B-13.2 Study on the effects of global warming on Vector-born diseases

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Abstract Global warming will bring about the temperature elevation in Asian region, and the habitat of vectors which may carry infectious diseases, such as malaria and dengue fever, will spread in subtropical or temperate zone. The purpose of our study is to simulate the spreading through reexamination of existing data and collection of additional information by field survey.

(1) We started field survey in Yunnan Province, China. We selected three villages with different malaria endemicity (hyper-endemic, low-endemic and non-endemic areas) and with different temperature. We collected several data-set concerning the malaria endemicity, density of *anopheles minimus* and some meteorological condition (temperature and precipitation) in those villages.

We found the relationship between the meteorological condition, *Anopheline* density and malaria endemicity.

(2) We carried out mosquito survey in several islands in Ryukyu Archipelago, and we defined the geographical and seasonal distribution of *anopheles minimus* and *anopheles sinensis* in those islands.

Key Words Malaria, *Anopheles minimus*, Yunnan Province, China, Ryukyu Archipelago

1. Introduction

IPCC and WHO have warned that the greatest effect of global warming may cause the spread of vector-borne diseases, such as malaria and dengue fever. They recommended, consequently, to initiate studies primarily on the extent of spreading diseases.

2. Research Objective

Global warming will bring about the temperature elevation in Asian region, and the habitat of vectors which may carry infectious diseases will spread in subtropical or temperate zone. The purpose of our study is to simulate the spreading through reexamination of the existing data and collection of additional information by field survey.

3. Research Method

(1) Epidemiological study in Yunnan Province

We selected three villages in Yunnan Province according to the malaria endemicity, and carried out epidemiological study. This epidemiological study in Yunnan Province is carried out as a cooperative study with the two Chinese Governmental Institutions. In that study we made three research. First, we carried out medical examination on residents, and

checked they are infected by malaria or not. Second, we carried out mosquito survey(adult and larvae collection) through year. Last, we settled some meteorological measurement equipments in those villages and monitored the temperature and precipitation.

(2) Mosquito survey in Ryukyu Archipelago

We carried out field survey to define the geographical and seasonal distribution of *Anopheles minimus* in Miyako Island and Ishigaki Island.

4. Result and Discussion

The results, obtained in those field survey, are as follows.

(1) Yunnan Province is located at the northern boundary of malaria endemic area in Southeast Asia. Jinghong, southern district in Yunnan Province was selected for field survey in 1992 because of malaria prevalence (about 10%, hypo-endemic or meso-endemic). Figure 1 and 2 show the frequency distribution of titers of *Plasmodium falciparum* and *Plasmodium vivax*. Figure 3 shows the seasonal variation of malaria incidence and some meteorological condition. Those figure show the relationship between malaria incidence and meteorological condition. *Falciparum* malaria and *vivax* malaria appeared June and increased until August or September. And the they decreased and disappeared December. These seasonal variation are synchronized with meteorological condition. Figure 4 shows the seasonal variation of density of *Anopheles minimus*. The density of *Anopheles minimus* shows the same relationship between meteorological condition as in malaria incidence.

