

SOUTH PACIFIC NEWSLETTER

No. 6
March, 1995



KAGOSHIMA UNIVERSITY RESEARCH CENTER

FOR THE SOUTH PACIFIC



Birds-eye view of the main campus of Kagoshima University, the home base of the Research Center.

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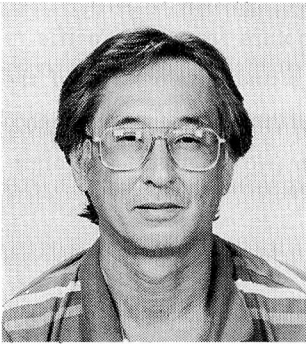
Front: The souls of the dead help fishermen locate a school of bonito. A picture inscribed on an oar. Santa Isabel, Solomon Islands. (Source: *Minami Taiheyo no Bijutsu*. Tairyusha, 1985)

From Micronesia to Kagoshima

June 1 to December 1, 1994

Harley Ichiro MANNER

Visiting Foreign Professor, University of Guam



Throughout the Caroline Islands (Palau, Yap, Chuuk, Pohnpei, Kosrae) and other parts of Micronesia, one can find various artifacts and memorials of Japan's presence during the earlier part of this century. On Koror Island in Palau, the extensive foundations of the Kampei Taisha Nan'yo Jinja is a remainder of the extent of Japanese migration and colonization in Micronesia. Others are quite small and may be found in some of the remotest and smallest islands of Micronesia. On Losap Atoll, for example, there is a stone memorial commemorating a visit to those islands by a group of Kyoto University researchers in the early 1940s. Evidently, this group had stopped at Losap in order to watch a solar eclipse. Unfortunately, the details and results of that visit to Losap are not known. In 1988, I visited Losap Atoll and saw that stone memorial. I began to wonder about the nature and extent of Japanese research in Micronesia during that period.

Most of my research is concerned with the ways Pacific Islanders have adapted to and modified their natural environment as expressed through their traditional systems of agriculture, land use, and resource management. My perspectives and understanding of these traditional systems are mainly based on the Western scientific literature and fieldwork experiences. During the years of the Japanese Mandate in Micronesia, many of these islands were visited and studied by Japanese researchers, who wrote their findings mainly in Japanese publications. While some of their studies have been translated into English, their findings, in many cases, remain largely unknown to Western scholars, including myself.

The purpose of my visit to the Kagoshima University Research Center for the South Pacific is to analyze the Japanese scientific literature on traditional subsistence agriculture and related areas (geography, anthropology, ethnology, botany) of Micronesia written between 1890 and 1940, in order to publish a much needed review and an annotated bibliography of their work during the above period. As the nature of Micronesian subsistence agriculture is changing quickly because of rapid socio-economic, political, and demographic changes, this project will provide a baseline description and analysis for comparison with that of today. I am collaborating on this project with Dr. Kazutaka Nakano, whom I first met in Fiji in 1981. Thus far, we have reviewed between 50 to 60 articles written during the Mandate period on the above topic. In addition, I hope to find out what the Kyoto University scientists learned on their visit to Losap Atoll more than 50 years ago.

There are other reasons why I appreciate this visit. First, it is my belief that a geographer can best learn of a place, in this case, Kagoshima, and its people by living and working in it. Second, the position here gives me time to think about my research (for example, future research agendas) and to do research. At my post at the University of Guam, 85% of my time is spent in teaching and administration. Since my arrival here in June, I have written two articles, presented three seminars and four lectures, and edited six papers by Japanese colleagues for publication. I am also editing two large manuscripts by foreign authors. Two other papers are in progress, generated in part by my interactions and discussions with Japanese colleagues. Third, this appointment offers the intellectual stimulation and resources for scholars from the Pacific to participate in studies of mutual concern needed for the proper growth and development of the Pacific islands. Finally, the position at the Research Center is an opportunity to further enhance cultural, technical and intellectual interchange, and friendship between two universities committed to the Pacific islands.

Scientific Survey of Pohnpei Island

Kazutaka NAKANO

Party Leader

Since 1981, the Kagoshima University Research Center for the South Pacific has been organizing series of research projects called "Scientific Survey of the South Pacific", funded by the Ministry of Education, Science and Culture of Japan. After the two years' interruption, a new series of projects focusing on Micronesia was begun in 1994. In the first year of this series, the field survey for this research project was successfully conducted in cooperation with the concerned personnel of College of Micronesia and the national and the state governments in Pohnpei, the Federated States of Micronesia.

The research party was composed of five survey teams:

Team 1, Appropriate agricultural development in relation to the terrestrial environment; Team 2, Development of marine biological resources and conservation of the marine environment; Team 3, Community health of islanders; Team 4, Development of the system of administration and its relationship to cultural autonomy; and, Team 5, Some biological aspects of oceanography.

A presentation of the survey results will be held in May 1995, and a progress report of the survey will be published in October 1995.

The itinerary and the members of the research party are as follows:

Itinerary;

24 October, 1994. Departure from Kagoshima Port, Japan

9 November, 1994. Arrival at Kolonia Port, Pohnpei Island

17 November, 1994. Departure from Kolonia Port

25 November, 1994. Arrival at Kagoshima Port

Members of Team 1;

NAKANO Kazutaka, Professor, Dr., Terrestrial Ecology and Geography, Research Center for the South Pacific, Kagoshima University

HAYASHI Mitsuru, Professor, Dr., Crop Science, Faculty of Agriculture, Kagoshima University

TOMINAGA Schigeto, Associate Professor, Dr., Fruit Science, Faculty of Agriculture, Kagoshima University

ONJO Michio, Research Associate, Tropical Agriculture Science, Faculty of Agriculture, Kagoshima University

ARIZONO Takuya, Graduate Student, Crop Science, Faculty of Agriculture, Kagoshima University

YASUMIZU Yoshihisa, Undergraduate Student, Crop Science, Faculty of Agriculture, Kagoshima University

ISHIGAKI Tae, Undergraduate Student, Crop Science, Faculty of Agriculture, Kagoshima University

Members of Team 2;

INOUE Akio, Professor, Dr., Marine Ecology, Research Center for the South Pacific, Kagoshima University

MATSUOKA Tatsuro, Associate Professor, Dr., Fishing Technology, Faculty of Fisheries, Kagoshima University

NORO Tadahide, Associate Professor, Dr., Marine Botany, Faculty of Fisheries, Kagoshima University

SHIMOHIGASHI Yasuyuki, Associate Professor, Dr., Biochemistry, Faculty of Science, Kyushu University

ETO Saori, Undergraduate Student, Marine Biology, Faculty of Fisheries

Member of Team 3;

MIKAMI Seiji, Research Associate, Dr., Epidemiology, School of Medicine, Hirosaka University

