

ATOLL RESEARCH BULLETIN

No. 100

Atoll News and Comments

Issued by

THE PACIFIC SCIENCE BOARD

National Academy of Sciences--National Research Council

Washington, D. C.

November 15, 1963

THE NATIONAL BUREAU OF STANDARDS

No. 100

1917

1917

THE NATIONAL BUREAU OF STANDARDS

NATIONAL BUREAU OF STANDARDS—NATIONAL BUREAU OF STANDARDS

Washington, D. C.

1917

ATOLL NEWS AND COMMENT

As announced previously, we are happy to continue this series which has the aim of keeping the ARB audience informed on current investigations on coral reefs and atolls, new books and other published items of particular interest in this connection, older published items to which it seems desirable to direct attention, and happenings of general interest to research workers in the field of reefs and atolls. The editors will be glad to receive notes or reviews of the above sorts from readers of the Bulletin which they feel will be of interest to their colleagues.

Atoll Investigations

Society Islands:

Expedition to Mopelia and Bora Bora:

In continuation of the program of investigation of Pacific coral reefs by the Centre National Français de la Recherche Scientifique and the Mission Singer-Polignac, a French expedition spent the last part of July and the first several weeks in August on the atoll of Mopelia or Mopiha'a in the Society Islands, then continued its work with a visit to the high island of Bora Bora, also in the Society Islands. It may be remembered that it was a visit to the latter island that furnished Charles Darwin with some of the information that led to the formulation of his subsidence theory of atoll formation.

Our correspondent Professor Andre Guilcher, of the Sorbonne, Professor François Doumenge, of the University of Montpellier, Professor Leopold Berthois, of l'École Nationale Agronomique, Rennes, and M. René Arnold, diver, underwater photographer and amateur zoologist, came from France, and were joined in Tahiti by the junior editor of ARB, Dr. Marie-Hélène Sachet, who was enroute to an investigation in the Marquesas. They were transported to Mopelia on "La Bayonnaise", French naval vessel based at Tahiti, and had at their disposal while on the atoll the small naval craft, "La Coralline

The main objectives of the expedition were to study the reefs from a geomorphological viewpoint, to sample the bottom sediments by means of a Peterson grab sampler, to study the properties of the lagoon water, and to study the land flora and vegetation of the islets of Mopelia. To the best of our knowledge no systematic attempt has previously been made to collect the land plants of this atoll and no description ever made of its vegetation.

After completion of the work on Mopelia, the expedition moved to Bora Bora, where the oceanographers and geologists studied its reefs and lagoon for comparison with those of Mopelia, while Dr. Sachet returned to Tahiti enroute to the Marquesas. We hope to have a more comprehensive account of the expedition and its results in a later number of the Bulletin.

Melanesian Atolls:

The "Noona Dan" Expedition.

"During the period August 1961 - September 1962 the motorketch "Noona Dan" has completed a cruise in Indo-Pacific waters under the auspices of the Copenhagen University, Denmark. The expedition was sponsored mainly by private donors (especially the Lauritzen-line), partly by official funds.

"The work of the expedition was concentrated in 3 main areas:

- 1) The islands in Southern Philippines (Balabac, Tawi-Tawi, Palawan, Ursula and Mindanao, visited in the period 12th August - 22 December 1961).
- 2) The Bismarck Archipelago (Mussau, Dyaul, Lavongai, Tingwon, central part of New Ireland, Gazelle Peninsula and Cape Hoskins area of New Britain, Manus in the Admiralty Group; all visited in the period 12th January - 13th July)
- 3) Rennell Island in the Solomon Group. 16th August - 3rd September 1962 (some of the expedition-members working on Bellona Island stayed there for another month).

Aside from Rennell short visits were paid to other atolls: Kilinailau, Nuguria, Tauu, Nukumanu. Additionally a trip was made to the Hermit Islands (quasi-atoll).

"Main task of the expedition was to collect samples representing animal and plant life in the areas mentioned (only land and freshwater species to be considered) with the intention of providing collections supplementing those made by previous marine expeditions. It was tried to concentrate work on small, isolated islands, so establishing a material that could shed some light on biological evolution and possibly contain hitherto unknown species. Especially insects, small reptiles, small mammals and birds were collected. Methods yielding quantitative results were always preferred. Beside this, work was carried out on other topics; thus types of soil were gathered by the botanists to support the ecological analyses.

"Apart from the biological work investigations of the marine terraces of the coralline islands of the Bismarck Archipelago were made. In the last phase of the expedition ethnographical research was included, mainly embracing subjects of religious and social life.

