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Cover photo: So-called the “Napoleon” Rock, Koshiki Islands, Kagoshima, Japan, September 2017
(by Hiroto TAKAMIYA)

Prevention of dengue fever in small islands of Micronesia

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Medical care is a serious problem for islands. Medical facilities are never enough on remote and small islands even in Japan. The same is true on Piis-Paneu and Pingelap Islands of the Federated States of Micronesia, where our center has conducted interdisciplinary researches (Fig. 1). These islands can be walked around in about an hour and have a population of about 200 people, and have no doctors and no nurses. I thought about what would happen if infectious diseases were prevented, especially mosquito-borne infectious diseases, on such small islands.

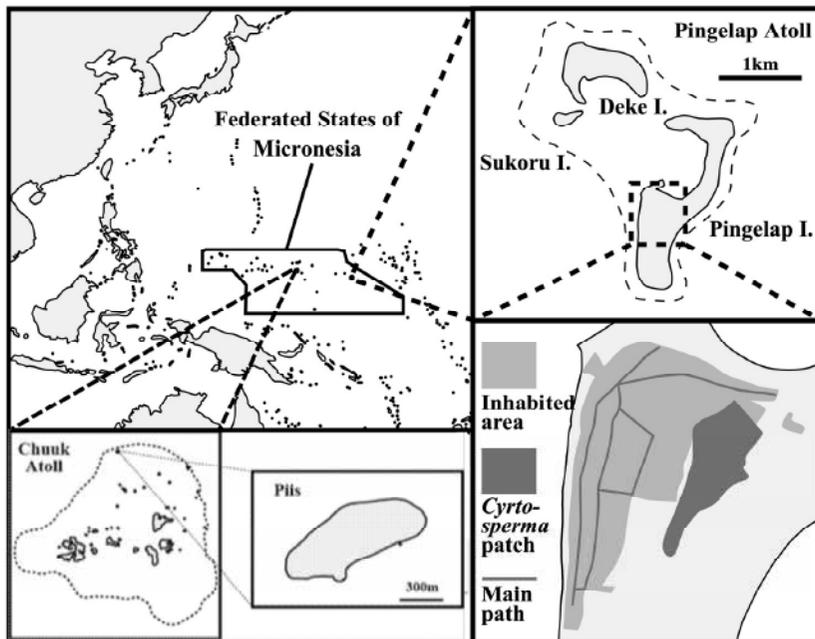


Fig. 1. Maps of Piis-Paneu and Pingelap Islands of the Federated States of Micronesia.

Malaria is one of the most important mosquito-borne infectious diseases in the world. In 2000, 300 million people worldwide were infected with malaria and 1.2 million died. In recent years, various control programs have been taken and the number of deaths is about 400,000 per

year. The protozoa, the pathogens of malaria, is transmitted by mosquitoes. However, not all mosquito species transmit malaria protozoa. The malaria protozoa are transmitted by *Anopheles* mosquito. Fortunately, there is no *Anopheles* mosquito in Micronesia, so there is no malaria epidemic.

Lymphatic filariasis, which causes elephantiasis, is also a mosquito-borne infectious disease. This lymphatic filariasis was once widespread in the tropics of the world, including Micronesia, but is almost disappearing in the Federated States of Micronesia with ongoing global eradication programs. The Republic of the Marshall Islands was declared in 2017 to be completely depleted of lymphatic filariasis. In Micronesia, *Culex quinquefasciatus* transmits lymphatic filariasis. *Culex quinquefasciatus* has been also found on Piis-Paneu and Pingelap Islands, but people on these islands are no longer infected with Lymphatic filariasis.

Dengue fever is also mosquito-borne infectious disease that is currently of concern in Micronesia. The first dengue outbreak to be found in the Federated States of Micronesia occurred in Yap in 1995. After that, a larger epidemic occurred in Yap in 2004, and an epidemic occurred in Kosrae in 2012. Dengue fever is an acute febrile illness that develops when infected with dengue virus belonging to the Flaviviridae family. After an incubation period of 2 to 7 days after infection, symptoms such as fever, headache, and arthralgia appear, after which a rash appears from the chest and trunk and spreads to the limbs and face. In addition, when dengue hemorrhagic fever occurs, the circulating blood volume decreases due to plasma exposure from blood vessels, which progresses to shock symptoms and blood coagulation in peripheral blood vessels, resulting in massive bleeding from the digestive tract and death. Dengue fever has spread in recent years, there have been 3.5 million infected people, 200,000 dengue hemorrhagic fever, and 20,000 deaths every year in the world.