Member of Team 4;

TSUCHIDA Mitsuyoshi, Professor, Dr., Architectural History in Japan, Faculty of Engineering, Kagoshima University

Members of Team 5;

ICHIKAWA Toshihiro, Professor, Dr., Biological Oceanography, Faculty of Science, Kagoshima University

KAWAMURA Nobuko, Graduate Student, Biological Oceanography, Faculty of Science, Kagoshima University

YUWAKI Yasutaka, Professor, Oceanography, Faculty of Fisheries, Kagoshima University

SHIMADA Kiyoshi, Associate Professor, Oceanography, Faculty of Fisheries, Kagoshima University

MASUMITSU Sunao, Assistant Professor, Oceanography, Faculty of Fisheries, Kagoshima University

HIGASHI Masataka, Assistant Professor, Oceanography, Faculty of Fisheries, Kagoshima University

Clerkship;

KANEKO Shinichi, Program Officer, Research Center for the South Pacific, Kagoshima University

ABSTRACTS FROM SEMINARS

Saving Tropical Forests through Production of Non-Wood Forest Products in Southeast Asia

February 2, 1994

Some so-called conservationists insist that the extinction of plants and animals is mainly caused by the harvesting and hunting of forest resources, thus requiring prohibitions against entering the forest.

In fact, rural people living near forests have harvested and collected various forest products such as food, fodder, fuel wood, medicinal plants, etc. In southeast Asia, the number of people who depend mainly on their daily foods from the forests is estimated at least 27 million.

Recently, both in natural forest and in man-made forest management, there has been a shift from timber production to the exploitation of non-wood forest products. Therefore, it is expected that forests may be maintained without severe damage to their structure and function.

"Inventory" projects are launched in some areas and often emphasize that people's deep knowledge of plants and animals is applicable to conservation of forests and utilization of forest resources for both their lives and our lives. In this sense, all organisms are useful or potentially useful products.

In southeast Asia, the various non-wood forest products, such as resins (oleo-resin, damar, copal, lacquer, benjoin, rubber latex, gutta-percha, jerutong, etc), essential oils (kayu putih oil, vanilla), fiber and paper making materials (papermulberry, climbing fern), medicinal plants, foods (tengkawang,

cinnamon), ornamental plants, animals products (bee-honey, lac insects, silk) are produced at varying scales of production.

There are many villages supported by the production of those non-wood products which contribute much to the development of their communities. In addition, there are many appropriate tools and knowledge used to supply those products constantly and at the same time to maintain forest sustainability.

Conservation of bio-diversity can not be achieved without the understanding and cooperation of the inhabitants in rural communities. The exploitation of commercially valuable forest products is important for increasing the standard of living and the national economy. While it is surely hard to solve those two problems, we have to look for ways to maintain bio-diversity and raise living standards.

Hiroyuki WATANABE

(Faculty of Agriculture, Kyoto University)

Easter Island, Earth Island

February 21, 1994

Easter Island is unique in many ways. Its position in the Southeast Pacific makes it the most isolated inhabited land in the world. It is famous for its giant stone statues, constructed by a lost civilization. It is also uniquely depauperate in its flora and vegetation, having only one species of tree and no forest.

Archaeology tells us that the island was first colonized about 400 AD, by polynesians, probably from the Marquesas. They introduced food plants and rats. By 700 AD the people were already making large statues, but the civilization flowered mainly between 1100 AD and 1680 AD when over 600 statues were made, transported distances of up to 10 + km, and erected on special platforms. How this was done without large timbers is a mystery, as is its purpose. Perhaps a form of ancestor worship was practised. A kind of writing, the rongo-rongo script, was developed.

About 1680 AD the civilization collapsed. There are legends of famine and war about this time. Obsidian spearheads of this age are common. Many of the statues were deliberately overturned, and the people turned to the bird-man cult, based around the annual arrival of the sooty tern to breed on an offshore islet. This could suggest a special interest in the protein food supply provided by eggs. There is evidence that fish-hook size declined about this time, suggesting the abandonment of deep-sea fishing. Human population probably crashed from about 10,000 people to 4,000 people.

The island was first contacted by the outside world in 1722 AD and the population suffered badly from introduced diseases and slave raiding. By the 1890s the population was 111, and most legends, and the ability to decipher rongo-rongo, were lost.

An attempt to discover the ecological history of the island by palynology of crater sediments has been very successful. Sediment records have been radiocarbon dated and go back to before 30,000 years ago. They show that the island was continuously forested until about 800 AD, the dominant tree being a palm similar to the Chilean wine palm. This could have provided food, and timber for canoes and for statue-moving. Remains of the fruits of this palm from 1200 AD show signs of being eaten by rats.

After 800 AD the island was progressively deforested by people, and by 1500 AD it was almost treeless. It is hypothesized that an ecological disaster thus occurred, resulting in the collapse of the civilization around 1680 AD.

While at Kagoshima, a new pollen core from the island has been investigated. This shows that the decline of the forest occurred in two stages. The earlier decline, which was without the burning of the later stage, could have resulted from a climatic shift such as an increase in storminess, or from a biological event such as the introduction of rats by people.

We may draw an analogy between Easter Island, isolated in the Pacific, and the Earth, isolated in space. The computer model for the

Earth in the 21st Century, produced by the Club of Rome in *The Limits to Growth*, shows a decline (by over-use) of resources followed by a population crash. The Easter Island history, in which the decline (by over-use) of the forest resources is followed by a population crash, suggests the Club of Rome model could be valid. What is even more disturbing is that, since Easter Island is small, the ecological decline must have been obvious, where as the degradation of the com-

plex Earth ecosystem is less easy to observe. It is suggested that co-operation, rather than competition, is the only way to survival.

Further details of this topic are given by Paul Bahn and John Flenley in their book *Easter Island, Earth Island* (Thames and Hudson, London, 1992)

J.R. FLENLEY

(Massey University, Visiting Foreign Research Professor, Kagoshima University Research Center for the South Pacific)

Cultivation of the Marine Lettuce *Ulva pertusa* in a Fish Farm

March 14, 1994

Marine lettuce is a common name for the sterile Chlorophyta, *Ulva pertusa*. The species had long been regarded as "trash seaweed of the sea" because of its high growth rate. In 1987, we started cultivating *U. pertusa* for the purpose of maintaining the "homeostasis of ecosystem" in mariculture farms. Our initial attempts to cultivate it in the sea were met with various difficulties, the major one being typhoon problems. However, when the floating culture system by net cage was designed for *U. pertusa*, that problem was solved. Since then, the culture system for marine lettuce has been established, and a wide variety of ways to utilize it have been developed. The impression of marine lettuce has changed from a "bad" seaweed to a beneficial one.