"Accommodations of the ship being limited, only up to six scientists were employed at the same time. The scientific leaders were:

"Dr. Børge Petersen, dr. Mogens Kjøie, dr. Finn Salomonsen and dr. Torben Wolff. The scientific staff: S. Andersen, L. Christensen, S. Christiansen, H. Dissing, L. Ferdinand, L. Lineborg, T. Monberg

Y. Sandermann-Olsen - assisted by W. Cuch, I. Trap Lind and E. Petersen. Unhappily the last mentioned lost his life by an accident during the expedition. As a very popular guest, professor Samuel Elbert, University of Hawaii, U.S.A. participated in the Rennell trip.

"Large collections have been the result of the expedition. Until now papers on new species and on some new races of birds have been published."

by Dr. Sofus Christiansen

Phoenix Islands:

Harry Maude writes: "I now hear that the whole of the population of the Phoenix Islands is being removed to the Solomon Islands owing to the prolonged drought. On Gardner Island the coconut supply is completely exhausted, nearly all the trees are dying and all the wells turned brackish except one in January." One wonders if the fact that these islands have always remained uninhabited should not have suggested an exhaustive ecological study before these colonies were established and people moved there.

Christmas Island:

Dr. Philip Helfrich continued his investigations of the marine biology of Christmas Island during the summer of 1963.

Wake Island:

Mr. Robert H. Alexander, Dr. M.-H. Sachet, and Dr. F. R. Fosberg made a brief stop at Wake Island in March, 1963, to see if any effects were still identifiable of the typhoon that devastated the island in 1952. A full report is expected in a future issue of the ARB.

Leeward Hawaiian Islands:

Kermit Gordon, director of the U. S. Bureau of the Budget, is said to be reconsidering his decision to turn the Hawaiian Islands National Wildlife Refuge over to the State of Hawaii after a storm of protest from conservationists who have no faith in the conservation policies of the State of Hawaii.

Gilbert and Ellice Islands:

William Briggs, of the U. S. Geological Survey, was able to collect for a few hours on Funafuti, Ellice Is., and Onotoa, Gilbert Is., during rest stops on a Scripps oceanographic cruise in 1962.

Dr. Gerd Koch writes that he has reached the Gilbert Islands (see ARB 94, pp. 14-15) and was at work at the time of writing, August 17, 1963, at Niutao.

Caroline Islands:

Dr. Vern Carroll writes: "Vern Carroll, a graduate student in anthropology at the University of Chicago, has been awarded a research grant by the National Institute of Mental Health to study the social organization of Nukuoro Island, U. S. Trust Territory of the Pacific Islands for a period of eighteen months. Mr. Carroll, who received his undergraduate training in anthropology at Yale University and who has received graduate degrees from Yale and from Cambridge, will be principally concerned with the local systems of descent, inheritance and succession to offices of leadership on this little-known atoll. He will also investigate the means by which increase in population was controlled in the past and study the ecological context of the contemporary society. Owing to the fact that Nukuoro is very nearly a blank spot on the ethnographic map. Mr. Carroll intends to devote a portion of his time to general ethnographic and linguistic inquiries. Any one with a research interest in this atoll is invited to communicate with him. The field period will begin in the summer of 1963."

New Books

Tuamotus and pearl oysters:

Missions dans le Pacifique; Recifs Coralliens, Huitres Perlieres.
by Gilbert Ranson. i-viii, 1-100, 47 pls. 9 figs. Editions Paul Lechevalier, Paris. 1962.

Dr. Ranson's work in the Pacific, particularly in the region of the Tuamotus, is well known through the number of short papers which have appeared in the Comptes Rendus. His interests, as exhibited in these notes, have lately been in the role of calcareous algae and filamentous algae in the formation of coral reefs and coral islands, and in the biology of the pearl oyster, a monographic treatment of which group is in preparation.

In this little book Dr. Ranson accumulates much of the data he has previously published, but it is presented in a more popular fashion, although the style shifts from the pedantic to the florid. The principal purpose of the book is to present a setting for the discussions of economy and conservation of the pearl shell industry in French Oceania. Of the seven chapters, the first three deal with the physical attributes of the Tuamotus, the fourth treats the shell industry of French Oceania and a fifth mentions several observations on water color, and the two final chapters are essentially a travel-log of visits to Viet Nam and Japan in particular relation to the shell industry of these areas.

In the first chapter, Dr. Ranson rightfully considers that modern reefs are but a veneer of live coral over fossil reefs, which is really only a restatement of the fact that time is required for the accumulation of the debris which is the reef. He concludes that Darwin's subsidence theory of atoll formation is the most satisfactory to account for all aspects of the Tuamotus. In commenting upon the role of algae in corrosion of limestones, Dr. Ranson takes to task the solution hypotheses of

MacNeil, Ladd, and Hoffmeister. The platform of the Tuamotus is considered to have been uplifted slowly, although the area of Makatea and Niau near the edge of the platform has been subjected to a more violent uplift. The 1.8 m. terrace of the Pacific is recognized. The chapter, which presents no new information or synthesis, is marred by the absence of bibliographic citations.

