of its island groups, the latter being a subject of a special review. At this Symposium, "Island Ecosystems of the Pacific Basin," held on August 25, 1966, a paper by M. W. Holdgate and E. M. Nicholson on an International Conservation Programme for the Pacific Islands was contributed on behalf of the International Biological Programme, Section C.T¹, as a basis for discussion. This discussion dealt with the problems of carrying out a covering resolution which was submitted to and duly approved by the Council of the Pacific Science Association and adopted at the closing General Meeting of the Congress on September 3, 1966 in the following terms:

"In view of the unique significance for world science of a number of islands in the Pacific Ocean which have hitherto, wholly or in part, escaped man-made changes, and in view of the irreplaceable endemic or rare species for which some of these islands form last refuges, and of the serious threats to the continuance of such natural conditions for research, the Congress AFFIRMS the urgent international importance of securing early and effective conservation of natural habitats on such islands. Therefore it is

¹ Conservation of Terrestrial Biological Communities.

RESOLVED to request representative institutions in member countries of the Pacific Science Association to bring to the attention of their Governments the need to exercise the strictest restraint in relation to such island natural areas, and

RESOLVED to request all scientists concerned to accord the fullest cooperation to the International Biological Programme and to the International Union for Conservation of Nature and Natural Resources in developing jointly with the Pacific Science Association surveys and recommendations which will enable the authorities concerned to establish an adequate permanent series of natural habitats to be conserved as a base for research throughout the Pacific region. The report of actions arising out of these recommendations is to be given to the next Pacific Science Congress." [Proceedings Eleventh Pacific Science Congress, vol. 14, p. 396, 1967.]

For the purposes of follow-up, it was agreed and communicated in an IBP/CT circular dated October 13, 1966, that the tasks should be broken down into four successive stages:

1. Survey in the field as may be required to supplement published or unpublished information in order to provide basic data for analysis and for the preparation of regional reviews and reports by the respective rapporteurs.
2. Circulation, critical analysis, and revision as necessary of regional reviews and reports, leading to their consideration at a Technical Meeting to be convened by IBP/CT in collaboration with the other parties at some appropriate place in the Pacific during 1968 or early 1969. Here a comprehensive program would be adopted and passed for action by the international authorities and governments concerned through IUCN.
3. Approach by IUCN to governments with recommendations for action on the approved program to be followed up in correspondence and interviews in order to secure maximum effectiveness of conservation of the listed sites. Simultaneously by 1969, when its General Assembly meets in India, IUCN to seek agreement on the Conservation of Oceanic Islands (not necessarily restricted to the Pacific). It is hoped that, given ample advance preparation, such agreement might be acted upon in 1970, by which time individual governments should have secured national measures to safeguard a good proportion of the listed islands. In view of their uninhabited character, some co-operative enforcement provisions might be necessary to make such a convention practically effective.
4. Reviews by the Twelfth Pacific Science Congress in Australia of the fulfilment of this resolution and of implications for further measures of conservation in the Pacific, which will be proceeding simultaneously through other channels. In particular, consideration will be given to the further development of international biological stations or general scientific stations at suitable points giving base coverage of the Pacific

region. A review will be made of contributions toward a more comprehensive program of long term research in the Pacific.

Originally the task was broken down geographically into eight sectors.

1. North-east Pacific from Bering Strait to Lat. 30°N , and westward to International Date Line;
2. Tropical Eastern Pacific, including Hawaiian Group from Midway Is., between 30°N , and Tropic of Capricorn, westwards to 180° but including Fiji and Tonga;
3. South-eastern sector, east of 130°W ;
4. South-west sector, South of Tropic of Capricorn and west of 170°E ;
5. South-west tropical sector, North of tropic of Capricorn up to 14°S and between 153° – 175°E ;
6. South-west tropical sector from approximately 14°S to Equator west of 180° , Banda Sea Islands, Bismarck, Solomon, and Ellice Islands, Nauru.
7. Northern tropical sector between Equator and Tropic of Cancer east to 180° ;
8. North-west sector from Tropic of Cancer to Bering Strait.

It was subsequently found necessary to omit the Philippines and the Indonesian Islands in the interests of concentrating on the oceanic islands of the Pacific. A number of specialist rapporteurs were invited to report on these sectors, but not all of those invited were able to do so, and in certain cases alternative arrangements had to be made.

It was pointed out at Tokyo that owing to the great importance of coral atolls and islands, it was highly desirable that the Section of IBP concerned with marine productivity should be associated in this survey and review, Sir Maurice Yonge, Scientific Co-ordinator for IBP/PM,² was accordingly invited to nominate suitable specialists with respect to coral structures and their biology.

In view of the scattered and somewhat inaccessible nature of previous documentation, work was also being done in locating and copying or abstracting a number of references in the literature which appeared to be of significance for the present purpose, and these were included in the documentation of the Technical Meeting.⁸

The primary object of the Technical Meeting was to review all available information contributed by participants or otherwise, or gathered from the literature, and to form conclusions concerning the location and nature of existing scientific interest, particularly of uninhabited oceanic islands in the Pacific, but with reference to Pacific conservation generally. On the basis of the ascertained scientific interest, an assessment was to be made of the present state of conservation and the main threats of injury or destruction which can be foreseen, with a view to preparing a definitive, or at any rate a provisional, list as a basis for an international program of conservation in the Pacific.

² Productivity of Marine Communities.

³ See Follow-up and Documentation.

PREPARATION AND COMPOSITION OF THE MEETING

Having defined the scope and principal object of the meeting, the next requirements was to settle a time and place for it. Several of those present at Tokyo had called attention to the simultaneous proposal for reviving in a new form the biological station which had existed up to 1940 near Koror in the Palau Islands. In its Resolution the Congress pointed out that "The Palau Tropical Marine Biological Laboratory, originally established by Dr. Shinkishi Hatai in response to the recommendations from the Fourth Pacific Science Congress, has been out of existence since the war years. This laboratory was centered in a large area now without research facilities for marine biology or fisheries which possesses a very wide variety of marine environments, with associated rich biota and island terrestrial environments. There are significant fishery resources in this region also. A re-established laboratory in Palau would provide scientific access to the world's richest biotic province, the Indo-Pacific Biotic Province, at a particularly favourable place. RESOLVED to ask the appropriate authorities to give prompt consideration to the re-establishment of the Palau Tropical Marine Biological Laboratory, including facilities for the study of terrestrial biology, geology, and other appropriate scientific studies." [Proceedings Eleventh Pacific Science Congress, vol. 14, p. 407, 1967.]

Under the circumstances, great satisfaction was felt when the High Commissioner for the Trust Territory of the Pacific Islands, Mr. William R. Norwood, sent an invitation to the Convener of IBP/CT, Mr. E. M. Nicholson, on September 18, 1967, suggesting that Palau would be the ideal place to hold such a biological meeting.

It was clearly essential that such a meeting should be as well prepared as possible and should be limited to a small, picked group, not only commanding long and extensive experience in the Pacific but also well qualified to reach conclusions and recommendations generally acceptable to its colleagues. Naturally, many difficulties were encountered in bringing together such a group at so remote a location, but finally the nucleus was constituted, consisting of three members of the IBP/CT International Sectional Committee—E. M. Nicholson, F. R. Fosberg, and L. M. Talbot—two National CT Chairmen from countries specially concerned—M. Numata from Japan, and G. A. Knox from New Zealand—together with Sir Maurice Yonge, Scientific Co-ordinator for IBP/PM, and a group of leading coral specialists, including T. F. Goreau, S. Kawaguti, S. Motoda, and J. W. Wells. To these were added the Secretary of the Pacific Science Association, Miss Brenda Bishop, and two leading authorities from Hawaii, V. Brock and M. S. Doty.⁴ With the help and guidance of the local organizer, R. P. Owen of the Entomology Laboratory, Palau, and L. G. Eldredge of the Division of Biosciences and Marine Studies of the University of Guam, an additional list of participants from the Trust Territory and Guam was prepared. Those who attended in this way are listed under the particular sessions in which they participated.

⁴ Addresses of participants will be found in Annex 2.

ACKNOWLEDGEMENTS AND THANKS

That the Technical Meeting proved so rewarding and enjoyable to the international participants was due to the wonderful hospitality and unflagging efforts of many who at various levels and in different places prepared for and sustained it, including many who cannot here be mentioned by name but to whom we are nonetheless most grateful.

In Guam Governor Guerrero welcomed the meeting with a much appreciated reception in his delightful mansion overlooking Agana Bay and did us the honor of attending our final session at the University to deliver a most thoughtful address which is reproduced below on page 000. The officers concerned in the administration of the Territory of Guam also gave keen support which was very much appreciated. Special mention must be made here of Paul Souder, who has such extensive personal knowledge and experience of these matters and was able to contribute so much, both in the meetings and in the field. The High Commissioner of the Trust Territory, Mr. Norwood, also extended to us the utmost hospitality and ensured that all the facilities we could desire were forthcoming in the Trust Territory. We were particularly happy to have his personal participation in the final meeting at the University of Guam. In Koror we also benefited much from the presence during the earlier discussions of the High Commissioner's Personal Representative, Leo Falcam, and the Palau District Administrator Boyd McKenzie. Dr. A. C. Yamashita, President of the University of Guam, and many of his colleagues also showed us great understanding, hospitality, and helpfulness.

The main burden of local organization fell on R. P. Owen, Head of the Entomology Laboratory in Palau, whose forethought and consideration, admirably supported by his staff, enabled our meetings at Koror to run more smoothly and efficiently than had been thought possible in so small and remote a center. During our somewhat extended stay at Koror, we received ceaseless, warm-hearted hospitality such as none of us had ever previously experienced in its unique Micronesian form. Mrs. Hera and Miss Ramona Owen and Mrs. Boyd McKenzie entertained us all in their homes, and we were also welcomed by the Government of the Trust Territory at an opening reception at the Royal Palauan Hotel and by the people of Koror at a community entertainment. Mr. and Mrs. Peter Wilson were also tireless in looking after us, and it was due to his initiative that a number of us were able to make the extended and interesting voyage to the coral reef of Kayangel during the weekend of November 23 and 24. Among many others who helped and guided us, we recollect the cookies baked by the Osborne girls and the many valuable and informative conversations with Dr. Osborne, Mr. Norden Cheatham, and members of the Peace Corps who sat in with us and accompanied us to the islands. Finally, we cannot omit mention of the exceptional trouble taken to meet our needs by the manager and staff of the Royal Palauan Hotel, which we had largely to monopolise during our stay.