Major characteristics of *U. pertusa* are as follows: 1) It has high growth rate; its growth rates were 20 to 25 times per tide (about 2 weeks) in summer, and 4 to 5 times per tide in winter; 2) *U. pertusa* contains

higher amounts of vitamin C (165 mg/100 g) and magnesium (4.84 g/100 g) than *Chlorella* or *Spirulina*; and, 3) *U. pertusa* is regarded as vitally functional in diets. In our experiments, the fish fed on dry pellets with *U. pertusa* (2%) as supplemental feed showed an increase in the amount of positive cholesterol and decrease in the amount of negative cholesterol.

We examined the polyculture of red sea bream *Pagrus major* and sterile *U. pertusa* in a mariculture farm on a scale similar to commercial farming. The results obtained are as follows: 1) The O₂ in experimental cage increased by 9%, while CO₂ decreased by 4%; 2) The growth rate of the fish in the experimental cage was higher than that of the control group by 1.5%; and, 3) The fish in the experimental cage fetched a price 15% higher than that of the fish in control cage, as the former has added value of being associated with "ecosystem culture". From the results mentioned above, it is highly recommended that

the mass culture system of *U. pertusa* in fish farms will be widely adopted in the near future.

Hachiro HIRATA
(Faculty of Agriculture, Kinki University)

Study on Fermented Food and Drinks in Kagoshima Prefectural Institute of Industrial Technology

April 18, 1994

Kagoshima Prefectural Institute of Industrial Technology is a core facility designed to support technological development and technical improvement. The Institute promotes advancement in many technological fields, especially in high technologies such as biotechnology, electronics and development of new materials for industrial products.

Our research and development is for utilization of local resources, of new production and processing systems, of new materials, in the fields of biotechnology and food, environmental preservation and amenity. The fermented food and drinks produced in Kagoshima have unique characteristics due to a mild and humid natural environment where fermented materials are enriched by microorganisms. Shochu from sweet potato, rice vinegar of Fukuyama, citric acid fermentation, Miso, soy sauce and Yamagawa-zuke pickles are some examples. Collection, improvement and breeding of microorganisms, and new technology such as cell fusion and

bioreactor technique have been introduced to develop new products from these fermented foods and drinks.

Studies for the biotechnology and food fields are as follows:

- (1) Improvement of food product process for controlling microorganisms so as to prevent pollution of food,
- (2) Study with regard to new-type alcoholic drinks using a new kind of purple sweet potato,
- (3) Improvement of shochu flavor using batch rectification,
- (4) Research on solid-liquid separation of stillate from sweet potato shochu distillery using unique yeast and
- (5) Effect of sweet potato cut 10 mm cubic size on shochu flavor and research on cooking the cut sweet potato.

Akira HASEBA
(Kagoshima Prefectural Institute
of Industrial Technology)

The Effective Use of "Shirasu"

May 23, 1994

The shirasu of the southern part of Kyushu was brought about by the pyroplastic

flow at quaternary age both by Aira volcano, situated at the innermost part of Kagoshima Bay, and by Ata volcano, at the entrance of the bay.

The chemical components of shirasu are rather homogeneous containing 68~78% of SiO_2 and 12~15% of Al_2O_3 . Its main constituent is volcanic glass which also includes such crystalline substances as feldspar, quartz, magnetite and pyroxenes.

A variety of possible uses of shirasu has been searched for by many investigators until now, and some products are developed such as light-weight aggregate, microballoon, zeolite, silicon carbide, silicon nitride, porous glass, alkali-proof glass fiber, tile, sound-absorbing materials and abrasive.

The author is now engaging in researches pursuing further utilization of shirasu using its minutely fractured materials as mentioned below.

1) The development of weather-proof paints and air bubbler in the waste-water treatment process by mixing with paints and plastics.

2) The development of microballoon (mean diameter: 7~17 μm). The microballoon has far smaller granule size, 1/5~1/10 of those balloons produced in the past, and its bulk density is less than 0.5 which suggests the possibility of wider uses for light-weight building materials or adiabatic light-weight polymers.

3) The development of adiabatic materials by thermal spray of microballoon to the surface of metals and concretes.

4) The development of high density concrete resistant to acid rain or saline water by mixing minutely fractured shirasu with concrete.

Accumulated amount of shirasu is estimated to be more than 9×10^{10} tons. Shirasu has often been accused of being the culprit for natural disasters. However, we, who live on the surface of shirasu, should think over how to use shirasu effectively for our happier and more comfortable lives.

Akira NAKASHIGE

(Kagoshima Prefectural
Institute of Technology)

Presumed Center of Origin of Garlic

June 13, 1994

The center of origin of garlic was unidentified and only cultivated clones were known. These clones were sterile, and the cause of sterility was unknown. To clarify its center of origin, the author collected and examined 180 garlic clones from all over the world. The clones showed a wide variation in bolting habit and meiosis, from non-bolting without flower-buds to complete-bolting with sterile

flowers and irregular meiosis. Only one was discovered to be fertile and showed regular meiosis, suggesting an evolution from sexual propagation to vegetative propagation. Therefore, it was expected that there still remain more fertile garlics in its center of origin. Vavilov (1951) thought Central Asia was the primary center, and besides Kazakova (1971) thought Caucasia and the

Mediterranean areas were the secondary centers. The author collected 161 garlic clones from those areas and examined them at Kagoshima.

In conclusion, all of the 16 garlic clones collected from the northern side of the Tien Shan Mountains in Central Asia showed pollen fertile or female fertile, suggesting this area as the primary center of origin. Caucasia, where 17 collected clones showed a

great variation in bolting habit and two of them were found to be pollen fertile, was identified as the secondary center. On the other hand, the Mediterranean area, where most of the collected clones were sterile and characterized by non- or incomplete-bolting was not identified as the secondary center.

Takeomi ETOH

(Faculty of Agriculture,

Kagoshima University)

Micronesia: Issues and Concerns for Research

July 18, 1994

Much of research is concerned with the ways peoples have modified or adapted to their island environments. In particular, I focus mainly on the traditional agricultural system to see whether or not it is an adaptive and sustainable component of a people's culture and environment. As a result of some recent studies in the atoll islands of Micronesia, I feel that our understanding of atoll ecology and subsistence systems is far from complete. Let me present two examples from Puluwat Atoll to prove my point. On Puluwat Atoll, which is located in Chuuk State of the Federated States of Micronesia, *Colocasia esculenta* and other food crops are cultivated on the *maa* (taro islet). The *maa* seems to be a very labor intensive system of food production, but until 1989, we knew little of this form of agriculture, let alone its existence. Secondly, the atoll was said to have a flora containing between 42 to 46 vascular plant species. Based on very recent research, however, the atoll has 182 species of vascular plants of which 50% are indigenous to the atoll.