The second chapter, which deals with factors involved in the solution of limestone, considers largely the effects of algae upon corals and coral rock. Aside from slight corrosive and abrasive activity of other organisms, particularly echinoids, the algae are considered to be most important in solution activity. The role of calcareous algae in the formation of the Lithothamnium ridge and in the formation of "buttress and recess" structures is briefly discussed. The third chapter, dealing with phosphate occurrences on the high islands of the Tuamotus, contains Ranson's argument that the phosphates are essentially residual, formed from organic materials leached from the original limestone. Guano is discounted in the formation of these deposits. The chapter contains, almost as an afterthought, a few comments upon the consolidation of beach-rock.

The fourth chapter is the longest and deals with the pearl oyster shell industry in French Oceania. This over-exploited industry is reexamined and conservation methods are discussed. Most of the format is given to a transcription of discussions between leaders of the industry in Papeete and Dr. Ranson. Conservation and introduction of methods such as those utilized in Japan were put into practice in the Tuamotu lagoons, particularly the provision for substrate ideal for settlement of the spat.

The final chapters are a mixed lot. A short one deals with the cause of water coloration, and contains the interesting observation that milky water, observed by Ranson in the Tuamotus, is caused by a mucus secretion containing finely disseminated calcium carbonate particles emitted by Cardium. The final two chapters, as indicated above, deal with his travels in Viet Nam and Japan respectively and are principally oriented towards the pearl shell industry.

The book suffers from the absence of documentation of many ideans and an uneven citation of bibliographic references. These are lacking in chapter 1, fully cited in chapter 2, but are only partially given in chapter 3. The illustrations are in black and white and are of uneven quality and are mainly unimaginative in content. The cover is a handsome yellow with a color inset of a typical tropical scene.

by Donald F. Squires

Bikini and Eniwetok Tests:

Proving Ground, by N. O. Hines. 1-336, 64 photos, 14 maps, 3 charts, University of Washington Press, Seattle, 1962. \$6.75.

This is an important book.. Although it purports to be merely a history of the Laboratory of Radiation Biology, of the University of Washington, and especially of its radiobiological studies in the Pacific between 1946

and 1961, the book contains an account of the early activities of the Atomic Energy Commission that relate to biology. As such it will serve as a source document when the time comes to weigh some of the activities, consequences, and responsibilities of the program of the AEC and its sponsored agencies. This is especially true since the book obviously was written and published under the sponsorship of the Laboratory of Radiation Biology and with the blessing of the AEC. Certainly no one may say that its content is prejudiced against these organizations or that the author was denied access to the full story.

Proving Ground is written in a very readable style. In fact, in places there is even created a feeling of urgency and suspense. It contains much factual information of value even above and beyond the stated objectives of the book. It is liberally illustrated with beautifully reproduced photographs, as well as with maps, diagrams, and graphs, all of great interest to an audience concerned with coral atolls. The chronological story of the tests at Bikini and Eniwetok and the biological research that accompanied and followed them, at least that carried on by the University of Washington group, is very well told, indeed.

Well told, also, is the story of the Laboratory's struggle to survive and to do a job of a magnitude that probably even the personnel, themselves, did not fully appreciate, on the pittance doled out to them by an administration dominated by physicists and military men. There is evidence throughout the book of the remarkable parsimony on the part of the AEC in their support of field biological research, especially in the critical 1950-1952 period. The resources and staff were never nearly equal to the assignments they were given. And the assignments showed little appreciation of either the magnitude or the importance of the task of understanding the ramifications of the effects of the tests on the ecosystems involved, or of the possible effects on the human inhabitants of these systems (cf. pp. 87-88, 102-103, 125-132, 152).

One impression that persists and grows in the reader's mind throughout the book is of the stultifying effect on scientific work of too much planning and discussion. What has emerged, in many of the programs described, bears little resemblance to what seemed to be in mind when the program was proposed. Recognition of a good proposal and giving encouragement and support to the proposer, forthwith, to carry it out never seems to have occurred at the planning levels in the AEC, at least in the biological field. Everything seemed to be the products of composite mental efforts, with anything at all bold carefully eliminated. Perhaps this is the modern way.

Against this background it is perhaps a bit easier to understand, if not to appreciate, the impression of coolness so often given by the Radiation Biology Laboratory personnel toward suggested incursions by outsiders into the Proving Ground picture, even a suggestion of proprietary feeling about the field of research on the biological results of testing in the Pacific atolls. AEC policies may also explain the apparent reluctance about prompt publication of the data collected by the numerous Laboratory expeditions.