On Guam, we were similarly indebted for unfailing hospitality, including the meeting of aircraft at singularly inconvenient hours by Dr. and Mrs. Lucius Eldredge.

This must also be accorded to Mrs. Herbert Johnston, Archivist of the University's Pacific Collection, for the magnificent closing reception, complete with a memorable Pacific sunset which we enjoyed from her garden on Nimitz Hill.

Beyond the confines of Micronesia we were also greatly indebted to Miss Brenda Bishop, Secretary of the Pacific Science Association, who travelled early to Koror and devoted her unique experience of conference organization to facilitating our work, which she continued throughout the meetings by handling the documentation and records with the aid of devoted local secretaries. The Technical Meeting also recorded special thanks to Miss Gina Douglas, Scientific Coordinator of IBP/CT, who did so much to prepare the basic documentation for the meeting, and to Miss Jennifer Tope, Secretary of the Section, without whose untiring flow of communications to so many corners of the earth the participants could never have been assembled as they were, at the right time and place.

Report

KOROR

Opening Ceremony

Following a weekend of informal activities on Guam, the opening ceremony took place at 1:30 p.m. at the Entomology Laboratory on Koror, Palau.

Addresses of welcome were given by Leo Falcom on behalf of the High Commissioner of the Trust Territory of the Pacific Islands, by High Chief Reklai on behalf of the people of Palau, and by J. Boyd MacKenzie, District Administrator, Palau District. In response, E. M. Nicholson described the purposes of the International Biological Programme and the overall purpose of the meeting (Fig. 1). F. R. Fosberg stressed the vulnerability of the environment which supports islands and the value of islands in showing natural processes in a relatively simple situation. Sir Maurice Yonge spoke (Fig. 2) of the necessity for long-term studies in depth, if significant results are to be achieved, and referred to the excellent work that was carried out in Koror at the biological station established prior to World War II. J. W. Wells spoke of the seas not only as the possible origin of life and as sustaining life but also as destroying land. He further stressed the important role of the reefs in protecting land.

All subsequent meetings in Palau were also held at the Entomological Laboratory (Fig. 3) under the Chairmanship of F. R. Fosberg.

An afternoon organizational session was held later at which it was agreed:

1. to invite selected Peace Corps Volunteers with training in and interest in the biological sciences to observe the meetings;
2. that the meetings should try to consider as a unit marine and terrestrial conservation;
3. to establish a sub-committee on a biological research station in Koror to report to the Chairman. Members: V. E. Brock, L. G. Eldredge, T. F. Goreau, S. Kawaguti, R. P. Owen, P. Wilson, and Sir Maurice Yonge.

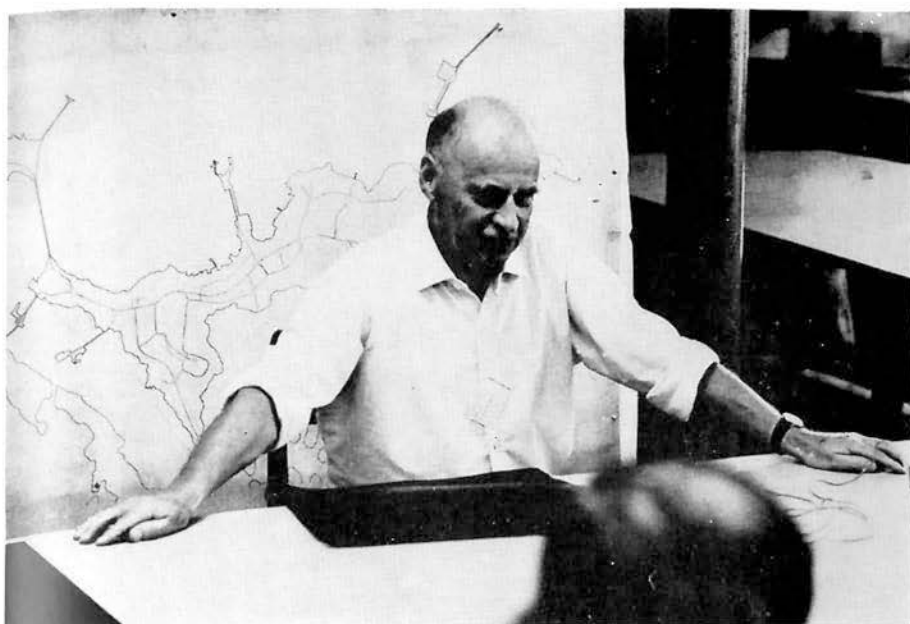


Fig. 1. E. M. Nicholson commenting at the Opening Ceremony

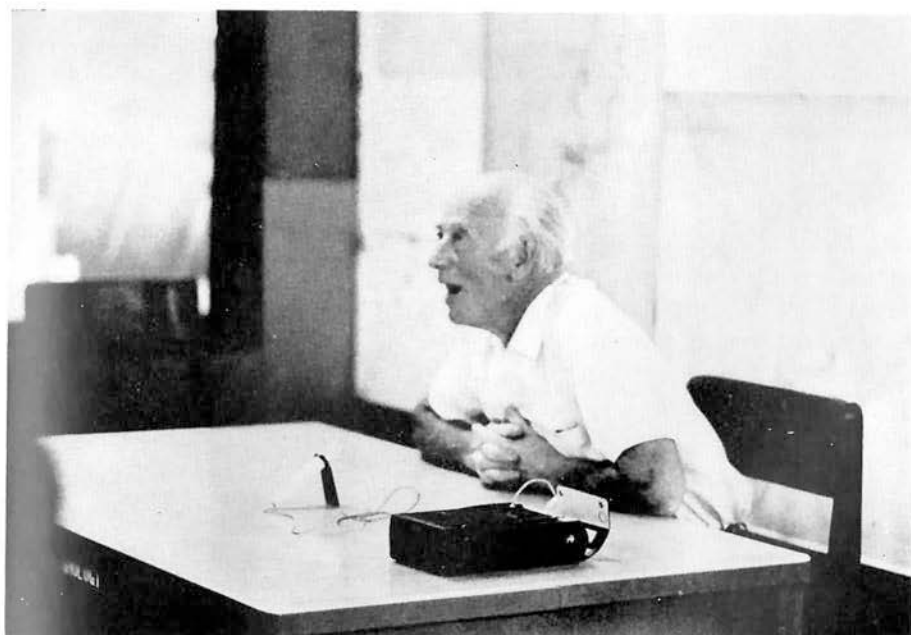


Fig. 2. Sir Maurice Yonge speaking at Opening Ceremony



Fig. 3. Entomology Laboratory, Koror, Palau

The meeting had before it a note on the International Biological Programme, extracted from the pamphlet, "What is IBP" by E. B. Worthington.⁵

Geographic Scope of Discussion

The Technical Meeting decided that it could not usefully attempt to cover the large series of offshore islands of Asia and Australasia extending southwards from Kamtchatka and the Kuriles through Japan, Ryukyus, Taiwan, Philippines, the Bismarck and Solomon Islands (except Rennell and Bellona), and thence to New Guinea and the islands of the Torres Strait, Arafura Sea and Timor Sea, thence returning northwards through the whole Indonesian archipelago to the Nicobar and Andaman Islands.

The effect of this decision was to concentrate discussion on the following broad regions: East Pacific islands; Polynesia; Micronesia; Melanesia, as defined by the preceding limits; the southern extratropical and Subantarctic islands; and the northern islands beyond the tropics, i.e. the Aleutians and other islands in the Bering Sea.

Tuesday, November 19—Discussion on Micronesian problems

This session was attended by participants and other representatives of the

⁵ "What is IBP" and other information on the International Biological Programme may be obtained from: IBP Central Office, 7 Marylebone Road, London, N. W. 1, England.

Trust Territory and of Palau, including:

Mr. Leo Falcom, Representative of the High Commissioner

Mr. J. Boyd MacKenzie, District Administrator, Palau District

High Chief Reklai

Mr. Norden H. Cheatham

Mr. Burt Edmonds, Peace Corps volunteer

Mrs. Marjorie C. Falanruw, University of Guam

Mr. Tom Fisher, Peace Corps volunteer

Mr. Gene Helfman, Peace Corps volunteer

Mr. David Imes, Peace Corps volunteer

Mr. Delbert Moody, Peace Corps volunteer

Mrs. Hera Owen, Palau Museum

Miss Ramona Owen, interpreter

Mr. Toshiro Paulis, Assistant Fisheries Specialist

Mr. Basilius Polycarp, Member of Legislature, Congress of Micronesia

Mr. Daniel C. Smith, Peace Corps volunteer, Reporter

Mr. Arnold Woodrich, Peace Corps volunteer

The meeting opened (Fig. 4) with R. P. Owen's paper, "The Status of Con-



Fig. 4. At the opening session R. P. Owen discusses Trust Territory Conservation. From left to right are M. Numata, V. Brock, G. A. Knox, C. M. Yonge, R. P. Owen, F. R. Fosberg, E. M. Nicholson, L. Talbot, P. Wilson, M. S. Doty, J. Wells, and S. Kawaguti.

ervation in the Trust Territory of the Pacific Islands." He noted that the Trust Territory administration is a complete, small government and does not ordinarily have the assistance of U.S. Government agencies such as the Department of Agriculture. In the Trust Territory, conservation is a holding situation, for there are more imminent needs, such as school construction. Burning, which depletes soils, and pollutes streams, is most serious in Palau and in the Marianas. Only Palau and Truk have marine conservation programs in operation.

At the request of the participants, the structure of the Trust Territory government was explained to include: High Commissioner; Deputy High Commissioner; commissioners of Public Health, Public Works, Public Affairs, Education, Administration, and Resources and Development. Economic Development, Agriculture, Transportation, and Land Management are under Resources and Development. Forestry, Entomology, Quarantine, and Conservation are under Agriculture, and Government Lands and Land Claims are under Land Management.