I present these two examples to underscore the point that basic, as well as applied research, in both the natural and social sciences, is very much needed in Micronesia, and that what may be true of Puluwat Atoll, may be true for all of the atolls in Micronesia, the Pacific, and elsewhere. If such is the case, one needs to ask why this has happened. I would suggest that because of their apparently simple habitats, relatively small human populations, perceived low potential for agricultural development, distance and isolation from the more populated islands and urban centers, the atoll islands have been largely ignored by researchers. However, because of these "constraints" the atolls may be more suitable for research and model building than the larger, more socially and environmentally complex islands of the Pacific. Research in the atolls is all the more important given their very rapid rate of social, environmental, and economic change.

There is a context into which research must be placed. As researchers often working in foreign countries, we are all too often

guilty of what may be described as scientific imperialism, the belief that whatever we study is paramount to other peoples' interests and concerns, that as researchers we have a right to share other peoples' knowledge with the world. However, Micronesians and other Pacific Islanders believe that "knowledge is power"; the difficulty of obtaining research permits; and locally raised questions concerning the proprietary rights to traditional knowledge and resources, all suggest that we need to reconfigure, rethink our approaches to research in foreign countries.

At a 1989 Women of the Pacific Conference workshop on research, 50 indigenous women, mainly from Micronesia, developed a set of concerns and guidelines for "outsider research" in Micronesia. They recognized that "the fulfillment of their own research agendas would benefit in some instances from collaboration, of possibly, reciprocal mentor relationships with outside researchers", and articulated a set of guidelines as "a means of improving both the quality of research ... and

the ways their respective communities experience the research enterprise" (Participants, 1992: 432). While the guidelines are concerned mainly with research projects about local women's issues, I believe that there are implied messages applicable to the conduct of all outsider research on Micronesia that we should incorporate into our research perspectives. If followed, the result may be even better research products, the development of local capacity, and long lasting relationships between researchers here and our hosts in other parts of the world.

From: Participants. 1992. Concerns and guidelines for outsider research in Micronesia. (1989 Women-Centered Research Methodology Workshop, University of Guam).
Isla: A Journal of Micronesian Studies, 1 (2): 432-434.

Harley I. MANNER
(University of Guam, Visiting Foreign
Professor, Kagoshima University
Research Center for the South Pacific)

A Record of Personal Experiences in Indonesia

—Mainly in Freshwater Fishery—

September 26, 1994

Three subjects were selected as the main purpose of visiting Indonesia: 1) to conduct ecological research in Segara Anakan Lagoon, Central Java; 2) to research the present situation of freshwater fishery, especially freshwater aquaculture; and, 3) to study the ecology and distribution of freshwater crustaceans in some islands.

1) The water surface area of the lagoon is becoming too narrow because of the

sedimentation of fine mud from rivers that flowed into the lagoon. The shallow fords are invaded by various species of mangrove plants which have grown thick and form small islands. Many fishermen catch fish, prawns, shrimp, and crabs in the lagoon. Thus, the sedimentation will become a question of vital importance for these fishermen in the near future.

2) The governmental institutes of fresh-

water aquaculture are establishing and propagating cultivation techniques for carp, tilapia, freshwater prawn, and other freshwater resources. The development of freshwater aquaculture will bring about a stable income to the fishermen, but may result in environmental pollution of inland waters.

3) I collected ca. 17 crustaceans in the inland waters of south Sulawesi. Most of

them, except potamoid crabs and *Macrobrachium weberi*, are thought to be amphidromous species whose larvae develop in coastal and sea waters. The amount of larval recruitment is thought to affect the population size of amphidromous freshwater resources.

Hiroshi SUZUKI

(Faculty of Fisheries, Kagoshima University)

Recent Progress in Myrmecological Studies in Southeast Asia

December 5, 1994

Ants are an extremely important insect group in the ecosystem of tropical rain forests. They may be predators, decomposers, or partners of many other insects and plants. An intensive ecological study in an Amazonian rain forest shows that in biomass ants occupy more than one-third of all the insects, and are more than four times heavier than all the vertebrates combined.

Many species, subspecies and varieties of ants were described from various parts of Southeast Asia mainly in the later half of the 19th century and at the beginning of the 20th century. Most of the descriptions during this period were quite incomplete, and no one has made a synthetic treatment of ants of this region. Reliable taxonomic revisions are available for only a few groups. Most species can be identified only at genus level even by taxonomic specialists, which creates serious difficulties for ecologists who plan to analyze data and write scientific reports.

It is, therefore, clear that what should be done first is taxonomic solution of problems surrounding common and ecologically important species. Despite this practical need

Southeast Asian countries have virtually no ant taxonomists. Main efforts by American and European myrmecologists are devoted to Neotropical and Afrotropical faunas. In this difficult situation, I have recently planned to develop a network connecting specialists of Japan, Indonesia, Malaysia and Singapore. The first step will be gathering materials from various localities in Greater Sunda Islands and sorting the specimens into supposed species in order to make it possible to compare them with the type specimens. Identified specimens will be distributed to several institutions in these countries to establish firm reference collections.

Ecological studies of ants, especially on the species composition in various forest types and ant-Homoptera-plant interactions, are now carried out in Malay Peninsula and Borneo in parallel with taxonomic studies. Cooperation between taxonomists and ecologists will become increasingly important in the future.

Seiki YAMANE

(Department of Biology, Faculty
of Science, Kagoshima University)

ABSTRACTS FROM SYMPOSIUM

Decompression Sickness in Divers

January 22, 1994

This compendium of papers presented at the symposium on "Decompression Sickness in Divers" held on January 22, 1994 at Kagoshima University Dental School comprises a broad spectrum of interest which parallels the natural evolution of cooperation between the diving and medical communities all over our country. The name of the Symposium was chosen to reflect the many facets of diving, from diving physiology and medicine, the history of diving and undersea science, actual and practical conditions and states of breath-hold divers (Ama), hygienic and pathological problems of air-divers, to hyperbaric chamber environments of high oxygen partial pressures involved in the therapy of diver's diseases. Clinical papers were encouraged in both diving medicine and hyperbaric oxygen therapy, and chronic bone and joint distress due to diving were also addressed. At the same time, the basic pathophysiology traditional to this kind of symposium was maintained in order to a basic forum for scientists throughout Japan to communicate their research results.

I deeply appreciate the collaborative attitude of Research Committee, Kagoshima University Research Center for the South Pacific towards the success of the symposium.