This tightness has relaxed some in recent years, but there still seems a remarkable paucity of published information compared to the amount of research effort expended. It is good to be able to say that much information of a general character, or of possible popular interest, is made available, some of it for the first time, in the pages of the book under review. This is certainly the best available summary of the results of the work done in and around Bikini and Eniwetok by the Laboratory of Radiation Biology.

For this reason it seems proper to point out a very few errors, some of them of omission, that have slipped by the obviously competent scientific reviewing that this volume has had. These are remarkably few in number, and some are possibly justifiable omissions.

On p. 31, the statement is made that the first drillings made to investigate the depths of coral beneath an atoll reef were those on Funafuti in 1897 and 1898. Actually, Capt. Belcher attempted a boring at Boring Bay, Hao Atoll, in the Tuamotus almost 60 years earlier.

In the account of the Crossroads Operation it is surprising to find no mention of the role of Lt. Cmdr. Roger Revelle, USN, in initiating the scientific survey.

One may at least question the correctness of the statement on p. 165 that the Bravo Shot produced the first "mishap and human suffering, the first such results attributable to the test program." This, it seems, ignores the whole question of the dislocation and maladjustment suffered by the people of Bikini, who were uprooted from their homes and removed so that their island could be used for the tests.

On p. 267, third line from the bottom, a word must have been omitted after "American".

In the list of plants on p. 324 Portulaca quadrifida is included. This species is not known in the Pacific east of Guam. Probably Portulaca samoensis is the species in question.

On p. 309, one cannot positively quarrel with the statement, "The probabilities of remote radiation effects could not be denied, but positive evidence of such effects was not found at the test atolls or anywhere else in the Pacific," but one wonders if this could not be because of not knowing what to look for, or not recognizing it or interpreting correctly what was found.

This book is recommended without hesitation to those interested in coral atolls, and Neal Hines is to be congratulated on his remarkable success in telling a scientific story in a way that is at once readable, informative, and scientifically sound.

Rats:

Pacific Island Rat Ecology, edited by Tracy I. Storer, and containing papers by the members of the Pacific Science Board team which worked in

Micronesia from 1955 to 1958, was recently published as Bishop Museum Bulletin 225, issued Dec. 31, 1962. The papers deal mainly with Ponape, a high island, but some of the work was done on atolls--Majuro, Ant, and Oroluk, and there are records of several kinds of rats from these atolls, as well as descriptions, photos, and ecological notes. This volume is a commendable example of integration of the results obtained by four ecologists, Robert L. Strecker, Joe T. Marshall, Jr., William B. Jackson, and Kyle R. Barbehenn, and the work of a systematic mammalogist, David H. Johnson, ably directed by Tracey I Storer, world renowned animal ecologist, who also edited the book. It is a noteworthy addition to the growing literature on the ecology of the Pacific islands.

Indian Ocean Birds:

Watson, G. E. Zusi, R. L., and Storer, R. E., Preliminary Field Guide to the Birds of the Indian Ocean, 214 pp., was published by the Smithsonian Institution in 1963. This interesting book was prepared especially for the use of the personnel of the International Indian Ocean Expedition. It contains directions for making collections and observations on birds; a list of all the birds known from the area, with their distribution; alphabetical lists of Latin and English names; field identification plates for each group of birds, illustrating the species with their principal identification marks indicated, and a brief statement of identifying features in the captions for these, and lists of birds found on the principal islands and island groups, these shown on a small map and on larger maps for individual islands and groups. This is a valuable compilation of distributional information, and is of interest to atoll students both because of the numerous atolls in the Indian Ocean area treated and because many of the birds found there are widely distributed on atolls in other oceans. Atolls and atoll groups treated are Cocos-Keeling, Laccadives, Minicoy, Maldives, Chagos Archipelago, Cargados Carajos, Tromelin, Platte, Coetivy, Bird, Dennis, Agalega, Amirantes, Providence, St. Pierre, Farquhar, Cosmoledo, Astove, and Gloriosa. The area covered by the book includes most of the islands in the Indian Ocean, but excludes Madagascar, Sokotra, Ceylon, the Andamans, The Nicobars, and the islands lying west of Sumatra and Australia. The continental rim, also, is excluded.

Recent Deaths

David I. Blumenstock: It is with sadness and regret that we record the untimely death of our friend, colleague, and contributor to the Atoll Research Bulletin, Prof. David Blumenstock, on August 28, 1963. Although only 49 at the time of his death, Dave had, for years, exhibited a mature grasp of his field of climatology seldom attained by a man of 60. An expert in his own field, he was also outstanding as a generalist, and as such, it is appropriate that he ended his career as a member of the University of California Geography Department. His book Ocean of Air, though written as a popularization of meteorology, should be required reading for ecologists and geographers. It is not only competently written, it is a pleasure to read.