There is no treatment specific for dengue fever. In addition, no vaccine has been commercialized. In other words, the best way to control dengue fever is to prevent the spread of mosquitoes that transmit the virus. Especially in remote islands with inadequate medical resources, it is very important to prevent the spread of vector mosquitoes. Not all mosquito species transmit dengue virus, only specific *Aedes* species do. The vector species of dengue virus are *Aedes hensilli* and *Ae. aegypti* in Piis-Paneu and Pingelap islands, respectively. We need to find out where these mosquitoes live and then come up with ways to control the outbreaks of dengue fever. As result of our survey conducted on the two islands, we found that the most common source of habitats of the mosquito larvae was plastic containers. This was followed by coconut shells, concrete water tanks, drums and metal containers (Fig. 2). Most of them are garbage in daily life. So, to reduce the mosquitoes that transmit dengue virus, people of the islands need to reduce garbage in daily life. The best way would be to collect the garbage and dispose of the garbage, but the small islands do not have the budget for that, nor is it likely to be able to build a garbage disposal facility on the island. Because that the distance of the dengue vectors is only about 100 meters, even without incineration or landfill, it would be possible to

prevent bloodsucking by building a garbage dumping site some distance away from where people live.

Therefore, we made pamphlets explaining the importance of dengue virus control and that garbage from daily life is a source of mosquitoes that transmit dengue virus, and



Fig. 2. Various containers for mosquito larvae, A, B: Plastic container, C: Tin, D: Glass bottle, E; Tire, F: Well, G: Coconut shell, H, Banana leaf, I: Tree hole.

distributed them to the islanders. I don't know if it is because of the pamphlet distribution and briefing sessions or because mosquitoes come up as a topic of conversation every year when we conduct our surveys, but the number of mosquitoes seems to be decreasing at some sites. However, it is difficult to get all people of the islands to understand the importance of dengue fever control, and since the situation has not changed dramatically, a long-term educational campaign will be necessary.

In 2014, an outbreak of dengue fever occurred mainly in Yoyogi Park in Tokyo, and about 260 cases of dengue fever infection occurred in Japan. Imported cases of infection overseas and diagnosed with dengue fever in Japan are reported every year, but the number of cases of dengue fever transmitted in Japan was the first in 70 years. In this case, it is not certain how the dengue virus invaded Japan, but the most probable route of invasion is for an affected person infected with dengue fever to enter Japan, be bitten by *Ae. Albopictus*, the vector mosquito species in Japan. The mosquito spread dengue virus by sucking blood from another person. In Japan, airport thermography is used to screen people who have a high fever when entering the country.

However, due to the incubation period of dengue fever, it may develop after entry. In addition, there are cases of subclinical infection, which is infected with dengue virus but shows few symptoms. When a person infected with such dengue fever enters Japan, that person may become the source of infection and an epidemic may occur. Up to now, about 200 cases of imported dengue fever have been reported every year in Japan. In other words, the dengue virus enters Japan every year. In Japan, where *Ae. albopictus* is widely distributed, there is always the possibility of an epidemic of dengue fever.

Research Seminars

No.209, 19 April 2021

“Changes in Amami People’s View of Nature: Through Conversations with Residents of Sumiyo Town”

Dajeong SONG (International Center for Island Studies, Kagoshima University)

[ABSTRACT]

The Amami Islands are aiming to be registered as a World Natural Heritage Site in the summer of 2021. The nature of the islands, which is evaluated as a World Natural Heritage Site, is an ordinary landscape for residents. It was also a resource used in daily life. Since the end of the 1980s, nature observation groups have been established by residents in Amami-Oshima Island and a nature conservation movement has occurred out of concerns for environmental degradation caused by development. Meanwhile, tours to experience the forest, which had never existed before, began at the same time. For example, hiking in the Kinsakubaru national forest, mangrove kayaking, and a night tour to observe the endangered Amami rabbit. These tours have been considered as ecotourism in the promotion of World Natural Heritage. In this presentation, I will examine how nature has been viewed by residents in Sumiyo town where there is the Amami rabbit’s habitat. Then, I will discuss how the Amami people should be involved in their nature.