Motoo KITANO

(Department of Oral Pathology,
Kagoshima University Dental School)

1) Diving Medicine

Mankind has a long history of diving. It is said that Chinese divers had caught pearl oysters beneath the sea about 4,000 years ago. It is a rigorous matter for man who lives on land to go into water. An environment with which diver must encounter under the water has many severe conditions such as no air to breathe, high water pressure, low water temperature, difficulties in communications with others. They are hostile to man and threaten his life. Based on these background, diving medicine has developed to find the way to let him dive safely without ill-effects. As space medicine, diving medicine forms an important part of environmental medicine. The followings are the leading topics of diving medicine; 1) Respiratory problems of diving, 2) Comparative physiology of diving animals, 3) Effects of high pressure on man, 4) Thermal problems of diving, 5) Decompression sickness, and 6) Others.

Ichiro NASHIMOTO

(Department of Hygiene,
Saitama Medical School)

2) Recent Survey on Diving Fishers in Japan

A questionnaire survey was distributed to 2,135 Coastal Fisheries Cooperative Associations (CFCA) in 1986-87 to obtain updated information on diving fishers in Japan.

Out of 2,135 CFCA, 764 were conducting diving fishery. The number of male diving fishers was 12,264 and that of female was

3,037. The breath-hold divers made 63.6% of all diving-fishing divers. The fishers in their forties occupied 30.1%, indicating that the average age was getting higher and they were in want of successors.

The energetics of diving-fishers were measured using two types of diving data loggers, one developed by Henderson et al, and the other by Vine Bionic Systems. Both loggers have the same operational characteristics. The subjects were 4 unassisted divers (Cachido-Ama) who wore wet suits and swim fins, and 9 assisted divers (Funado-Ama). The depth and R-R intervals were recorded every second, and total time in water, total diving time, total surface time, total number of dives per day, average depth of single dive, average deepest dive, average single dive time, average longest dive, descent velocity, ascent velocity, descent time, ascent time and bottom time per dive were calculated.

The average diving duration time and depth in Cachido-Ama were 37.0 ± 0.4 sec and 6.9 ± 0.1 m and in Funado-Ama 68.5 ± 4.3 sec and 9.7 ± 0.5 m, respectively. Total diving time was 63 ± 12 min in Cachido-Ama and 26 ± 2 min in Funado-Ama. But total bottom time in Funado-Ama was 45.0 sec much longer than in Cachido-Ama. Funado-Ama was thought to be more profitable for underwater fishing.

Motohiko MOHRI

(Japan Marine Science and
Technology Center)

3a) Statistical Investigation of Working Pressure and Decompression Sickness at Compressed-air Works

Recently compressed-air engineering work mostly employs pneumatic caisson

method and tends to use higher working pressures in accordance with mechanization of shield works. Under the circumstances, the present author totaled results of five years' surveys on development of decompression sickness (DCS) and compared the results with former research findings. For this comparison, the control data was chosen among those which had been comprised by the same procedures as Mano & Shibayama (1987).

It is commonly said that DCS could not be developed under a condition of working pressures less than 1.0 kg/cm^2 . Although we experienced seven patients with DCS development under 1.0 kg/cm^2 of the pressure, no case was observed in the present survey conducted with a total of 12,503 exposures of compressed-air works. Total number of compressed-air works with over 1.0 kg/cm^2 pressures include: 3,822 more exposures found in 1986 or later than before 1986; 9,649 more exposures observed in 1985 or former with working pressures of $1.0\text{-}2.0 \text{ kg/cm}^2$; and, with higher pressures over 2.0 kg/cm^2 , the number of the works showed rapid increase in 1986 or later. This means that deep excavation works, which need higher working pressures than before, are becoming popular for today's compressed-air works. In other words, working circumstances became more strict in these years, therefore, more precise safety supervision should be required. When decompression control is carried out basing on the current decompression table, development rate of DCS increases in line with enlargement of working pressures. This was also observed in the present study.

Comparing onset rates of DCS during these five years with those observed before the years, the results of these five years show

lower rates, based on the working pressures divided by each 1.0 kg/cm² group, than those seen before the five years. This supposedly indicates that more strict decompression control is being carried out today than before.

Yoshihiro MANO

(School of Allied Health Sciences, Faculty of Medicine, Tokyo Medical and Dental University)

3b) Safety and Health at Nonsaturated Diving: The Actual Situation of Japanese Sport Divers

To draw a profile of Japanese sport divers, we have conducted personal interviews at 3 diving spots situated in the Izu Peninsula, during the summer vacation periods of 1991 and 1992. The results of 235 interviews are presented. The male v.s. female ratio was of 2.8 v.s. 1, the average of age being of 28.4 years. The average diving experience was of 230.1 tanks (27.3 tanks per year, 2 tanks per day). Recorded in 40 (17%) cases, nitrogen narcosis was the most frequent dysbaric disorder, followed by barotrauma at paranasal sinus and ear, dental barotrauma, and DCS. Nitrogen narcosis has manifested at the average depth of 35.0 meters, and almost half of the divers with more than 5 years of experience have already had experienced such kind of narcosis. Occurrence of barotrauma at ear (12%) was associated with non-traditional ear-clearing methods, as the so-called 'natural' (spontaneous) equalization. Positive answers to questions concerning paranasal barotrauma (12%) have pointed to some predisposing factors, such as cold, sleeplessness and hangover. DCS, reported by 3%, affected exclusively divers with 5 or more years of experience.

Yoshihiro MANO

4) Pathogenesis and Prevention of Dysbaric Osteonecrosis

Japanese diving fishermen are known to have a high prevalence of dysbaric osteonecrosis. Their typical dive practices are characterized by long exposure to high pressure and by repetitive diving.

The etiology of dysbaric osteonecrosis still remains controversial. Because the development of dysbaric osteonecrosis may occur silently, the diver may be unaware of the actual ischemic event. Moreover, key etiologic evidence is often lost before the diver is examined.

The early stage of dysbaric osteonecrosis was evaluated in four autopsy cases of divers who died of acute decompression sickness. Hypercoagulability of blood was present in these cases. Hypercoagulability of blood has also been observed in experimental rats after decompression.

Dysbaric osteonecrosis has been experimentally induced in six sheep at the University of Wisconsin-Madison. These findings are reviewed by comparing dysbaric osteonecrosis in both divers and experimental animals.

In conclusion, a bone compartment syndrome and hypercoagulability appear to be pathogenetic factors in dysbaric osteonecrosis.

Mahito KAWASHIMA

(Kawashima Orthopedic Hospital)

5) A Clinical Study of Twelve Cases of Decompression Illness in Kagoshima Prefecture during the Past Two Years, December 1991 - December 1993

Twelve cases of decompression illness during the past two years were studied.