He first came to us in 1955, when moving from Rutgers, New Jersey, to Honolulu, where he was to be climatologist for the Pacific region, U. S. Weather Bureau. He wanted to know what were the problems where a climatologist could be useful to biologists in the Pacific Islands. We suggested a study of the effects of typhoons on islands and their vegetation and other life. He followed this lead and ranged the Pacific very widely, studying the aftermaths of typhoons. A brief look at the immediate effects of Typhoon Ophelia on Jaluit Atoll, in January 1958, led him to organize an expedition several months later to study this storm's behavior, the results of which were presented in ARB No. 75. The notes taken on a second expedition to Jaluit, two years later, and on another expedition to Ulithi, after a typhoon had raked that large atoll, have not been published. It is sincerely hoped that his great accumulation of information on this subject can be salvaged and made available, as he would have wanted.

His place in the Pacific Islands scientific community will not easily be filled.

Carl L. Skottsberg: We also regret to have to record the death of Prof. Carl Skottsberg, in Gothenburg, Sweden, on June 14, 1963. He did not work directly on any atoll, so far as we know, but contributed probably more than anyone else to the over-all phytogeographical picture of the Pacific Islands during his sixty-odd years of active botanical work.

Joseph Rock: Death of another Pacific botanist, Dr. Joseph Rock, took place in Honolulu on December 5, 1962, according to the Newsletter of the Hawaiian Botanical Society, vol. 2, no. 1. He visited Palmyra Island in 1913 and published the first account of its flora and vegetation in 1916. A biographical sketch, by Alvin K. Chock, appears in the cited number of the Newsletter, and also in Taxon, vol. 12, pages 89-102, 1963.

Matters of General Interest

Pacific Botanists 1963:

The Pacific Scientific Information Center has recently published "Pacific Botanists 1963", a revision of earlier lists of botanists interested in Pacific Basin problems prepared by the Standing Committee for Pacific Botany. This list is arranged alphabetically, but is accompanied by an extensive "Interest Index" which lists the botanists by subject and geographical interests, and by a "Residence Index" which lists them by country of residence. The files on which this index is based, transferred to the Information Center by the Standing Committee for Pacific Botany, are kept permanently open for revision and addition, and corrections are solicited. This index follows the similar "Pacific Anthropologists 1962".

Micronesica:

The College of Guam has announced the founding of Micronesica, a new scientific journal to be devoted to all branches of science and including

papers from Micronesia and related areas. The editor-in-chief is Dr. Benjamin C. Stone, of the Botany Department, College of Guam, assisted by a number of associate editors for different subjects. Manuscripts are welcome and should be sent to Dr. B. C. Stone, Editorial Office, Micronesica, College of Guam, Box 97, Guam, U.S.A. It is hoped that the first number may appear by June, 1964.

Hawaiian Botanical Society Newsletter:

The Hawaiian Botanical Society Newsletter, inaugurated in February 1962, is now in its second year of publication. This mimeographed publication is issued monthly except during the months of July, August, and September, and includes articles and notes of general interest about Hawaiian and Pacific Botany and a list of recent publications. The Society's annual membership fee of \$2.00 includes receipt of the newsletter. Newsletter correspondence should be sent to the Editor (Alvin K. Chock, B. P. Bishop Museum, Honolulu 17, Hawaii) or the Assistant Editor (Tosho Murashige, Department of Horticulture, University of Hawaii, Honolulu 14, Hawaii).

Another Bomb Test:

We are informed that the French have selected the atoll of Mururoa, in the southern Tuamotus, to test a hydrogen bomb, probably in 1965. At present they are said to be building air strips on Anaa and Hao, for use in this enterprise. We hope that, if they proceed with this misguided enterprise, they will at least carry out a thorough scientific survey of the atoll before everything is irretrievably destroyed. We will try to get a more complete account of this project for a later number.

Contributions:

We have tried to acknowledge the many contributions received toward the publication fund of the Bulletin, but may have missed some. We sincerely appreciate this support, both because it is needed, and because it shows that the Bulletin is useful and appreciated. Future contributions will also be extremely welcome.