M. Doty suggested that land-use plans should include reef areas, since new products are being developed from shallow-water organisms. The Trust Territory government, R. P. Owen pointed out, owns all lands from high tide out to and including the reef and mangrove swamps. Whole areas could be set aside. At F. R. Fosberg's request, R. P. Owen reiterated that district orders could allow for the setting aside of reserves; however, the government prefers to have this action taken by the Congress of Micronesia. Some of the values of mangrove swamps were discussed. These include protection from typhoons, breeding grounds, biochemical buffer zone, and others. Removal of mangroves greatly affects the offshore coral reefs and lagoons. Mention was made of a forthcoming review of mangroves [Macnae, W. 1968. *Adv. Mar. Biol.* 6:7 3-270].

It was agreed that there should be representative mangrove areas preserved throughout the Pacific along with their associated reef and dry-land areas. Further mention was made that mangrove swamps fade back into freshwater areas in some cases, as around Babelthuap.⁶

Sir Maurice Yonge spoke of the interest in the dugong and the manatee, the scattered populations of which are rapidly diminishing. It was pointed out that a biological study of the dugong had never been carried out in Palauan waters. The center of the Palauan population, 500 miles from the nearest, is unknown. Local information should be gathered. High Chief Reklai told that a long time ago there were a lot of dugong. They sleep during the day and eat at night. They are rarely seen now. He explained that crocodiles were killing the dugong and mentioned that the Japanese introduced a crocodile with webbed feet. Since these do not eat their young, they have become numerous. R. P. Owen said that the salt-water and New Guinea crocodiles are in Palau, but it is uncertain whether any brought by the Japanese escaped when the cages were broken during bombing. An increase in the number of crocodiles has been noted over the past nineteen years. S. Motoda said a skull specimen from Palau was sent to Taipei and thinks a publi-

⁶ See Resolution RS. 1.

cation resulted.

On the crocodile eating the dugong, R. P. Owen said stomach-analysis studies showed contents consisting of 90% bird feathers (terns mostly), and 10% land crabs, turtles, rats, African snails, and goats. Before eradication of the crocodile, ecological studies must be carried out to see how the crocodile fits into the overall ecosystem.⁷

Research is needed over the entire range of the dugong. Crocodile control and dugong conservation programs must be initiated.⁸

The question of dugong cultivation was brought up. Sea grasses could easily be raised; however, predators pose a great problem.

On education in biology, L. Talbot said that the Biological Sciences Curriculum Study (BSCS) high school biology texts were adapted for the Philippines, and Malaya is adapting some material. Pacific area texts should be tested and rewritten for the area. L. G. Eldredge mentioned a New Zealand publication for tropical islands [Blanc, R. R. V. 1958. *Nature Study. A handbook for Pacific Island teachers.* Island Education Division, Dept. Education, Wellington, N. Z.] and a local one for Guam [A science teachers handbook to Guam, Guam Science Teachers Association].

Sewage disposal was discussed. Effects on bait fisheries and skipjack populations, immediate and long-term were noted by P. Wilson. Sewage, whether or not treated, adds nutrients which encourage growth and rapidly change the ecology. Oceanographic studies are needed for the immediate area of disposal. Overall plans must be made for conservation of the human environment as soon as possible. V. Brock described the work of the Federal Water Pollution Control Administration of the U. S. Department of the Interior. Land sewage disposal should be cautiously approached, especially in limestone areas. Island soils and their properties should be known.⁹

Protective legislation exists for turtles; however, it is almost completely ignored. The hawksbill can be commonly seen, but the green turtle is very rare. P. Wilson indicated that Fisheries is trying to stop the taking of undersized (under 2 ft.) turtles. They are no longer found for sale. In the laboratory, turtles have been reared to 6 to 8 inches, using fish as food. About a thousand have been released, release having been made in the same area as capture. Since tags are not available for young turtles, no follow-up studies can be made. V. Brock described the reef research institute recommended at a meeting in Honolulu in August, 1968, which may be established at the South Pacific Commission with United Nations assistance. There would be a green turtle project, and the IBP Meeting should encourage it. F. R. Fosberg said the Meeting should recommend research on turtles and encourage the SPC institute to obtain detailed information on turtle problems.¹⁰

⁷ See Resolution RPTT5.

⁸ See Resolution RPTT4.

⁹ See Resolution RS7.

¹⁰ See Resolution RR3.

The spiny starfish, *Acanthaster planci*, was reported as present in Palau, although not as extensive as noticed on Guam. A status report is needed from wherever it occurs, including prevalence, damage, and outbreaks. T. Goreau suggested looking for the starfish feeding during the day. The seriousness of this population explosion cannot be over-stressed.¹¹

L. Talbot said the problems of dredging for phosphate should be considered as part of resource use capability planning and classification. No such classification exists for Palau or other Pacific islands. Hawaii's classification is based, only in part, on agricultural potential. Provisions must be made for watersheds and for scientific, cultural, and aesthetic values. Should destruction of a resource occur, it must be agreed that it be re-established.

It was agreed that ecological studies be carried out on the coconut crab and the fruit bat to determine possible threats to viable populations. If necessary, legislation should be proposed to protect these resources.

The summary statement on the islands of Micronesia prepared by F. R. Fosberg was considered. Matters which were discussed included decapitation of the mountain on Kusaie for an occultation program. The Atoll for Science project was mentioned by F. R. Fosberg. Also discussed was the setting aside of a sea-mount and deep-sea trench.

Sand procurement for construction purposes was discussed at length. J. B. MacKenzie added that 6000 cubic yards was needed at that time. T. F. Goreau mentioned sand for hotel beaches and for maintaining recreational areas. Coral rubble is also gathered indiscriminately for foundations. This affects living coral. A resolution pertaining to reef material for construction was presented.¹²

Wednesday, November 20—Fieldtrip

The entire day was devoted to a field trip to the Ngerukewid Islands Wildlife Preserve, the "Seventy Islands," (Fig. 5).

Thursday, November 21—Review of Pacific Oceanic Islands

The meeting continued the review of Pacific islands following F. R. Fosberg's report on Micronesia.

On the principal Hawaiian islands, the importance of preserving what can still be preserved was emphasized, particularly some wet areas. This is all the more important as the national IBP includes consideration of studying the wetter areas in the Hawaiian Terrestrial Biology Subprogramme. In subsequent discussion, much interesting information and advice was given concerning a large number of other islands dealt with in the Check List and in papers before the Technical Meeting. The relevant points are covered in the revised version of the Check List and, in the case of New Zealand, in the revised paper by Professor Knox.

As a result of the visit the previous day to the coast of Urukthupl and off-lying islands and to the Ngerukewid Islands Wildlife Preserve, members of the

¹¹ See Resolution RR1.

¹² See Resolution RS5.

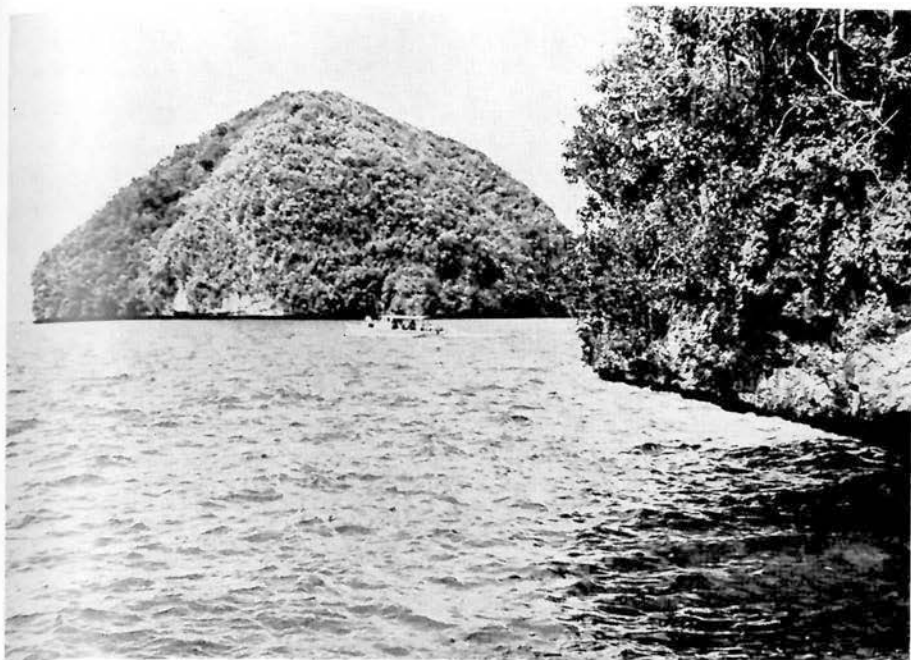


Fig. 5. Scene during field trip to Ngerukewid Islands Wildlife Preserve.

Technical Meeting were unanimously strongly of the opinion that no fully comparable intact natural combination of terrestrial and marine habitats was known to be in existence and that it was of the utmost international importance that it should be set aside as a Palau Islands National Park. This would not only protect numerous rare and threatened species such as the Micronesian megapode (*Megapodius laperouse senex*), the Palau scops owl (*Otus podarginus*), the crimson-crowned fruit dove (*Ptilinopus porphyraceus*), the Nicobar pigeon (*Caloenas nicobarica*), and the dugong but would also assure the continuance of the necessary natural conditions for long-term research from the proposed Palau Tropical Research Institute and would provide a base for considerable direct and indirect employment through the development of selective tourism. In furtherance of this conclusion, the meeting passed Resolution RPTT1 on the Palau Islands National Park.¹³

During the afternoon, the representatives of the IBP/PM section withdrew for a separate meeting to discuss the special interest areas in connection with corals. The main points covered in this report are included in the revised version of Sir Maurice Yonge's paper, "Conservation of Coral Reefs."

Friday, November 22—

The first part of the session was devoted to considering the report on marine aspects and or problems concerning the projected Tropical Research Institute in

¹³ See Resolution RPTT1.



Fig. 6. At the site of the Palau Tropical Biological Station are, S. Kawaguti and S. Motoda (left center), former researchers with original laboratory. Also at the site are D. Smith, M. S. Doty, L. G. Eldredge, and M. Numata.