Among these, one death was encountered. Half of the twelve cases were Type I (Bends), characterized by localized pain around the joints. The other half were the more severe Type II, which includes spinal cord injuries, pulmonary disturbances (Chokes), cerebral disturbances, arterial gas embolism, and vestibular staggerings. Two of the severest cases, one of which was fatal, were reported with the common risk factor of obesity. The fatal case, in which the patient died shortly after recompression therapy, was related to reperfusion injury. Diving after a long interval of diving inactivity was also found to be a probable risk factor of decompression illness.

Kazuhiro ARIKAWA

(Emergency Department,
Kagoshima University Hospital)

6) Pathological Aspects of Decompression Sickness

Recent studies concerning the pathogenesis of decompression sickness (DCS) were reviewed. Discussion of the related evidence linking the observations of pathological findings in human beings and experimental animals with acute DCS leads us to conclude that the acute elevation of tissue pressure inside a compartment such as a bone marrow cavity which is encased by rigid cortical bone, following acute decompression of atmospheric pressure is the most responsible for the deve-

lopment and progression of tissue damage in DCS. The brain and the spinal cord are also located within compartments which are encased by a rigid dual membrane with or without an overlying rigid bone. A high incidence of damage of all of these three organs is seen in patients with acute DCS. However, the severity of tissue damage is not equally distributed throughout a compartment, and cannot be understood only by this etiology. Instead, "watershed zones" may explain the site predisposition of tissue damage in each organ. "Watershed zones" are the most vulnerable areas where the arterioles and arteries may easily collapse due to the acute increase of the perivascular tissue pressure.

Abnormalities of the venous vessels are widely observed in these three organs in DCS, which are characterized by many nitrogen gas bubble emboli, fat emboli and thrombi in the venous system. These abnormalities in the venous system should cause disturbances in venous blood circulation. Disturbance in venous blood returning towards the heart from these organs should accentuate the elevation of the tissue pressure inside the compartments. The disturbance of the venous system may not be the last word when discussing the pathogenesis of tissue damage in DCS, but it should be considered in any further research on this subject.

Motoo KITANO

PUBLIC LECTURE SERIES

The South Pacific

— Countries and Peoples —

August 6 & 7, 1994

The public lecture series of the Kagoshima University Research Center for the South Pacific were held in the campus of Kagoshima University for two days, on August 6 and 7, 1994. The lectures were focused on introducing of the respective countries and peoples in the western South Pacific and around it, namely, the Philippines, Malaysia, Indonesia, the Federated States of Micronesia and the Mariana Islands, and Belau (the Palau Islands). The lectures were delivered by the full and part-time campus staff, including a Foreign Visiting Professor, of the Research Center, who had conducted fieldwork, and who were pursuing the studies of either scientific or cultural aspects of those countries.

The fields of the topics were appropriately mixed and varied greatly. As a consequence, the content of each introduction was quite unique and very different from stale presentations usually given to the tourists.

As well as the previous year, the number of participants were not very numerous. Many of them, however, participated in this series for the first time, and all of them listened assiduously. At this series, besides the direct questions to the lecturers at each lecture session, an hour was allotted for overall discussions between all of the lecturers and the participants. Such an attempt had not been made before. One of the purposes of this attempt was to direct the attention of

the participants to the comprehensiveness of the region concerned and interrelationship amongst the respective countries. Both the lecturers and the participants had such lively discussions that it was necessary to greatly extend the schedule despite the fact that the series occurred during the hottest season on record. Thus, the attempt for the overall discussions, in addition to the whole series, was a great success.

Subjects and abstracts of the lectures are as follows:

Kazutaka NAKANO
(Kagoshima University
Research Center for the South Pacific)

1) The Whole Region Concerned with the Following Lectures

As the common topic of these series of lectures is "countries and peoples", we should first consider what a country is. Although most Japanese seem to accept naturally the country of Japan and her territory without much consideration, a similar situation is not applicable to the countries which the following lectures will consider. Excluding Belau (Trust Territory of USA), the governing policies of the Philippines, Malaysia, Indonesia, and the Federated states of Micronesia were greatly influenced by the European countries and the United States of America at their respective times of establishment. A country is a political unit potentially based on the use

of authoritative force.

The economic positions of all the countries concerned in the following lectures may be summarized as the developing countries. Malaysia and Indonesia, however, have been noticeably developing in recent years. On the other hand, the Philippines appear to have a stagnant economy. These three countries have already achieved the change from an economy chiefly dependent on the agricultural sector to one dependent on manufacturing and processing.

In respect to the climate of the region concerned, the rainfall pattern is more important than temperature. Generally speaking, an area close to the Equator rarely has a dry season. As the distance from the Equator increases in the tropics, the occurrence of a dry season with very little rainfall increases. It should be noted, however, that the ocean area east of the Philippines and the Caroline Islands has a mean annual rainfall greater than 3,000mm even though it is not close to the Equator.

Note: The Republic of Belau became an independent country on October 1, 1994.

Kazutaka NAKANO

2a) The Philippines: *Nautilus* Research in the Philippines

The distribution of six species of *Nautilus*, a famous living fossil of the cephalopods, is restricted to the archipelago in the southwestern Pacific. Among them, *Nautilus pompilius* has the greatest distribution area, and the northern limit of it is the Philippines.

The *Nautilus* research group of Kagoshima University and University of Tokyo have carried out joint research with the University of San Carlos in the Philippines to study the

habitat of *Nautilus* around Sebu island and Bohol island in the middle part of the Philippines islands in 1992 and 1993 for about one month each. We prepared in advance two types of *Nautilus* trap in Japan. We expected to capture considerable numbers of *Nautilus* with these traps because we had excellent results earlier with the same traps in Fiji, Palau and Papua New Guinea.

We took 19 individuals of living shells in 1992 and 45 in 1993; however, among them we captured only two in 1992 and four in 1993 with our own traps. Fifty eight other specimens were obtained with the assistance of the native fishermen and their special traps for *Nautilus*. In the Philippines there are a few professional fishermen catching only *Nautilus*, who have been making traps especially devised for capturing *Nautilus*. We learned much of the knack of making and using the "native" trap from them. At the end of our research we expressed our heartfelt "Daghang salamat" to them for their kindly help.

* "Daghang salamat" means thank you very much in Tagalog.

Junzo TSUKAHARA

(Faculty of Science, Kagoshima University)

2b) Filipino Fishermen Culture Japanese Seasonal Gifts "*Ocyugen*"

Japanese people have appreciated agar from the earliest times. For the extraction of agar, red algae, such as *Gracilaria* (*ogo-nori* in Japanese) and *Gerdium* (*ten-gusa*), were originally harvested in the Japanese coastal waters. However, increasing demand for agar from the food and medical industries have recently created a worldwide shortage of agar.