List of Atoll Research Bulletins 1-100

1. Basic information papers, by various authors. 1-25, Sept. 10, 1951.
2. Symposium on coral atoll research, by various authors. 1-14, Sept. 10, 1951.
3. Vertebrate ecology of Arno Atoll, Marshall Islands, by J. T. Marshall, Jr. 1-38, Oct. 15, 1951. ✓
4. Marine zoology study of Arno Atoll, Marshall Islands, by R. W. Hiatt and D. Strasburg. 1-13, Oct. 15, 1951.
5. The soils of Arno Atoll, Marshall Islands, by E. L. Stone, Jr. 1-56, Nov. 15, 1951.
6. The agriculture of Arno Atoll, Marshall Islands, by E. L. Stone, Jr. 1-46, Nov. 15, 1951.
7. The plants of Arno Atoll, Marshall Islands, by D. Anderson. 1-4, i-vii, Nov. 15, 1951. ✓
8. The hydrology of Arno Atoll, Marshall Islands, by D. C. Cox. 1-29, Dec. 15, 1951.
9. The coral reefs of Arno Atoll, Marshall Islands, by J. W. Wells. 1-14, Dec. 15, 1951.
10. Anthropology-geography study of Arno Atoll, Marshall Islands, by L. Mason, J. Tobin and G. Wade. 1-21, Sept. 1, 1952.
11. Land tenure in the Marshall Islands, by J. Tobin. 1-36, Sept. 1, 1952.
12. Preliminary report on geology and marine environment of Onotoa Atoll, Gilbert Islands, by P. E. Cloud, Jr. 1-73, Dec. 15, 1952.
13. Preliminary report on marine biology study of Onotoa Atoll, Gilbert Islands, by A.H. Banner and J.E. Randall. 1-62, Dec. 15, 1952.
14. Description of Kayangel Atoll, Palau Islands, by J.L. Gressitt. 1-6, Dec. 15, 1952. ✓
15. The insect life of Arno, by R. L. Usinger and I. La Rivers. 1-28, April 30, 1953.
16. The land vegetation of Arno Atoll, Marshall Islands, by W. H. Hatheway. 1-68, April 30, 1953. ✓
17. Handbook for atoll research, by various authors, edited by F. R. Fosberg and Marie-Hélène Sachet. 1-129, May 15, 1953.
18. Ichthyological field data of Raroia Atoll, Tuamotu Archipelago, by R. R. Harry. 1-190, July 31, 1953.

- ✓ 19. Check list of atolls, by E. H. Bryan, Jr. 1-38, Sept. 30, 1953.
20. Health report of Kapingamarangi, by R. E. Miller. 1-42, Sept. 30, 1953.
- ✓ 21. Notes on Ngaruangi and Kayangel Atolls, Palau Islands, by J. L. Gressitt. 1-5, Sept. 30, 1953.
22. Summary of information on atoll soils, by E. L. Stone, Jr. 1-4, Sept. 30, 1953.
23. Vegetation of Central Pacific Atolls, a brief summary, by F. R. Fosberg. 1-26, Sept. 30, 1953.
24. Enumeration of the decapod and stomatopod Crustacea from Pacific coral islands, by L. B. Holthuis. 1-66, Nov. 15, 1953.
25. Bryophytes from Arno Atoll, Marshall Islands, by H. A. Miller and M. S. Doty. 1-10, Nov. 15, 1953.
- ✓ 26. Scorpions on coral atolls, by M.-H. Sachet. 1-10, Nov. 15, 1953.
27. Nutrition study in Micronesia, by M. Murai. 1-239, Jan. 31, 1954.
- ✓ 28. Preliminary report on land animals at Onotoa Atoll, Gilbert Islands, by E. T. Moul. 1-28, May 31, 1954.
- ✓ 29. A summary of information on Rose Atoll, by M.-H. Sachet. 1-25, May 31, 1954.
30. The hydrology of the Northern Marshall Islands, by T. Arnow. 1-7, May 31, 1954.
31. Expedition to Raroia, Tuamotus, Part 1. Expedition to Raroia, Tuamotus, by N. D. Newell. 1-12; Part 2. Physical characteristics of Raroia, by N. D. Newell. 13-21; Part 3. General map of Raroia Atoll, by N. D. Newell. Nov. 30, 1954.
- ✓ 32. Raroian Culture, Part 1. Economy of Raroia Atoll, Tuamotu Archipelago, by B. Danielsson. 1-91; Part 2. Native topographical terms in Raroia, Tuamotus, by B. Danielsson. 92-96; Part 3. Native terminology of the coconut palm in Raroia Atoll, by B. Danielsson. 97-99; Part 4. Bird names in Raroia Atoll, by B. Danielsson and A. Natua. 100-101; Part 5. Check list of the native names of fishes of Raroia Atoll, by B. Danielsson. 102-109. Nov. 30, 1954.
- ✓ 33. Floristics and plant ecology of Raroia Atoll, Tuamotus, Part 1. Floristic and ecological notes on Raroia, by M. S. Doty. 1-41; Part 2. Ecological and floristic notes on the Myxophyta of Raroia, by J. Newhouse. 42-54; Part 3. Ecological and floristic notes on the Bryophyta of Raroia, by H. A. Miller and M. S. Doty. 55-56; Part 4. Ecological and floristic notes on the Pteridophyta of Raroia, by K. Wilson. 57-58., Nov. 30, 1954.