No.210, 17 May 2021

“Basic Studies about Sea Pens Living from Kyushu to the Ryukyu Islands”

Yuka KUSHIDA (International Center for Island Studies, Kagoshima University)

[ABSTRACT]

Sea pens are marine colonial benthic animals belonging to subclass Octocorallia (Cnidaria: Anthozoa). They are specialized to live in sandy or muddy bottoms from shallow to deep water, and have roles as ecosystem engineers by providing habitat and shelter to associated marine organisms such as small crustaceans, mollusks and fish. Recently, due to their ecological

importance, sea pens have been treated as one of target taxa for protection and conservation in Europe and Canada. However, basic studies on sea pens such as their taxonomy, diversity, phylogeny, evolution and ecology are not very well studied as they are difficult to sample and analyze specimens, and also due to low human interest towards marine organisms in sandy or muddy environments. I have focused on basic research on sea pens in the northwestern Pacific during my Ph.D. studies. As an example of this research, molecular phylogenetic studies suggested that the species numbers of sea pens in the Ryukyu Islands are more than twice what is currently known in this region, and this result demonstrates the need to conduct further diversity studies in sandy and muddy bottom ecosystems. Here, I would like to introduce sea pens and their research, spanning from Kyushu to the Ryukyu Islands.

No.211, 28 June 2021

“Life of Polychaetes in the Ryukyu Islands”

Masanori SATO (Emeritus Professor of Kagoshima University)

[ABSTRACT]

Polychaetes (Annelida) are major components of benthic communities in marine and brackish waters, with about 1000 species known from Japan (about 200 species around the Amami Islands). Here are some interesting habits of the following species that live in the Ryukyu Islands.

1) Nereidids inhabiting estuaries. *Tylorrhynchus osawai* Izuka, 1903 is distributed throughout Japan to the south to the Ryukyu Islands (Amami-Oshima and Okinawajima islands), showing a unique reproductive swarming just after times of high tide during a few nights closely following the new and full moons mainly from October to December; epitokes derived from the anterior portions of the worms, which are filled with eggs or sperm, swim up into water column, with the posterior portions of the worms degenerated and usually detached; they are transported toward the sea on ebbing tides for spawning. On the other hand, the other several species including *Composeteia kumensis* Sato, 2020, which is endemic to the Ryukyu Islands, seem to spawn without swarming (details unknown).

2) *Spirobranchus corniculatus*-complex (Serpulidae) usually associated with living massive or plate-like poritid corals. The calcareous tubes of this species are buried in the skeleton of the coral, with the multicolored (red, yellow, blue and so on) branchial crown spread outward for feeding. Our fixed-point observation on Amami-Oshima Island indicates that the hermit crab *Paguritta vittata* Komai & Nishi, 1996, which usually inhabit the empty tube of *S. corniculatus*-complex, assists the successful settlement of the recruiting young of this species on the living coral surface (Kikuchi et al., unpublished data).

No.212, 12 July 2021

“History of the Amami and Okinawa Islands Youth Groups in Occupied Japan”

Itaru NOUNAKA (Faculty of Law, Economics and Humanities, Kagoshima University)

[ABSTRACT]

How did the young people of the Amami and Okinawa Islands live during the occupation period? This can be clarified by focusing on and investigating the *Seinendan* (Youth group) in Amami and Okinawa during that time. The *Seinendan* is an organization. Therefore, the *Seinendan* can solve community problems that cannot be settled by individuals. Examining the activities of the *Seinendan* is also the task of understanding the reality and wishes of young individuals and groups of young people under American occupation.