Thus in place of agar, another viscous

material extracted from tropical red algae, *Eucheuma*, has been utilized. This viscous material is known as carrageenan and is utilized as a gel additive in the production of such products as ham, beer, fruit juice, ice cream, pet food, cosmetics and medicines.

Gelatinized carrageenan solution is necessary in the summer in Japan. This is because a fruit jelly, sold in cake shops and distributed as a seasonal gift (*ocuyugen*) in Japan, requires carrageenan. Traditional Japanese jelly has been made from agar. However, this modern European-style fruit jelly is produced using carrageenan. The carrageenan used is extracted from red algae, *Eucheuma*, cultured in the Philippines.

The cultivation of *Eucheuma* was developed in the Philippines with the assistance of the University of Hawaii in the 1970s and 1980s. Fragments of *Eucheuma* easily grow in tropical shallow seas. Without equipment and funds, even small-scale fishermen can afford the cultivation of this red algae to contribute to their income.

The lecture introduced Filipino fishermen engaged in the aqua-culture of red algae and the relationship between the Japanese Food Industry and a Filipino fishing village.

Tadahiro NORO

(Faculty of Fisheries, Kagoshima University)

3) Malaysia

The beautiful island that became the main stage of the musical movie SOUTH PACIFIC was a small island called Pulau Tioman, located off the east coast of the Malay Peninsula. The South Pacific is historically and culturally related to the so-called Malay world, the center of which is the Malay peninsula. The Malay world covers a

wide area from Madagascar to the west, Taiwan and the Philippines to the north, and the islands of the South Seas to the east. There can be seen some common basic cultural traits in these areas.

The states of Kelantan and Trengganu on the east coast of the Malaysia are the places where a strong Malay traditional culture can be seen. Though Malaysia is well-known to be multi-ethnic as a nation, most of the ethnic groups in these two states are ethnic Malays. The Malay culture has been well preserved in the two states, where are places often dear to the hearts of Malays.

Most Malays who live in town areas have original villages called kampung and they are deeply attached to their kampung. Those who are in towns often talk about their home villages or kampung with nostalgia. Even in the cities, there are some residential areas called kampung.

Sueo KUWAHARA

(College of Liberal Arts, Kagoshima University)

4a) Indonesia

The territory of Indonesia stretches over a wide area. The distance between her eastern (the boundary with Papua New Guinea) and western (the northwestern tip of Sumatra Island) ends is approximately 5,000 km. This is equal to the distance between the Ural Mountains and the west coast of Ireland (along latitude 54° N). The establishment of such an insular country with some very large islands in a vast ocean area was partly based on the fact that the Netherlands had once governed the whole territory, although the Indonesian intention of establishing such a large country despite the possibility of choosing another way should be taken into account.

Population maps of Indonesia indicate that the Island of Java has a distinctively high population density. This population density is more than twice of that of Japan, which is also famous amongst population geographers for her very high population density. Java has many volcanos, and its soils which originated from volcanic eruptions are recognized as being very fertile. It is often said that the high population density there is based, to some degree, on Java's highly fertile soils, which indirectly affect culture. The cultures of the Javanese and the Sundanese appear to be adaptations to the conditions of high population densities.

Kazutaka NAKANO

4b) On Indonesian Passer (Local Market)

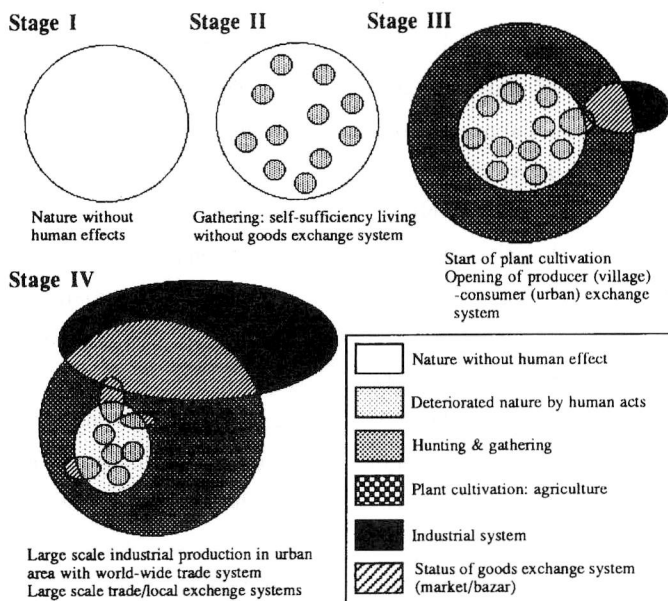
Morning market (Asaichi) near Nishi Kagoshima Station carried many farm prod-

ucts by villagers. It is a good circulation system for consumers. Many farm products are directly on sale to the city residents by village women. I treated such product circulation systems (passer) in Africa, South Pacific Islands and Indonesia. Discussion of origin, development and decline of the passer is in relation to figure 1.

Goods supply systems for human living based on exchange existed on a limited scale in hunting and gathering societies. The passer did not exist before beginning of agriculture. In Africa, the South Pacific, and Indonesia, the existence of extensive passers is guaranteed by rich products from villages around the city. A record of video documentation on a big passer of Padang, West Sumatra is presented by the author for consideration. It is a good example of supply system of village products for the city consumer.

Fig. 1. Global ecosystem and human living.

GLOBAL ECOSYSTEM AND HUMAN LIVINGS



Mitsuru HOTTA

(Department of Biology, Faculty of Science, Kagoshima University)

5) Micronesia: Yesterday and today

As a geographic region Micronesia encompasses an oceanic area of 11,658,000 km², and consists of the following political entities: the Commonwealth of the Northern Mariana Islands, Territory of Guam, Federated States of Micronesia, Republic of Nauru, Republic of Kiribati, Republic of Palau (Belau), and the Republic of the Marshall Islands. The land area by contrast amounts to only 377,815 km². Micronesia is Greek for small islands of which there are more than 1000. Most of these islands are uninhabited, atoll islands, which because of their small size and geological origins, have very limited terrestrial resources and little opportunities for economic development.

The political-economic-social infrastructures of the Micronesian states are still largely undeveloped. Except for Nauru, all countries in Micronesia have an unfavorable trade balance as imports of manufactured goods greatly exceed exports of mainly agricultural products. The tuna industry, which is still undeveloped, may be the exception and an important future source of income, given the large Exclusive Economic Zones surrounding each of the Micronesian states. Guam and the Commonwealth of the Northern Mariana Islands have developed a tourism industry based primarily on Asian, particularly Japanese, visitors. By contrast, the Federated States of Micronesia has limited opportunities for development; its GDP was \$ US 1,052 per capita in 1988, and subsistence production is still very important, particularly in the outer atoll islands. The FSM is also characterized by a high rate of population growth (4% per annum) and high emigration to the US and its territories. Ironi-

cally, during the 1920s and 1930s, these islands and the Northern Marianas were centers of Japanese trade and industry. For the Northern Mariana islands, sugar accounted for almost 1/2 of all exports from Micronesia to Japan in 1938, amounting close to 20 million yen in 1937. Places like Kolonia, Pohnpei, were structurally and functionally, Japanese towns in Micronesia, and production centers of katsuobushi, copra, and other agricultural products.