Palau on which a Resolution was agreed.¹⁴ (Fig. 6).

It was appreciated that in the present state of knowledge a comprehensive and integrated list of terrestrial and marine areas meriting conservation would not be practicable, but every effort should be made to work to that end. The remainder of the meeting was concerned with extended discussion on the substance and wording of a large number of Resolutions, the final texts of which are reproduced on pages 000, together with the Palau Declaration which was unanimously agreed as a comprehensive keynote statement of the agreed purposes of the Technical Meeting.

Tuesday, November 26—Guam session

On Tuesday the Technical Meeting reconvened at the University of Guam where it was honored with the presence of the Governor of Guam, Manuel F. L. Guerrero, and of the High Commissioner, William R. Norwood (Fig. 7). After tribute had been paid to the hospitality of the Government of Guam and of the University, Governor Guerrero made the following reply:

“Distinguished guests, faculty members, ladies and gentlemen:

It is truly a pleasure to welcome this distinguished group of scientists to our island.

¹⁴ See Resolution RPTT2.



Fig. 7. Governor M. F. L. Guerrero and High Commissioner W. R. Norwood talk informally at the beginning of the sessions held at the University of the Guam.

It pleases me greatly not only because this is the first International Biological Conference to be held in Guam, but also the quest for knowledge and understanding of our surroundings and environment is very evident, as well as the fact that the University is taking the leadership here.

As this university grows, and we expect that it will, the science department here may one day serve as the clearing house and storehouse of scientific knowledge in this area of the Pacific, and may well be a recognized source where many eminent scientists from all over the world will come.

This Conference initiates this territory on a course of action to identify the direction for which Guam can really be the center for this specific science.

In Guam, nature has provided us well. We must discover and classify its potential and benefits to mankind. The discipline and advancement of our knowledge evolve a better and fuller appreciation of the resources of nature and would enhance our standards.

While much of man's interest is directed to the sky and outerspace, he must also look to the land and the sea for there are many unknown qualities of behavior yet to be understood and harnessed for the betterment of mankind. In Guam, as in the Trust Territory, there is much to know and to explore.

But, I also know that there are steps which we must take to conserve our island's resources, the natural beauty as well as plant, animal and sea life.

Our responsibility is to preserve and protect what nature has provided for this area of the world.

A problem of deterioration in our reef has been called to my attention. Fishing methodology and other forms of dispossessing the wealth from the ocean has taken its toll as have the starfish which eats away the coral reef unchecked.

I hope that you and Guam, as a whole, may profit by your presence here. It has always been true that the more we learn the more we recognize how little we know.

I admire and commend you and trust that your conference here has been productive as well as inductive.

Thank you."

Mr. Norwood associated himself with the remarks of Governor Guerrero. He wanted first to thank the group for attending the conference in Palau. Secondly, he wanted to express his regret at not having been able to find the time to be with them, so he had seen this opportunity to come to Guam primarily to thank the group for taking the time to attend the conference in Palau. This would not be only a rewarding experience for them but the interest they have thereby developed in Micronesia, and by seeing that remarkable portion of Micronesia, will benefit the Trust Territory and enable the Territory to identify areas of science and exploration, and types of research that will have significance for development of the Trust Territory. The Trust Territory is a laboratory in many ways. Its natural areas are still unspoiled, and many of their peoples have been thrust into the 20th century. This poses great problems to the Trust Territory administration in identifying resources which must be reserved, and others that can be developed for the needs of the people.

Dr. Yamashita, President of the University of Guam, expressed the University's pleasure at having this visit from the group, and its satisfaction at being considered an appropriate institution for the meeting.

Attending the Guam session in addition to the participants were the following observers:

- C. N. Adair, Associate Professor, University of Guam
- F. B. Aguon, Director, Department of Agriculture
- R. H. Chesher, Associate Professor, University of Guam
- D. M. Davis, Associate Professor, University of Guam
- M. F. L. Guerrero, Governor of Guam
- I. I. Ikehara, Chief, Division Fish and Wildlife
- R. S. Jones, Professor, University of Guam
- H. T. Kami, Fisheries Biologist, Division of Fish and Wildlife
- W. R. Norwood, High Commissioner, Trust Territory of the Pacific Islands
- G. Perez, Wildlife Biologist, Division of Fish and Wildlife

- F. San Nicolas, Director, Department of Land Management
- H. S. Sickler, Territorial Planner, Department of Land Management
- L. Siguenza, Chief, Division of Parks and Recreation
- D. R. Smith, Associate Professor, University of Guam
- P. B. Souder, Director, Department of Commerce
- R. T. Tsuda, Associate Professor, University of Guam
- A. C. Yamashita, President, University of Guam

P. Souder described conservation of natural areas on Guam as a holding operation until plans for development as conservation areas are made. He described and pointed out on the map areas which are set aside and those for which plans are proposed.

F. R. Fosberg described the philosophy behind the selection of these areas. He had long been conscious of the vulnerability of the biota of islands to human activity. Of all the animals and plants that had become extinct in relatively recent times, the majority have been on small islands. This results from evolution having produced local endemic species of plants and animals on many islands which were easily wiped out by disturbance. Only relatively recently it had seemed that land animals and plants stood in the greatest danger. Now, however, the ability of man to change conditions even below sea level had added an extra dimension to the necessary conservation effort. Before World War II there was good representation on Guam of many vegetation types, but the military activities immediately after the War brought many changes and left little of some of the very interesting vegetation types.

The predominant type of northern Guam consisted of wild breadfruit belonging to perhaps the closest of all wild species to the domesticated breadfruit. It was important to set this aside for study and economic reference. Typhoons have not helped, but indigenous vegetation was fairly resistant to their effects. The University area was an excellent example of the limestone plateau forest.

Paul Souder described the proposal for strip mining to obtain chromium oxide, ferric oxide, and manganese oxide. The developer claimed that a substantial proportion of all would be recoverable and planned to take the spoil around by barge and fill in the entire reef area of Agana Bay to provide between six and eight acres of additional private land for development. E. M. Nicholson emphasized that while there were areas so scientifically or scenically important or vulnerable that strip mining should not be permitted on them, there were other areas where, under suitable strict and comprehensive safeguards it could be undertaken without long term damage, and in some cases would actually enhance the biological productivity or recreational value of an area. Each case must be looked at on its merits, the most important considerations being that the operation should leave the area as least as productive and valuable as it was at the beginning and that the intervening extractive operations should be so conducted as to avoid causing nuisance, pollution, or unacceptable disturbance. Although the utmost vigilance was needed, it would be most unfortunate if it came to be assumed that all conservationists must be



Fig. 8. At the University of Guam sessions are (left to right) G. Wells, M. S. Doty, V. Brock, R. P. Owen, L. Talbot, S. Motoda, G. A. Knox, C. M. Yonge, M. Numata

opposed to all strip mining anywhere, since this would neither be realistic nor defensible. (Fig. 8).

T. F. Goreau supported this, saying agricultural productivity has been increased in Jamaica—top soil was replaced, the area reconditioned and replanted. The land was wet limestone karst and with an expanding population and scarce land the situation was improved. Secondly, land already under lease by a bauxite company was converted by the company to pasture for cattle. On the negative side, many mining operations entail waste products, and if there is conversion to alumina, there are considerable waste products which cannot be put into the ground water or dumped into the sea. Such wastes can easily pollute ground water. The point was made that the particular area affected by the proposed operation on Guam had a very light soil and it would be difficulty to prevent a heavy loss of topsoil leading to siltation of the reef and pollution of many reefs and beaches since the currents run from the south end, where the strip mining was proposed, towards the north. In this way the loss of tourism would exceed the gain from strip mining. L. M. Talbot stressed the need for land capability classification as a logical basis for development of different uses, some of which were mutually compatible and others not. Malaya was a good example of development of such a plan for land use within the Office of the Prime Minister at Kuala Lumpur. F. R. Fosberg remarked on the difficulty of defining top soil which in some areas on Guam was

extremely thin. The structure of soils was just as important as what they were made of. Dredging was accompanied by an unbelievable amount of siltation which was disastrous to coral, partly through shading of the water, partly through settling on top of the reef and partly by abrasion. Where islands are protected by coral reefs such interference might be killing something vital to the survival of the island.¹⁵

Paul Souder referred to the development of Tanguisson Point power plant northeast of Agana, which would have inlet and outlet water channels into the reef area discharging water substantially hotter than Federal standards would approve.¹⁶ Professor Knox stressed the vulnerability of an island ecosystem to irreversible change and the necessity for basing consideration of all such projects on a full and complete expert report on possible ecological consequences. If approval were given, adequate conditions should be laid down to maintain or improve environmental quality and this should be the responsibility of the exploiting company.

A number of Resolutions relating to Guam were discussed and passed before the conclusion of this morning's session.¹⁷

The afternoon session was concerned with the procedure and arrangements for follow-up of various matters discussed, and with conveying additional background information of interest to the Technical Meeting. It was agreed that the paper by Fosberg, Mueller-Dombois and Doty "Initial Site Studies for the International Biological Program in the Tropical and Far Western Pacific" was of relevance, and as it had not appeared elsewhere, it should be made available to those interested by inclusion in the Proceedings.

¹⁵ See Resolution RBR5.

¹⁶ See Resolution RBR4.

¹⁷ See Resolutions PG1 and PG2.