- ✓ 34. Animal ecology of Raroia Atoll, Tuamotus, Part 1. Ecological notes on the mollusks and other animals of Raroia, by J. P. E. Morrison. 1-18; Part 2. Notes on the birds of Raroia, by J. P. E. Morrison, 19-26. Nov. 30, 1954.
35. Interrelationship of the organisms on Raroia aside from man, by M. S. Doty and J. P. E. Morrison. 1-61. Nov. 30, 1954.
36. Reefs and sedimentary processes of Raroia, by N. D. Newell. 1-35, Nov. 30, 1954.
37. Pumice and other extraneous volcanic materials on coral atolls, by M.-H. Sachet. 1-27, May 15, 1955.
38. Northern Marshall Islands Expedition, 1951-1952. Narrative by F. R. Fosberg. 1-36, May 15, 1955.
- ✓ 39. Northern Marshall Islands Expedition, 1951-1952. Land biota: Vascular plants, by F. R. Fosberg. 1-22, May 15, 1955.
40. Bryophytes collected by F. R. Fosberg in the Marshall Islands, by H. A. Miller. 1-4, May 15, 1955.
- ✓ 41. Canton Island, South Pacific, by O. Degener and E. Gillaspay. 1-51, Aug. 15, 1955.
42. The insects and certain other arthropods of Canton Island, by R. H. Van Zwaluwenburg. 1-11, Aug. 15, 1955.
- ✓ 43. The natural vegetation of Canton Island, an equatorial Pacific atoll, by W. H. Hatheway. 1-9, Aug. 15, 1955.
44. The hydrology of Ifalik Atoll, Western Caroline Islands, by T. Arnow. 1-15, Aug. 15, 1955.
- ✓ 45. A partial list of the plants of the Midway Islands by J. A. Neff and P. A. DuMont. 1-11, Aug. 15, 1955.
46. Conspicuous features of organic reefs, by J. I. Tracey, Jr., P. E. Cloud, Jr. and K. O. Emery. 1-3, Aug. 15, 1955.
47. Fishes of the Gilbert Islands, by J. E. Randall. 1-243, Aug. 15, 1955.
- ✓ 48. The geography of Kapingamarangi Atoll in the Eastern Carolines, by Herold J. Wiens. 1-86, 1- [7], June 30, 1956.
- ✓ 49. Bioecology of Kapingamarangi Atoll, Caroline Islands: Terrestrial aspects, by William A. Niering. 1-32, June 30, 1956.
50. Geology of Kapingamarangi Atoll, Caroline Islands, by Edwin D. McKee. 1-38, June 30, 1956.
51. Observations on French Frigate Shoals, February 1956, by Arthur Svihla. 1-2, Sept. 15, 1957.

52. Zonation of corals on Japtan Reef, Eniwetok Atoll, by Eugene P. Odum and Howard T. Odum. 1-3, Sept. 15, 1957.
53. Slicks on ocean surface downwind from coral reefs, by F. R. Fosberg. 1-4, Sept. 15, 1957.
- ✓ 54. Field notes on atolls visited in the Marshalls, 1956, by Herold J. Wiens. 1-23, September 15, 1957.
55. Agricultural notes on the Southern Marshall Islands, 1952, by W. H. Hatheway. 1-9, September 15, 1957.
- ✓ 56. Atolls visited during the first year of the Pacific Islands Rat Ecology Project, by J. T. Marshall, Jr. 1-11, Sept. 15, 1957.
- ✓ 57. Preliminary report on the flora of Onotoa Atoll, Gilbert Islands, by Edwin T. Moul. 1-48, September 15, 1957.
- ✓ 58. The Maldivé Islands, Indian Ocean, by F. R. Fosberg. 1-37, September 15, 1957.
- ✓ 59. Report on the Gilbert Islands: Some aspects of human ecology, by René L. A. Catala. 1-187, October 31, 1957.
60. Climate and Meteorology of the Gilbert Islands, by M.-H. Sachet. 1-4, October 31, 1957.
61. Long-term effects of radioactive fallout on plants, by F. R. Fosberg. 1-11, May 15, 1959.
62. Health and sanitation survey of Arno Atoll, by J. D. Milhurn. 1-7, May 15, 1959.
- ✓ 63. Report on a visit to the Chesterfield Islands, September, 1957, by F. Cohic. 1-11, May 15, 1959.
64. Canton Island, South Pacific (Resurvey of 1958), by Otto Degener and Isa Degener. 1-24, May 15, 1959.
65. Some marine algae from Canton Atoll, by E. Yale Dawson. 1-6, May 15, 1959.
66. Notes on the geography and natural history of Wake Island, by E. H. Bryan, Jr. 1-22, May 15, 1959.
- ✓ 67. Vegetation and flora of Wake Island, by F. R. Fosberg. 1-20, May 15, 1959.
- ✓ 68. Additional records of phanerogams from the northern Marshall Islands, by F. R. Fosberg. 1-9, May 15, 1959.
69. Contribution to a German reef-terminology, by Georg Scheer. 1-4, May 15, 1959.
70. Atoll news and comment, Editors. 1-7, May 15, 1959.