The purpose of this presentation is to examine the history of the Amami and Okinawa Islands *Seinendans* during the occupation period and to consider the actual situation of Amami and Okinawa under the occupation system. In this study, I will focus on the bulletins such as “*Okinawa Seinen*” (Okinawa) and “*Shinseinen*” (Amami) published by the *Seinendans*. Through a comparative study of these collections, I would like to show the unique steps of the Amami and Okinawa Islands *Seinendan* organizations during the occupation era.

It is well-known that the *Seinendans* of mainland Japan were rebuilt after the World War II, and although there are regional differences, they have dealt with community issues and been engaged in cultural movements. However, in the case of the Amami and Okinawa Islands, there are unique developments that are different from those of the mainland, and it is necessary to clarify their own history. The precondition for community issues in the Amami and Okinawa Islands was the fact that they were directly controlled by the United States and separated from the mainland. This was significantly different from the view of community issues for the youth groups in mainland Japan.

No.213, 4 October 2021

“Construction of Research and Education Platform through the Coral Reef in Uplifted Coral Reef Island Kikai-Jima Island, Japan”

Taro KOMAGOE (KIKAI Institute for Coral Reef Sciences)

[ABSTRACT]

The Kikai-Jima Island located in central Ryukyus, southwestern Japan has well-developed coral reef terraces since the past 100 thousand years ago, because of sea-level changes and the high uplift rate. Geologically, it is one of the areas where local life and coral reefs' benefits are closely related. Based in Kikai-Jima, KIKAI Institute for Coral Reef Sciences (KICRS) has started its activities in 2014. With the support of many researchers and local people, we aim to play a role as a platform that connects coral reefs and society.

The field of coral reefs attracts a diverse range of people, regardless of science or humanities, from many academic fields to the fields of art. Taking advantage of this coral reef field, KICRS conducts a research project “MIRAI Project” that integrates research in multiple fields centered on coral reef science and considers the past, present, and future of the region. Also, we are developing a research and education program “KIKAI College” for elementary school students to university students and adults.

The presenter has been researching to estimate the past marine environment using sclerochronology methods, which is the study of physical and chemical variations (oxygen and carbon stable isotope ratio, trace element concentration, and growth pattern) in the accretionary hard tissues of the bivalve shells and the coral skeleton.

Currently, as a field-stay researcher, in addition to the geochemical analysis so far, I have researching coral reefs and ocean observations in collaboration with areas that can only be done locally.

In this study group, I will introduce the research activities and the outreach activities on Kikai-Jima.

No.214, 8 November 2021

“Onshore and Offshore Seismic Observations in the Northern Part of the Nansei-Shoto Islands”

Yukihiro NAKATANI (Nansei-Toko Observatory for Earthquakes and Volcanoes, Research and Education Center for Natural Hazards, Kagoshima University)

[ABSTRACT]

The region from the southern part of Kyushu to the northern part of the Nansei-Shoto Islands is under complex tectonic conditions. The Philippine Sea plate has been subducting beneath the Eurasian plate at the Ryukyu Trench, while the Okinawa Trough has been forming by back-arc spreading. In order to elucidate seismic and/or volcanic phenomena caused by such tectonics, observational studies are indispensable.

Many onshore seismic stations have been deployed in Japan since the 1995 Great Hanshin-Awaji Earthquake, and a high-density observation network consisting of more than 2,000 stations is currently in operation. In the northern part of the Nansei-Shoto Islands, however, the accuracy of hypocenter determination is low because seismic stations are located only at the islands that are linearly arranged along the arc. Therefore, Nansei-Toko Observatory for Earthquakes and Volcanoes, Kagoshima University have been carrying out ocean bottom seismic observation east off the Tokara Islands since 2014, even as have been enhancing the observation on the inhabited and uninhabited islands in order to understand precise seismicity.

In this presentation, I will introduce the onshore and offshore seismic observations in the northern part of the Nansei-Shoto Islands and the results obtained from them. I will also show an

overview of the earthquake swarm activity that occurred near the Tokara Islands (between Akusekijima and Kodakarajima) in April 2021.