Conclusions and Recommendations

Palau Declaration

RESOLUTION:

- R1 List of Islands and Areas Recommended to be Conserved
- R1A List of Islands proposed for International Scientific Supervision
- R1B List of other areas proposed for conservation

RECOMMENDATIONS: PAN PACIFIC, GENERAL

- RG1 Care of environment on oceanic islands
- RG2 Multi-resource land and water capability classification
- PG3 Resource conservation and population
- PG5 Rehabilitation responsibility
- PG5 Administrative resource management
- PG6 Conservation councils
- PG7 Listing unique natural and historical resources
- PG8 Recording indigenous conservation practices

RECOMMENDATIONS: PAN PACIFIC, EDUCATION

- PE1 Education and conservation
- PE2 Education for resource management

RECOMMENDATIONS: PAN PACIFIC, SPECIFIC PROBLEMS

- RS1 Mangroves
- RS2 Prevention of fishing with explosives and poisons
- RS3 Control of indiscriminate shell collecting
- RS4 Spear fishing
- RS5 Gathering of sand and coral for construction and other purposes
- RS6 Radioactive contamination of island ecosystems
- RS7 Sewage disposal
- RS8 Coconut crab and fruit bat

RECOMMENDATIONS: PAN PACIFIC, RESEARCH

- RR1 Starfish
- RR2 Natural recovery of damaged reefs
- RR3 Sea turtles research
- RR4 Rats

RECOMMENDATIONS: SPECIFIC

- RBR1 Conservation of Bonin and Ryukyu Islands
- RBR2 Guam—park system
- RBR3 Aleutian and Hawaiian Wildlife Reservation areas
- RBR4 Thermal Pollution on Guam
- RBR5 Mining on Guam

RBR6 Hawaiian Islands

RECOMMENDATIONS: PALAU AND TRUST TERRITORY

- RPTT1 Palau Islands National Park
- RPTT2 Palau Tropical Research Institute
- RPTT3 Phosphate project
- RPTT4 Dugong
- RPTT5 Crocodile

“PALAU DECLARATION”

of the IBP Technical Meeting on Conservation
of Pacific Islands, in Koror, Palau Islands
November, 1968

The islands of Micronesia possess many natural environments of rare quality and of special significance for world science, for education and for tourism. This treasured inheritance is in the immediate care of the Micronesian peoples and mostly within the scope of the Trust Territory's Administration's responsibility to the United Nations. To make wise use of it and to conserve it for future Micronesians and their guests from overseas is an urgent challenge. It can be met if the undoubted goodwill and good intentions of Micronesians can be fully translated into practical legislation with the backing of public opinion, and of adequate scientific research and practical measures of education, endorcement, and use and management of resources.

Micronesian citizens, scientists and representatives of the Trust Territory Administration meeting in Koror with visiting scientists associated with the International Biological Programme and the Pacific Science Association, are convinced that Micronesia has the capability for carrying through a first-class programme of conservation as a contribution to the balanced and prosperous development of the Trust Territory. Given adequate support such obstacles as exist could be surmounted without undue difficulty. We express the confident hope that this will soon be done.

R-1 List of Islands and Areas Recommended to be Conserved

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koror, Palau Islands, November 2968, on concluding its review of the check list of Pacific Oceanic Islands reports the fulfilment of the first stage of the tasks specified in Resolution 4.3 of the Eleventh Pacific Science Congress held at Tokyo in 1966, relating to the development of surveys and recommendations to make a permanent series of natural habitats to be conserved as a base for research throughout the Pacific region.

The Technical Meeting accordingly *requests* the co-operation of all concerned, with the help of I.U.C.N., in promptly taking action to assure appropriate conservation status to the islands and areas on the annexed lists in accordance with the recommendations indicated in each case.

There remain, however, certain gaps in coverage for oceanic islands, and it has not been possible hitherto to cover islands in the continental offshore zone

extending from the Kurile Islands through Japan, the Philippines, Indonesia and New Guinea to the Torres Strait and the Coral Sea.

The meeting, accordingly, *requests* the National Committees for the IBP in Australia, Indonesia, the Philippines, Japan, and U.S.S.R. to co-operate in carrying out a complementary survey of the continental islands in the offshore zone of the Western Pacific in time for results to be reported to the Twelfth Pacific Science Congress (Canberra, Australia, 1971).

R1A List of Islands Proposed for International Scientific Supervision

Ever since Galapagos served Charles Darwin so decisively in demonstrating the origin of species, the great value of undisturbed Pacific Islands as outdoor laboratories for science has been well known. Unfortunately, however, there has hitherto been no practical means of ensuring the conservation of remote unpeopled islands valuable for research. The remnant remaining are increasingly exposed to injury or destruction of their plant and animal life.

The need and the possibility of remedying this situation are being demonstrated both by growth of scientific activity and by the development under the Antarctic Treaty of acceptable methods of international group supervision over uninhabited territories for research and for conservation.

It is accordingly proposed that a select series of uninhabited Pacific oceanic islands should be designated with a view to international agreement that (subject to due notice) they should be held freely available for research by scientists of all nations. In this way their high significance and the common interest in their permanent use for the advancement of knowledge might be emphasised and made widely known, and their abuse by casual visitors discouraged. A proposed list of such islands as are recommended for this purpose with the ground for recommendation in each case, is attached.

List of Islands Proposed for International Scientific Supervision

Name	Island Group	Administration
Minami Iwo Shima	Volcano	Japanese
Uracas (Farallon de Pajaros)	Mariana	Trust Territory
Maug	"	"
Farallon de Medinilla	"	"
Guguan	"	"
Helen Reef	Caroline	"
East Fayu	Caroline	"
Pokak Atoll (Taongi)	Marshall	"
Bikar Atoll	"	"
Phoenix	Phoenix	UK (Gilbert & Ellice)
Howland	"	US
Jarvis	Line	"

Name	Island Group	Administration
Malden	Line	UK
Kingman Reef	"	US
Vostok	"	UK
Rose Atoll	American Samoa	US
Suvarov	Cook	Independent
Oeno	Pitcairn	UK
Henderson	"	"
Ducie	"	"
Adams	Auckland	New Zealand
Antipodes	—	"
Fernandina (Narborough)	Galapagos	Ecuador
Espanola (Hood)	"	"
San Salvador (Santiago) (James)	"	"
Pinzon (Duncan)	"	"
Darwin (Culpepper)	"	"
Wolf (Wenman)	"	"
Pearl and Hermes Reef	Hawaiian Isl.	USA
Laysan	"	"
Gardner Pinnacles	"	"
Necker	"	"
Nihoa	"	"

R1B List of Other Areas Proposed for Conservation

In addition to the comparatively few remaining uninhabited oceanic islands which are proposed in R1A to be set aside for scientific use under international agreement, there are many other cases where further measures of conservation are urgently needed on the part of the various national administrations concerned. While it has not been possible at this stage to attempt a complete list, the following partial and interim list indicates the islands and areas where some action on the lines specified in each case is known to be desirable on conservation grounds.

RECOMMENDATIONS: PAN PACIFIC, GENERAL

PG-1 Resolution on Care of the Environment on Oceanic Islands

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koror, Palau Islands, November 1968, having reviewed available evidence concerning the current state of natural environments on oceanic islands in the Pacific:

1. Finds that much grave and irreversible damage has been and is being unnecessarily caused to these islands by arbitrary and ill considered projects and operations, many of which have proved abortive for their stated

purpose and have been rapidly abandoned with the loss of the funds and resources applied to them, and,

2. Observes that governmental agencies concerned with military installations, agricultural development, provisions of airstrips, telecommunications, etc. have played a major role in such damage and destruction, often by unilateral interventions without duly consulting other agencies concerned or representatives of local opinion or competent scientific advisors able to call attention to probable results.

The Technical Meeting therefore most earnestly requests governments and other authorities concerned to refrain from initiating or permitting injury or destruction to the limited surviving samples of natural environment in the islands unless

- a) the probable consequences have been fully assessed by independent specialists;
- b) interested local and international parties have been fully consulted in advance; and
- c) it has been conclusively established that the need to be met is serious and long-term and that it can not be met by any practical alternative.

Further the Technical Meeting regrets the tardy development of comprehensive resource planning to provide a suitable framework within which many conflicting claims to or of the island land and resources can be scientifically evaluated and harmonized. It urges more rapid adoption of such measures as land capability classification on a fully comprehensive basis as a means of avoiding such waste of resources, human and natural, as the record too often shows.

PG-2 Resolution on Multi-Resource Land and Water Capability Classification

The IBP Technical Meeting on Conservation of Pacific Islands, meeting on Guam, November 1968, NOTED that most areas of land and sea contain a variety of actual or potential resources, and hence can be put to a variety of uses. Some such uses are complementary, while others are exclusive.

It is accepted throughout the world that the most effective use of resources should be based upon land and water use capability classification, to assure that any projected resource use will not be a random matter determined by a quick profit for a few, but will take best advantage of the capabilities of the area and the needs of the people.

Island ecosystems are particularly fragile and vulnerable to abuse, and their resources, terrestrial and aquatic, are strictly limited. Therefore, it is particularly important that the use of their limited resources should be based upon the most rational foundation. Therefore, the Meeting:

1. Calls to the attention of the competent authorities the urgent need for

- resource surveys and land and water capability inventories;
2. Emphasizes that these surveys must not be based solely on agriculture or other "cash crops" but must take into account all potential resources and needs (including recreational, scientific, and touristic);
3. Urges that on the basis of these surveys, comprehensive multi-resource land and water use capability classification mapping or zoning be carried out—and adhered to—to provide guidelines for the further development of the Pacific Islands for the maximum benefit of their peoples.

PG-3 Resolution on Resource Conservation and Population

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koror, Palau Island, November 1968 being aware of the comparatively rapid growth of human populations in various Pacific Islands with consequent increased requirements for food and other needs obtained in large part from the local environment, calls attention to the urgent necessity of the management of these resources within the limits of their sustainable yields to meet these needs.

Therefore, the Technical Meeting RECOMMENDS that:

1. Programs of research on the renewable natural resources be evaluated anew and strengthened where necessary;
2. Where such resources are unable to sustain the production required of them, alternates or substitutes be found before the resources are seriously damaged or destroyed; and
3. Serious attention should be given to maintaining the human population within the limits which the renewable natural resources will support.

PG-4 Resolution on Rehabilitation Responsibilities

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koror, Palau Islands, November, 1968, recognizes that various development activities, industries and exploitative activities often result in unavoidable damage or alteration to the environment with attendant considerable loss of resource values to the local populations. Strip mining is a particularly destructive example. The Meeting RECOMMENDS that legislation be enacted to provide:

1. That where it is proposed that such exploitation or activity be undertaken, it should be the responsibility of the agency or company involved to show rehabilitation is possible, and to undertake any research necessary to accomplish this;
2. As a condition to granting approval for such exploitation or activity, the competent authority should require the agency or company involved to carry out the necessary rehabilitation; and
3. That where exploitation has already taken place, it should be the respon-

sibility of the agency or company involved to carry out appropriate rehabilitation, including undertaking any necessary research.