Note: At the end of the lecture, comparative data on the political and economic status of the Micronesian states, and slides of the Federated States of Micronesia and a video on various areas of Micronesia were shown to the audience to give them an idea of the multicultural nature of Micronesia.

Harley I. MANNER and
Yasuyuki KARAKITA

(Kagoshima University Research Center
for the South Pacific)

6) Nature and Peoples of Palau

In the course of my lecture, I introduced the topics of Palau's history and natural characteristics. The history of Palau occurs in relation to other countries, principally Spain, Germany, Japan and the U.S.A. Spain ruled Palau from 1885 to 1899, Germany, from 1889 to 1914, Japan, from 1914 to 1945. A pamphlet about Palau expained seriously in the succeeding sentence about the rule of Japan.

"1914 marked the beginning of a 30-year rule by Japan. Agriculture, trade and fisheries were developed to an extent never before or since seen in Micronesia. During Japanese rule, Palau was fortified for a war that left

many barren coral islands and displaced people in its wake.”

After that, Palau was a trust territory of the U.S.A. In 1980 the Republic of Palau was established, but the relationship between Palau and the U.S.A. was continued. (This year, subsequent to my lecture, Palau became independent.)

In the course, I recalled Palau’s legend about Uab. “He was so big and always hungry. Uab’s father and mother couldn’t gather enough food. The giant Uab roared his disapproval when he felt hunger. The people of the island were bringing taro, yams, fish and crabs to him. They shrank back in fear and wondered how long they would be able to provide enough food to keep him satisfied. In a short time, they believed that Uab would destroy their villages. One night, the people crept up and tied him up. Uab struggled and kicked so strongly that his body split apart and pieces flew out to sea. Uab’s body turned into islands and Palau’s people believe Babeldaob island is Uab’s torso. Rocky Peleliu is one of his legs and the high island at Aimeliik is his other leg, as if still kicking.”

The existence of Palau and the number of islands was something I referred to. The Islands of Palau were made up of fringing reef, barrier reef and atoll. I also referred to the variety and beauty of nature at Palau, espe-

cially Foraminifera which is a group of protozoa including amoeba. I explained grouping, life cycle, internal structure, collecting methods and how to research Foraminifera. I illustrated a lecture with slides of *Baculogypsina sphaerulata*, *Baculogypsinoidea spinosus*, *Calcarina calcar*, *C. defrancii*, *C. gaudichaudii* and *C. hispida*.

The art and culture of Palau were also introduced through a guide book. Palau’s guide book give an account that “Palauan craftsmen transform the tools and utensils that have been used in their islands for centuries into some of the most exquisite handicrafts in Micronesia.” Story boards are given special mention among the arts of Palau. These were carved on wooden beams of the building, “men’s Abai”, used as a meeting house. Hats, purses and baskets made from pandanas are still used by the people today. Also, diving is a wonderful way to see the sights of Palau. For humans, to see fish at the bottom of the sea, is to feel a sense of continuity with other forms of life.

Elsewhere, I introduced discussions about the transition of population, a “laboratory of tropical industry” during the Japanese ruled period, the deposits of bauxite ore, and the summary of geology of Palau.

AKIO HATTA
(Faculty of Education, Kagoshima University)

Recent Publications of Kagoshima University
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SOUTH PACIFIC STUDY

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- Ding YANG and Akira NAGATOMI. The Chinese *Clitellaria* (Diptera: Stratiomyidae).
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- Jun TAKEDA. Seasonality and Change in Traditional Fishing Patterns in Minatogawa, Okinawa.

Vol. 13, No. 2 (1993)

- Ding YANG and Akira NAGATOMI. The Chinese *Oxycera* (Diptera: Stratiomyidae).
- Md. Lutfe ALAM, Teruzane KAKOI, Nobufumi MIYAUCHI and Akio SHINAGAWA. Electron Microscopic Observation of Clays of Calcareous and Noncalcareous Soils in Bangladesh.
- Motoo KITANO, Charles E. LEHNER, Mahito KAWASHIMA, Yasushi TAYA and Edward H. LANPHIER. Experimentally Induced Dysbaric Osteonecrosis in Sheep: A Histopathological Analysis.
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- Akira NAGATOMI. Taxonomi Notes on Xylomyidae (Diptera).
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Hiromitsu IWAMOTO. *Nanshin* and Japanese Migrants in Papua New Guinea: Myth and Reality of Japanese Expansion in the South Seas.

OCCASIONAL PAPERS

No. 24 (1994)

People's Lives and History in the South Pacific Region. (in Japanese) (Reprinted with permission from *TROPICS* Vol. 3, 1994)

EDITOR'S NOTE

South Pacific Newsletter is published annually by the Kagoshima University Research Center for the South Pacific with the aim of introducing the activities of the Center to overseas researchers. It was first published in 1990. Its original title *Newsletter* was subsequently changed to the current one in 1993.

The editors hope that our *South Pacific Newsletter* will link Japan into the flow of information available in the South Pacific. Letters to the editors are invited. We hope to publish some of them in a future issue of the Newsletter. The address is shown on the back cover of this Newsletter. All contributions are welcome.

**KAGOSHIMA UNIVERSITY RESEARCH CENTER
FOR THE SOUTH PACIFIC**

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VISITING RESEARCHER

The Research Center is engaged in interdisciplinary research activities concerning tropical Oceania and surrounding regions, and the staff carries out comprehensive studies under the common research subject, "Man and the Environment". Every year until 1997, the Center will host one Visiting Researcher with a distinguished record of publications on some aspect of regional studies of the above-stated areas. Once selected, the candidate will be appointed as a Visiting Professor or Associate Professor and take office for 6 months to one year.

The candidate should undertake, during the term of their appointment, collaborative research with the staff concerning one of the following themes:

- 1) terrestrial environments,
- 2) organisms and resources in marine environments,
- 3) conditions of health, and
- 4) history and/or cultural studies.

As a rule, the applicant should hold a Ph.D. or M.D.

An appointee can be granted a salary and research expenses equivalent to a corresponding staff member of Kagoshima University and round-trip travelling expenses as well as the right to use an office, equipment, library, and other facilities and services.

Detailed inquiries are always welcome and should be addressed to the following:

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