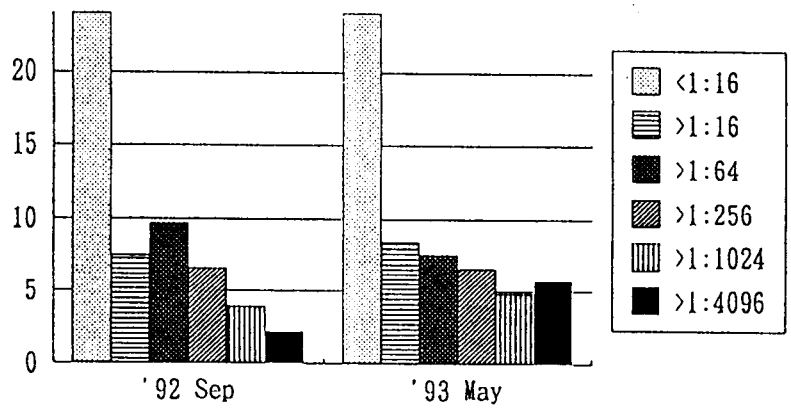

Figure 1. Frequency distribution of *Plasmodium falciparum* titers

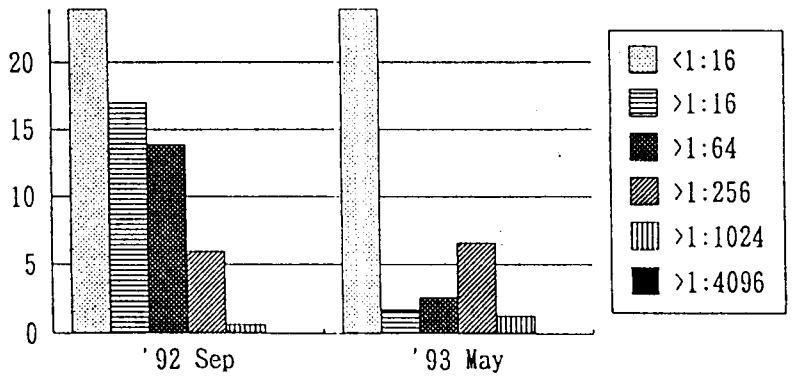

Figure 2. Frequency distribution of *Plasmodium vivax* titers

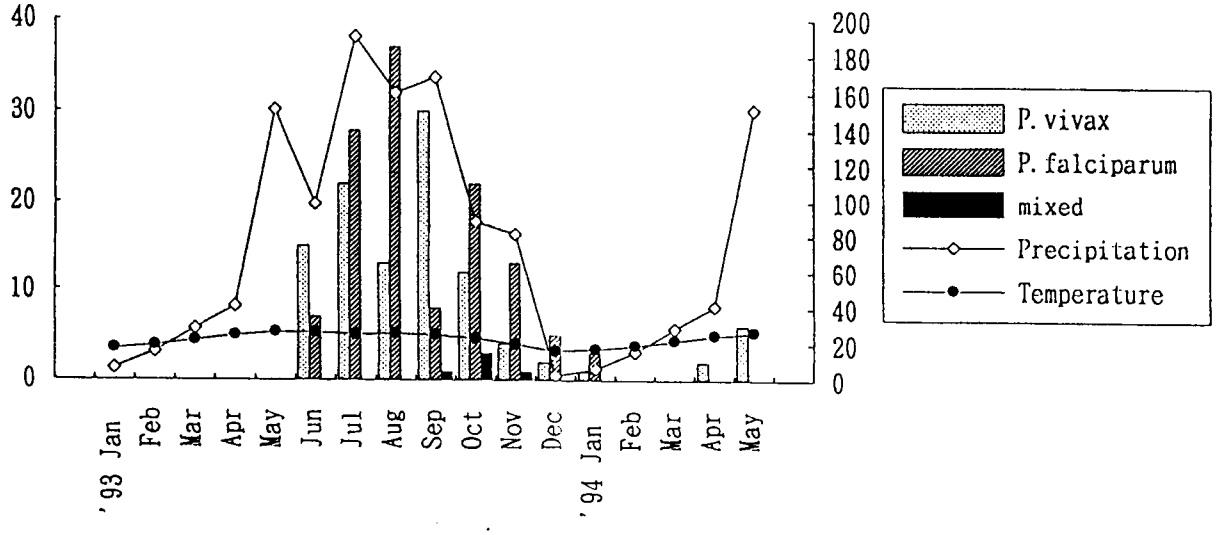

Figure 3. Seasonal variation of temprerature, precipitation and malaria incidence

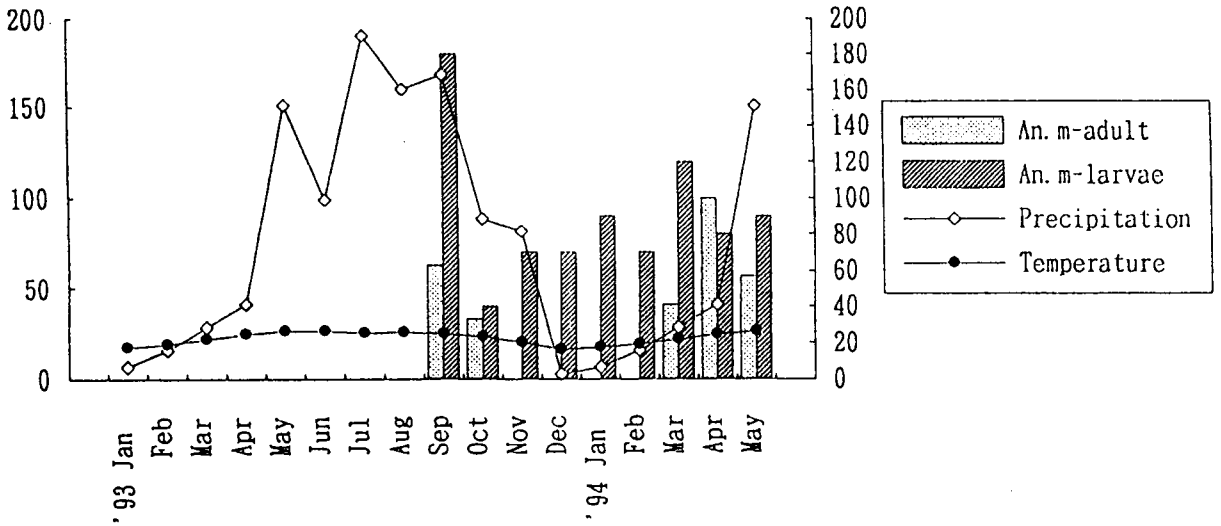

Figure 4. Seasonal variation of temperature, precipitation and density of *Anopheles minimus*

(2) In Okinawa, *Anopheles minimus* and *Anopheles sinensis* (vector of malaria) disappeared with extensive control measurement in 1960s. But now, both species are detected in Ishigaki Island and Miyako Island. *Anopheles minimus* and *Anopheles sinensis* inhibit in streams or rice fields. The meteorological condition in Okinawa are suitable enough for vectors to survive. Then temperature elevation may increase the risk of malaria epidemic in Okinawa.

(3) From these data, we will make clear the relationship between meteorological condition, vector density and malaria incidence. And then we will simulate and predict the malaria epidemic in the case of various degrees of temperature elevation in Southeast Asia and Japan.