PG-5 Resolution on Administrative Resource Management

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koror, Palau Islands, November 1968, *noting* with approval the bringing together under the recent National Parks and Wildlife Act in New South Wales of the administration of national and state parks, historic and archaeological sites, nature reserves, wildlife refuges, and other functions concerned with management of natural resources; and *considering* that the absence of a unified, independent, professionally staffed organization for such purposes is a major factor in inadequate resource management; RECOMMENDS that governments charged with the administration of Pacific islands ensure that corresponding resource management legislation be enacted and that appropriate independent administration and operational units for the management of natural resources be established.

PG-6 Resolution on Conservation Councils

The IBP Technical Meeting on Conservation of Pacific Islands, meeting on Guam, November 26, 1968, recommends that governments within the Pacific area be encouraged to establish Conservation Councils or similar bodies to allow for better communication between governmental and private organizations whose interest is at least in part, conservation or resource development. Such a council should consist of representatives from land management, agriculture, fisheries, academic, and other similar units.

PG-7 Resolution on Listing Unique Natural and Historical Resources

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Palau during November 1968, *recognizing* the necessity of local enthusiasm for the principles of sustained multiple use of natural resources; *acknowledging* the recognition of the interests of the resident peoples is a most effective way of engendering the needed enthusiasm for and tradition of multiple resource management, RECOMMENDS that for each political and geographic unit lists be prepared of their unique natural and historical resources whether of scientific, aesthetic or utilitarian value, including historical sites, and it is further RECOMMENDED that the appropriate responsible governmental and international agencies facilitate the assembling and dissemination of this information.

PG-8 Resolution on Recording Indigenous Conservation Practices

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Palau during November 1968 *recognizing* that ethnological studies have indicated that some of the indigenous Pacific Island cultures include features that are in reality conservation practices, whether in the guise of religion, social custom, taboos, or whatever, e.g. the Marshallese custom of setting aside bird and trutle sanctuaries, and *considering* that knowledge of these practices is rapidly disappearing under the impact of western culture and whereas the application of knowledge of this sort may become critical to the future ability of islands to carry and support their expanding population on a fixed or decreasing resource base.

The meeting RECOMMENDS an immediate and vigorous campaign to search out and place on record as much information on indigenous conservation or conservation-related practices and customs as still available from local indigenous sources, as well as from ethnological literature.

RECOMMENDATIONS: PAN PACIFIC, EDUCATION

PE-1 Resolution on Education and Conservation

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koror, Palau Islands, November 1968, *recognizing* that the key to the establishment of effective conservation programs in the Pacific Islands is an appreciation amongst the inhabitants of the necessity for such programs and their cooperation in bringing them into effect, *considers* that the importance of conservation education cannot be stressed too highly. It therefore RECOMMENDS that the attention of education authorities throughout the region be drawn to:

1. The importance of basing biology courses in schools on local plants and animals and to the need for locally oriented texts using such examples;
2. The importance of stressing in such educational programs the interdependence of living organisms, the functioning of island ecosystems (including the close inter-relationship of land, lagoon and reef), the role of man in the ecosystems, and the importance of conservation;
3. The need to prepare and distribute widely appropriate literature, films, and other materials on conservation problems including the effects of the increase in size of human populations.

PE-2 Resolution on Education for Resource Management

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Palau during November 1968, *noting* the encouraging trend toward increasing the professional opportunities for the resident peoples in resource management throughout the Pacific, RECOMMENDS that a positive program of education be

encouraged to the end that selected members of the younger generation be trained for positions in island resource management.

RECOMMENDATIONS: PAN PACIFIC, SPECIFIC PROBLEMS

RS-1 Resolution on Mangroves

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koror, Palau Islands, November 1968, *took note* of the increasing unrestricted exploitation and filling in of mangrove areas by engineering projects and other human agencies which are causing rapid disappearance of these natural communities over large areas.

The meeting *emphasizes* that mangrove communities:

1. are important breeding sites for fish, birds, and marine invertebrates;
2. harbor an unique fauna and flora of very great scientific interest;
3. protect the adjacent lagoons, reefs, and inshore environments from the toxic action of land run-off, especially sewage;
4. protect the land against marine erosion;
5. are important land builders;
6. provide safe anchorage for ships and boats during typhoons;
7. provide valuable economic resources such as mangrove oysters, crabs, bait fish, etc.; and
8. are of great potential value for tourism development.

In view of the above, the Meeting RECOMMENDS that:

1. unrestricted exploitation and infilling of mangrove areas be stopped immediately;
2. guidelines be established for effective conservation by administrative action and control;
3. all activities which are potentially damaging to mangrove communities be subject to prior licence; and
4. long-term investigations be initiated to determine the level of economic exploitation which mangrove communities can sustain without undue damage to the ecosystem.

RS-2 Resolution on the Prevention of Fishing with
Explosives and Poisons

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Palau during November 1968, *discussed* the problems of fishing with explosives and poisons and *agreed* unanimously that such practices are extremely harmful to the marine reef environment and wasteful in the indiscriminate killing of all forms of life and developmental stages including fish, corals, and plankton, as well as the destruction of habitats essential for reef productivity.

The Meeting *recognized* that where conservation programs have been lacking or poorly staffed and supported, the destruction of the marine environment has resulted in lowering of reef productivity and availability of the chief source of protein to island inhabitants.

The Meeting also *deplored* the consequent loss of scenic underwater coral reef areas, recognizing that the destruction of such areas not only harms reef productivity but seriously retards the development of the tourist industry which in turn requires scenic undersea vistas for ultimate development.

Therefore, the Meeting RECOMMENDS that:

Administering authorities of Pacific islands concern themselves with wanton destruction of island reefs and marine life and take corrective action including:

- a. Setting up Conservation Programs supported by trained individuals and adequate program funds.
- b. Include concepts of conservation in the curriculum of elementary and grade schools.
- c. Provide adequate enforcement where conservation laws exist.
- d. Provide adequate conservation laws based on needs, facts, and enforcement abilities, where such laws do not yet exist.

The Meeting *agreed* that failure on the part of administering authorities to meet these responsibilities will result in costly destruction to the natural marine resources and productivity of the inshore island waters which it may never be possible to recover.

RS-3 Resolution on the Control of Indiscriminate Shell Collecting

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koror, Palau Islands, November 1968, *considered* with the gravest concern the indiscriminate collection of marine shells on Pacific Islands and reefs. These conspicuous but relatively uncommon animals are confined to shallow water, and their collection is largely for large-scale export for financial profit. Their removal is having the most serious effect on the ecosystem and is a possible cause of the population explosion of the Crown-of-Thorns starfish, *Acanthaster planci*, which is destroying vast areas of living coral in several regions of the Pacific.

RS-4 Resolution on Spear Fishing

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koror, Palau Islands, November 1968, *recognizes* that the indigenous people of many of the Pacific Islands rely on fishing with spears for an important part of their food requirements, and that in many cases traditional conservation measures have assured a sustained harvest; but *notes* that in many other areas, changes in methods, availability of new equipment, and introduction of recreational spear fishing, have resulted in over-fishing and consequent depletion of the basic fish

resource, with attendant loss to the local inhabitants and to visitors.

Certain species of fishes and crustaceans are particularly vulnerable to spear fishing, which may selectively remove them from an area, causing an imbalance in the ecosystem involved.

The meeting calls this danger to the attention of the authorities involved, and RECOMMENDS that appropriate conservation measures be undertaken.

RS-5 Resolution on the Gathering of Sand and Coral for Construction and Other Purposes

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Palau Islands, November 1968, *considered* the growing requirements of the developing island communities for sand and coral in increasing quantities for construction purposes.

The Meeting *recognized* the need for the use of such materials but *expressed concern* over their indiscriminate gathering in large quantities. It also *discussed* the growing need for undisturbed sand and beach areas, particularly in those islands with developing tourist industries.

The Meeting *noted* that the gathering of sand and coral has, in almost every instance, been carried on without controls or guidelines and without knowledge by administrative officials of the damage to the underwater resources that can and has resulted from indiscriminate gathering operations.

Therefore, the Meeting RECOMMENDS that:

Administering authorities require commercial users and producers of sand and coral to conform to certain operational guidelines, including:

- A. Not taking sand and coral from or near beaches;
- B. Not taking sand from shallow living-coral beds or algal sand areas;
- C. Sand harvested in commercial quantities should be from basins, lagoon bottoms, or channels where sand is accumulating;
- D. The gathering of coral for such purposes as road construction should be confined to dead coral beds.

The Meeting *considers* that unless such guidelines are observed by administering authorities and commercial producers and users of sand, serious damage will result to the basic productivity of the lagoons and the esthetic value of their natural beaches and shallow water areas.

RS-6 Resolution on Radioactive Contamination of Island Ecosystems

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koror, Palau Islands, November 1968, *expresses* its deep concern at the continued deliberate release on Pacific Islands of fission products and other radioactive nuclides with long biological half lives. It further *deplores* any activities causing large-scale

release of fast and slow neutrons by nuclear reactors and other nuclear devices which could induce secondary radioactivity with long residence periods in island ecosystems.

RS-7 Resolution on Sewage Disposal

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koror, Palau Islands, November 1968, *discussed* the development of long range plans for the disposal of sewage within the lagoons of the major islands of the Trust Territory. The participants were in agreement on the need for governmental planning to ensure that the natural beauty and productivity of the inshore waters of the islands would not be upset.

In order to ensure a system of sewage disposal that meets standards set by public health officials and marine ecologists to prevent any damage to the marine environment, the Meeting RECOMMENDS:

That the High Commissioner request the assistance of the Federal Water Pollution Control Administration, Department of the Interior,

- a. To evaluate the existing disposal systems;
- b. To suggest for adoption by the Trust Territory of the Pacific Islands physical, chemical, and biological (including microbiological) standards, for the classification of Trust Territory waters;
- c. To review present and future plans for the disposal of sewage and other wastes in light of these standards.

RS-8 Resolution on the Coconut Crab and the Fruit Bat

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Palau Islands, November 1968, *recognizing* that the coconut crab (*Birgus latro*) and the fruit bat (*Pteropus* spp.) are important in the ecology of islands and in many areas are important articles of food, and

Noting that the numbers of these animals are seriously declining in many islands;

RESOLVES that conservation measures, based on adequate ecological research, should be instituted wherever these animals occur.