No.215, 13 December 2021

“Supporting Children’s Physical and Mental Health”

Marie AMITANI (Graduate School of Medical and Dental Sciences, Kagoshima University)

[ABSTRACT]

Even before the COVID-19 pandemic, the number of children with school refusal has been increasing every year. According to a survey conducted by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) in 2021, one out of every 49 children was not attending school. The reasons for this are not only relationships with friends and teachers, but also physical discomfort, disruption of the rhythm of life, and problems with the Internet and games. In addition, about 20% of the children feel a vague sense of anxiety without knowing the reason.

Against this backdrop, children’s behavior of school refusal is not only a matter of their environment, such as friendships and relationships with teachers, but also requires comprehensive support from physical, psychological, and social perspectives. Together with the children, parents, and school staff, it is necessary to assess the vicious circle that the children are in from a medical standpoint, and to intervene and support them appropriately with regard to their physical ailments such as abdominal pain and headache, as well as their psychosocial background, through psychotherapy, adjustment of the parent-child relationship, cooperation with schools, and understanding the problems in the local community. We are expected to intervene and support them appropriately. For children who cannot attend school for some reason, we have been working to promote their social adjustment and independence by providing lifestyle guidance, intervention using Kampo medicine and yoga, psychotherapy, and support for cooperation between parents and schools.

In this session, I will introduce the comprehensive support for children who cannot go to school in order to improve their physical and mental health.

No.216, 24 January 2022

“Shell Utilization and Larval Release by Land Hermit Crabs in Iriomotejima Island”

Wataru DOI (Faculty of Fisheries, Kagoshima University)

[ABSTRACT]

As with aquatic hermit crabs such as Paguroidea, *Coenobita* crabs (Family: Coenobitae) carry gastropod shells as a mobile home. The shells protect the spirally curved and less calcified abdomen of the crab from mechanical damage and desiccation. They are adversely affected by a shortage of shells. Therefore, the availability of the shell resources can determine the abundance

and size structure of *Coenobita* crabs in terrestrial environments. Because of their terrestrial life, availability of shell resources is strongly influenced by human activities. I review the relationship between the crabs and the humans by introducing the ecological studies of *C. brevinamus* in two abandoned villages on Iriomotejima Island. Similarly to most semi terrestrial crustaceans with pelagic larval stages, the land hermit crabs expand their geographical distributions through their initial stage of life history. Coenobitid crabs have been found to release their larvae on various types of substrates and with varying degrees of exposure to the open sea (e.g., sandy beaches, rocky shores, coastal cliffs in inlets, semi-closed bays, and areas exposed to the sea). *Coenobita violascens* in the Urauchi River showed discriminating reproductive behavior. Tree climbing took two consecutive days when larvae were released on tree roots and swept into the river water. Adaptive significance of tree-climbing behavior associated with reproduction will be discussed in the latter half.



A view from one of the research seminars

Recent Publications

+++ **Journal** +++

South Pacific Studies Vol.42, No1/2, 2021-2022

Research Papers

SONG, D. and SUZUKI M.: Current Status and Problems of Nighttime Traffic Control around the Santaro Road in Amami-Oshima

YAMAMOTO S., DJARWANINGSIH T. and WIRIADINATA H.: Use of *Capsicum* Peppers in the Karimunjawa Islands, Central Java, Indonesia

RIWASINO J., YARAPEA A. and HENSON M.: Communication Process for Partnership Tree Farming in Markham Valley of Papua New Guinea

TAKAMIYA, H.: Nissology, Island Archaeology, and the Archaeology of Ryukyus (1)

+++ **Kagoshima University Toughoken Booklet** +++

No. 14 KUWAHARA S.: Anthropology of the Amami Islands (March 2021)

No. 15 YAMAMOTO, S. and H. TAKAMIYA (eds.): The Amami Archipelago Rich in Nature and Culture Resources: History and Culture (March 2021)

No. 16 YAMAMOTO, S. and H. TAKAMIYA (eds.): The Amami Archipelago Rich in Nature and Culture Resources: Agriculture and Fishery (March 2021)



Kagoshima University Toughoken Booklets No. 14, No.15, and No.16

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