71. Microclimatic observations at Eniwetok, by David I. Blumenstock and Daniel F. Rex, with a special section on Vegetation by Irwin E. Lane. i-ix, 1-158, June 30, 1960.
- ✓ 72. Report on Tarawa Atoll, Gilbert Islands, by Edwin Doran, Jr. 1-54+24, October 15, 1960.
73. Some aspects of Agriculture on Tarawa Atoll, Gilbert Islands, by R. R. Mason. 1-17, October 15, 1960.
74. Birds of the Gilbert and Ellice Islands Colony, by Peter Child, 1-38 October 15, 1960.
75. A report on Typhoon Effects upon Jaluit Atoll edited, by David I. Blumenstock. 1-105, April 15, 1961.
- ✓ 76. Observations on Puluwat and Gaferut, Caroline Islands, by William A. Niering. 1-10, December 31, 1961.
Historical and climatic information on Gaferut Island, by Marie-Hélène Sachet. 11-15, December 31, 1961.
77. A check list of marine algae from Ifaluk Atoll, Caroline Islands, by Isabella A. Abbott. 1-5, December 31, 1961.
- ✓ 78. Narrative report of botanical field work on Kure Island, 3 October 1959 to 9 October 1959, by Horace F. Clay. 1-4, December 31, 1961.
- ✓ 79. Botanical observations on Leeward Hawaiian Atolls, by Charles H. Lamoureux. 1-10, December 31, 1961.
80. The tropical coral reef as a biotope, by Sebastian A. Gerlach. 1-6, December 31, 1961.
81. Qualitative description of the coral atoll ecosystem, by F. R. Fosberg. 1-11, December 31, 1961.
82. Heron Island, Capricorn Group, Australia, by F. R. Fosberg, R. F. Thorne and J. M. Moulton. 1-4, 5-13, 15-16, December 31, 1961.
- ✓ 83. Notes on some of the Seychelles Islands, Indian Ocean, by C. J. Piggott. 1-10, December 31, 1961.
84. Atoll News and Comments. Editors, 1-14, December 31, 1961.
85. Land tenure in the Pacific - A symposium of the Tenth Pacific Science Congress convened by Edwin Doran, Jr. 1-60, December 31, 1961.
- ✓ 86. Geography and land ecology of Clipperton Island, by Marie-Hélène Sachet. 1-115, February 28, 1962.
- ✓ 87. Three Caribbean atolls: Turneffe Islands, Lighthouse Reef, and Glover's Reef, British Honduras, by D. R. Stoddart. 1-151, June 30, 1962.
88. Coral Islands, by Charles Darwin, with introduction, map and remarks by D. R. Stoddart. 1-20, Dec. 15, 1962.

89. Geophysical observations on Christmas Island, by John Northrop. 1-2, Dec. 15, 1962.
- ✓ 90. Plants of Christmas Island, by Alvin K. Chock and Dean C. Hamilton, Jr. 1-7, December 15, 1962.
91. Central subsidence. A new theory of atoll formation, by Hans Hass. 1-4, Dec. 15, 1962.
- ✓ 92. Vascular plants recorded from Jaluit Atoll, by F. R. Fosberg and M.-H. Sachet. 1-39, Dec. 15, 1962.
- ✓ 93. A brief study of the cays of Arrecife Alacran, a Mexican atoll, by F. R. Fosberg. 1-25, Dec. 15, 1962.
94. Atoll news and comments, Editors, 1-19, Dec. 15, 1962.
95. Effects of Hurricane Hattie on the British Honduras Reefs and Cays, October 30-31, 1961, by D. R. Stoddart. 1-142, May 15, 1963.
96. Some aspects of the meteorology of the tropical Pacific viewed from an atoll, by Ronald L. Lavoie. 1-80, May 15, 1963.
- ✓ 97. The flora and vegetation of Laysan Island, by Charles H. Lamoureux. 1-14, November 15, 1963.
- ✓ 98. Insects and other invertebrates from Laysan Island, by George D. Butler, Jr., and Robert L. Usinger. 1-30, November 15, 1963.
99. Notes on the Wedge-tailed Shearwater at Heron Island, Great Barrier Reef, Australia, by A. O. Gross, J. M. Moulton, and C. E. Huntington. 1-11, November 15, 1963.
100. Atoll news and comments, Editors, 1-16, November 15, 1963.