RECOMMENDATION: PAN PACIFIC, RESEARCH

RR-1 Resolution on Starfish

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Palau during November 1968, RECOMMENDS that the ecology, including the predators, habit of feeding on live coral polyps leaving behind the dead skeleton, life history and development of the Crown-of-Thorns starfish, *Acanthaster planci* be investigated in an attempt to understand and to control its current explosive

increase and the consequent destruction of reefs such as those on Guam, the Great Barrier Reef, and elsewhere.

Comparative studies in areas with and without population increase are also *recommended*.

RR-2 Resolution on the Natural Recovery Processes of Damaged Reefs

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koror, Palau Islands during November 1968, *discussed* the increasing destruction of coral reefs by human activities throughout the Pacific.

The Meeting *recognized* the need for increased studies on reef ecology and recovery of damaged reefs and *urges* administering authorities to encourage such studies, particularly by groups, organizations or agencies which are responsible for damage to reefs.

RR-3 Resolution on Sea Turtle Research

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koror, Palau Islands, November 1968, *recognizing* the importance of sea turtles in the ecology and economics of tropical islands, *commends* the Trust Territory administration for its efforts to *protect* the turtles and *encourage* them to increase their number; and *commends* and *encourages* the South Pacific Commission in the establishment of its proposed Reef and Lagoon Research Institute and especially its green turtle project; and RECOMMENDS to all interested agencies and individuals that research on sea turtle ecology be *pursued* with all possible speed and energy.

RR-4 Resolution on Rats

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koor, Palau Islands, November 1968, *recognizing* that throughout the Pacific Islands introduced rats constitute one of the greatest menaces to wildlife, are a serious pest on food crops as well as being disease carriers, RECOMMENDS that the attention of research institutes within the region be drawn to the need for a great increase in research on the ecology of rats specifically directed at the establishment of effective techniques for the elimination of exotic rats from island ecosystems.

Every possible measure should be taken to prevent the introduction of rats to islands where they are at present not found, especially from those islands established as scientific reserves is also *recommended*.

RECOMMENDATION: PAN PACIFIC, SPECIFIC

RBR-1 Resolution on Conservation of Bonin Islands and Ryukyu Islands

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koror, Palau Islands, during November 1968, *discussed* the increasing destruction by human activities in the Ryukyus, Bonin Islands and Iwo Islands and expressed concern over the lack of work for assisting natural recovery being carried on by administering authorities. The meeting *recognized* the urgent need for the reservation of undisturbed areas and the preservation of species in danger of extinction, and *discussed* the counter-measures for aiding natural recovery processes in damaged areas.

Therefore, the Technical Meeting RECOMMENDS that the Minister of Agriculture and Forestry, Minister of Education, Minister of Welfare, Governor of Tokyo give immediate attention to preserving the endemic biota, original vegetation and related habitats:

- a. Designating strict reserves as soon as possible;
- b. Prohibition of hunting and collecting of rare native plants and animals;
- c. Prohibition of spraying large quantities of pesticides;
- d. Prohibition of cattle raising;
- e. Avoiding cultivation of crops which compete with the conservation of endemic organisms in specific islands (e.g. Bonin great bat, *Pteropus pselaphon*, versus banana).

The Technical Meeting further RECOMMENDS that H. E. the Prime Minister, H. E. the Governor of Ryukyu Islands and the Commander of U. S. Military Forces in the Ryukyus give attention to preserving islets as a whole (e.g. Senkaku Is.) or large areas including endemic biota, original vegetation and related habitats of Ryukyu Islands:

- a. Designating strict reserves (each over 2,000 ha);
- b. Prohibition of clear cutting, burning, and introducing exotic tree species in specific islands (e.g. Iriomote Is.—a pulp company is said to be felling primeval forests there);
- c. Prohibition of spraying large quantities of pesticides;
- d. Prohibition of cattle raising.

RBR-2 Resolution on Unified Park System

The IBP Technical Meeting on Conservation of Pacific Islands, Meeting on Guam, November 1968, RECOMMENDS that in order to fulfill the widely *recognized* need for an adequate and well-run series of parks on Guam, all parks—conservation, historic, and recreation—be united in a single and unified Park System, staffed by professionally qualified persons and with an adequate legislative

and administrative basis. This system would include such areas already established and all future ones to be established.

RBR-3 Resolution on Aleutian and Hawaiian Wildlife Reservation Areas

The IBP Technical Meeting on Conservation of Pacific Islands, meeting on Koror, November 1968, *expressed* grave concern over numerous reports of unilateral destructive actions by U.S. defence and nuclear agencies in disregard of the official status conferred on the majority of the northern uninhabited islands of Hawaii and of the western islands of the Aleutian chain within the Hawaiian and Aleutian Wildlife Reservation areas. The meeting was surprised and disturbed to learn that the Administration apparently does not support the Bureau of Sport Fisheries and Wildlife in carrying out its obligations to maintain these reserves. It was RECOMMENDED that the authority of other agencies to alter and damage these protected areas and their wildlife should be reviewed at the highest level, with a view to clear and definite new directives being given to prevent further violations.

RBR-4 Resolution Concerning Thermal Pollution on Guam

The problem of the disposal of waste heat from thermal electric power plants is an increasingly difficult one for which no wholly satisfactory solution appears to exist. The meeting was informed that a new thermal electric power plant would be installed on Guam utilizing nearshore sea water for cooling. The rise in nearshore seawater temperatures may be sufficient to violate present standards of water quality established for the Territory of Guam and will create a local zone of water warmed above the normal ambient temperature of the sea. The consequences of such warming of tropical ocean water on the biota have been little studied and are poorly known. It is strongly RECOMMENDED by the meeting, therefore, that the effects of the heated discharge on the biota, when and if it occurs, be studied by competent scientists.

A thorough ecological survey should be implemented prior to the time the plant becomes operational and begins releasing heated water. This initial study will then become the basis for comparison with later studies.

RBR-5 Resolution on Mining on Guam

The IBP Technical Meeting on Pacific Conservation, meeting at Guam, November 1968, has learned of a proposed mining development proposal which would involve (1) strip mining on a fairly large area of the island of Guam and (2) mining, suction methods, in various offshore bays and other shallow waters. The Technical meeting *emphasizes* that island ecosystems are especially vulnerable to irreversible change. Mining operations, especially strip mining and suction mining

of reef sediments are particularly destructive.

With strip mining the following dangers exist:

- (1) The destruction of unique biotic communities on small island areas.
- (2) Accelerated soil erosion.
- (3) Attendant problems of silting of rivers, beaches, and reefs.
- (4) The destruction of watersheds and agricultural land. As yet there has not been the research and experience to demonstrate whether it is possible to re-establish top soil and vegetation under these conditions.
- (5) The loss of some resources of great potential or actual value both to tourism and to the general quality of the human environment.

With suction mining the dangers are:

- (1) Changes in current patterns and beach profiles leading to accelerated beach erosion.
- (2) Siltation which destroys coral reefs, with consequent loss of productivity, fish resources, and protection of the land from marine erosion.

The processing of minerals from both activities can lead to serious problems of pollution from often highly toxic wastes which can have serious repercussions on the land surface, to human water supplies, surface and subsurface, and to off-shore marine waters.

On the surface this proposal appears to be a classical example of long-term values being overlooked in favor of short-term gain.

The meeting would strongly recommend that in such cases, a study of the proposed operation and its long-term ecological, sociological, and economic consequences, be made by an independent qualified scientific body which in all cases should include a general ecologist. It is further recommended that in such cases, it should be the responsibility of the proposer to fund such a study, but it should not have jurisdiction over the choice of experts and the conduct of the study.

RBR-6 Resolution on the Hawaiian Islands

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Palau during November 1968, *commenting* that the present national parks in the State of Hawaii, on the islands of Hawaii and Maui, form an admirable beginning of a series of preserved areas which should ultimately include good examples of all of the many natural environments in the Hawaiian Islands and which could afford protection to the very many endemic and threatened species of plants and animals, and *noting* with alarm the present tendency to introduce exotic game mammals and birds without adequate ecological knowledge, RECOMMENDS that:

1. A national park of substantial dimensions be established on the island of Kauai;
2. A State system of natural areas for scientific and conservation purposes be brought into being to protect examples of all important biotic commu-

- nities for future study and enjoyment;
3. The proposal to introduce Axis Deer to the island of Hawaii and any other planned introduction of exotic game animals be immediately suspended;
 4. A comprehensive study of the vegetational history and present ecological status of the various remaining natural terrestrial and marine habitats in the State be undertaken and carried to a point where the conservation needs of the State are clear; it is hoped that the proposed USPIB Terrestrial Hawaii Program will be funded and can carry out this provision.
 5. Every feasible effort be made to protect and save from disappearance the many remarkable endemic plants and animals that make up the native biota.

RECOMMENDATIONS: PAN PACIFIC, PALAU AND TRUST TERRITORY

RPTT-1 Resolution on Palau Islands National Park

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Palau during November 1968, expresses warm appreciation of the successful initiative of the High Commissioner for the Trust Territory of the Pacific Islands through District Order 4.56 establishing the Ngerukewid Islands Wildlife Preserve—the “Seventy Islands”—in its primitive state, but urgently represents that:

1. This comparatively small reserve forms only a minor part of the uniquely rich series of rock islands, coasts and lagoon areas between Koror and Peleliu on the south and the ocean reef to the west, between approximately latitude 7°20'N and 7°10'N.
2. This unique region plainly merits and requires permanent and secure conservation as an essential and outstanding example of the ecological scenery of the Pacific, as a refuge for many endemic plants and animals including threatened endemic birds such as the Micronesian Megapode *Megapodius laperouse senex* and the Palau Scops Owl *Otus podarginus* both estimated to be under sixty pairs, and as an area for the scientific researches long conducted from Koror, the major expansion of which is now planned.
3. A National Park thus composed would exhibit features of land and water probably surpassing in scientific significance and in potential tourist attraction any other coastal National Park in the world; and
4. The creation of such a National Park on wholly publicly-owned land and water would strongly contribute to local prosperity for the foreseeable future. If necessary, part of the area could be zoned for scientific and tourist uses and for some present fishing activities.

The Technical Meeting accordingly recommends that:

1. Immediate action be taken by the High Commissioner and the Office of Territories to safeguard the integrity of this area pending thorough survey and demarcation of Park boundaries;

2. The approval of the Palau Legislature and the Congress of Micronesia be sought for the creation of such a Palau Islands National Park;
3. The IUCN International Commission on National Parks be invited to recognise the world importance and to assist in the planning and development of such a National Park, and to seek for it the approval of the United Nations and of the international organizations concerned.

RPTT-2 Resolution on Palau Tropical Research Institute

The IBP Technical Meeting on Conservation of Pacific Islands, meeting in Koror, Palau Islands, November 1968, *reaffirms* the resolution of the Eleventh Pacific Science Congress (Tokyo, 1966) and, having seen the area, *confirms* that Palau is an ideal place for a Tropical Research Institute to provide access to the rich Indo-Pacific biotic province at a particularly favourable place, and *urges* that every effort be made by the Trust Territory administration to promote the establishment of such an institute for the carrying out of continuing research on fundamental island and coral reef problems.

RPTT-3 Resolution on Phosphate Project*

The IBP Technical Meeting on Conservation of Pacific Islands, held at Koror, having been informed of the project for immediate survey and prospecting by the Continental Minerals, Inc., of 1,500 square miles of land and water in southern Palau with a view to large-scale mining of phosphate:

1. *Strongly recommends* that the existing Seventy Islands Reserve, which is of unique scientific interest and of great tourist potential, should be wholly excluded at once from the proposed survey and lease areas;
2. *Protests* against the conclusion of any such agreement which may lead to drastic interference with such a large area of valuable natural environment of vital importance to the islands and their inhabitants, before a thorough ecological study has been made without delay, in advance of commercial prospecting;
3. *Recommends* strongly that research on the ecological consequences be undertaken immediately, before commercial prospecting, and points out that in view of the known consequences of other phosphate mining operations in this region, it is the responsibility of the mining company to prove that this proposed operation will not have damaging consequences.
4. *Requests* that, in view of the above, and of the reported failure to consult The Congress of Micronesia, prior to granting official approval to the

* Mr. H. Coolidge was informed by the U. S. Department of the Interior that, "Continental Minerals, on April 1, 1969, advised the High Commissioner that their prospecting revealed no phosphate or associated minerals in commercial quantity. Therefore, Continental has terminated the agreement."

company for prospecting, the Trusteeship Council of the United Nations should be invited to ensure that the interests of conservation of the environment and use of natural resources is suitably safeguarded by independent technical appraisal of the project and submission of the results to the Congress of Micronesia.

RPTT-4 Resolution on Dugong Recommendation

The IBP Technical Meeting on Conservation of Pacific Islands, meeting at Koror, November 1968, *recognizing* that the dugong found in the waters around Palau is of scientific significance particularly because of its isolated habitat in these islands and represents a valuable and potentially productive source of protein, and *noting* that the numbers of dugongs in these waters are reported to be steadily diminishing to the point where the species may now be quite rare and possibly threatened with extinction; further *noting* that there is virtually no scientific information on the status, biology or ecology of these interesting mammals, RECOMMENDS that research be undertaken to determine the animal's numbers, status and trend of the population, distribution, and ecology, with a view to providing the information necessary for effective management of the species to assure its survival, and if practical, to bring it to a productive status where a sustained yield may be obtained. This research would involve two steps:

1. Compilation of information from the many people of Palau who have past or present knowledge of the animal;
2. Field research by competent biologists.

RPTT-5 Resolution on Crocodile

The IBP Technical Meeting on Conservation of Pacific Islands, meeting at Koror in November 1968, has been informed that crocodiles have been increasing in the waters around Palau. The crocodiles are a threat to people, and there is a possibility that the decrease in the dugong is at least part due to predation by these animals.

Properly managed, crocodiles can provide a valuable resource. Accordingly the meeting RECOMMENDS that research on crocodiles be undertaken:

1. To determine numbers, distribution, status and trends of the populations;
2. To gather information on their ecology and population dynamics, necessary for effective management of them as a resource, while affording necessary protection to people.

ANNEX 1

A Note on Procedure

The primary objective of the Technical Meeting was to examine the available data and to undertake a major task of selection with a view to establishing which of the Pacific oceanic islands appear best to meet international scientific requirements for their permanent conservation. This task could probably best be envisaged in terms of a series of successive stages.

The first stage of screening was to determine which Pacific islands ought to be excluded from consideration *at this stage* for geographic reasons, i.e. because they are continental rather than oceanic, or otherwise fail to meet the underlying assumption that there is a peculiar specific need for the conservation of oceanic islands as scientific laboratories owing to their history of biological isolation.

The next stage is evidently to screen out all the islands which are wholly or permanently inhabited or have been so modified by past habitation or past or present human exploitation that their value for the study of evolution of ecosystems and their scientific aspects has been too seriously compromised. (At this stage some dichotomy between the terrestrial and the marine approaches may emerge, since it is conceivable that islands ruled out for such reasons from consideration for terrestrial conservation might still retain an outstanding reef and accompanying flora and fauna.)

By this stage we should be left with a residual population of Pacific islands which are acceptable as oceanic, uninhabited and substantially unspoiled, or still of biological importance. Geologically these may be grouped (following: Thomas, W. L. Jr. 1963. The variety of physical environments among Pacific Islands. *In* Man's Place in the Island Ecosystem, Bishop Museum Press) as:

- (1) low islands of carbonate rock;
- (2) islands of elevated reef rock;
- (3) volcanic islands;
- (4) islands containing ancient "continental" rocks, to which for our present purpose might usefully be added a fifth hybrid class,
- (5) volcanic or "continental" islands flanked by significant more or less exposed coral structures in the sea.

(See the Conference document, Check List of Pacific Islands, compiled by Gina Douglas).

At this stage it will be desirable to consider particular ecosystems, plant formations, and so forth, characteristic of these various types and to take account of any nonbiological factors requiring to be borne in mind in proceeding to selection in terms of the fauna and flora.

As a next stage it seems possibly advisable to consider in turn each of the basic island groups in terms initially of their plant formations and subsequently of their faunas and their ecosystems in general. As a result of this stage of the exercise, it should be possible to determine:

- (1) for which aspects of which islands is there a need for additional or more up-to-date survey and inventory work before a sound scientific assessment can be reached;
- (2) for the rest, which islands in each group can be named as presenting definably significant special scientific features such as:
 - (a) surviving endemic species,
 - (b) endemic species believed extinct,
 - (c) unique or peculiar ecological conditions,
 - (d) important concentrations of animal or plant populations requiring special protection,
 - (e) sites on which important research has been or is being carried out,
 - (f) sites appearing specially suited to future research which are liable to be lost or damaged if not included in a "bank" of areas set aside for currently unforeseeable scientific studies.

By this stage we should have (subject to the extent of unknown factors) a clear indication of the small minority of islands still retaining scientific features which qualify for consideration in an international and national programme of conservation. The next logical step therefore is to consider which of these are already subject to some provisions for conservation, what these provisions are, and how they are enforced. This might be followed by consideration of known projects for extension of such existing measures or for bringing under conservation any of the islands not yet covered. A third stage would be to consider what specific provision for conservation measures appears to be required in order to achieve the best possible solution in terms of present and future scientific needs.

The nature of appropriate conservation measures was also discussed from the scientific standpoint with a view to providing a suitable background for discussion in the International Union for the Conservation of Nature and between governments concerned. Regard was had at this stage to the existing agreed measures for conservation of fauna and flora in the Antarctic which have been approved by the twelve governments signatory to the Antarctic Treaty and are in course of ratification by the various legislatures concerned. Certain of these measures have already been voluntarily applied elsewhere, e.g. by the Union of South Africa in the Prince Edward Island group, and their extension to other Sub-Antarctic islands is currently under consideration. A further relevant precedent is contained in several inter-governmental conventions establishing consultative bodies in connection with fisheries in the Pacific, e.g. the International Pacific Salmon Fisheries Commission and four others which "grant to each member country the right to check the general application of conservation measures on the high seas by contracting parties. With certain differences of detail they prescribe a procedure whereby duly authorised

officials of any member country may search and seize vessels of other member countries which are acting in violation of the Convention or of regulations adopted under it." [FAO: The State of Food and Agriculture, 1967, p. 137]. Notwithstanding this authority, the right to prosecute and impose penalties on nationals of any member country is reserved to their own government.

Insofar as uninhabited oceanic islands are concerned, there is by definition no currently effective enforcement agency on the spot and no existing strategic economic or other interest to be specially safeguarded. It therefore appears that if and when a list of such islands of first-class importance for science is drawn up with adequate supporting information and reasons it should, as in Antarctica, be in principle open to discussion internationally whether a convention, parallel to the above mentioned Fisheries Convention, might be concluded, containing provisions similar to those already adopted for Antarctica by the twelve Antarctic powers, with the addition of certain policing provisions similar to those in the Fisheries Conventions. Such a convention may be envisaged as containing an initial list of islands agreed internationally to be safeguarded for science. Provision could, if necessary, be made for due notice to be given by any of the countries concerned for the withdrawal of any of the islands from the convention, if possible subject to the concurrence of the other signatory powers and of some appropriate international agency such as the Economic and Social Council of the United Nations.

An alternative approach would be for the signatories voluntarily to agree to international supervision of conservation measures on the above lines, but on the basis that the islands concerned would be given conservation status legally, simply through the laws of the countries possessing them. No doubt various other approaches may be proposed. Any negotiations involved would, it is hoped, be conducted through the International Union for the Conservation of Nature in consultation with the United Nations agencies concerned.

Finally, it should be borne in mind that some important conservation problems and areas within the Pacific and affecting these issues exist either on islands excluded as being inhabited or continental or on the actual continental coastlines. It was hoped that time would permit a brief glance in these directions in order to offer certain suggestions or indications for supplementary or liaison activities on the part of those concerned which might add to the value to science of the immediately envisaged programme for conservation of Pacific oceanic islands.

ANNEX 2

International Participants

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