

FOREWORD

The papers printed in this bulletin are the results of studies of insects collected on an entomological survey of Guam in 1936. This survey was conducted under the auspices of the Hawaiian Sugar Planters' Association, for the purpose of studying insects of economic importance associated with the various crops grown in Guam and insects affecting man and domestic animals. Guam is the most important station between the Philippines and Honolulu on the route of the Pan-American Airways across the Pacific, and as knowledge of the Guam insect fauna was meager, it was deemed important to acquire as complete a knowledge as possible of this fauna. Unknown insects were already being found in planes arriving at Pearl Harbor, Oahu, and, in spite of the system employed in the fumigation of the planes, an occasional insect was found which had not fully succumbed. There was some concern lest unknown pests might survive and succeed in becoming established, and, perhaps, destructive to sugar cane or other crops grown in Hawaii.

The plan for the survey was initiated late in 1935 by Dr. Harold L. Lyon, Director of the Experiment Station of the Hawaiian Sugar Planters' Association. Through the efforts of Captain B. V. McCandlish, then Governor of Guam, the survey party, consisting of Mr. and Mrs. O. H. Swezey, and Mr. R. L. Usinger of the Entomology department, Bernice P. Bishop Museum, left Honolulu, April 17, 1936, on the U. S. Army Transport Grant, arriving in Guam April 27. For a few weeks we had the assistance of Mr. E. H. Bryan, Jr., Curator of Collections at Bishop Museum, who spent two months in Guam assisting in the establishment of the Guam Museum. Mr. Usinger continued with the survey until July 6, whereas Mrs. Swezey and I carried on until November 30, a period of seven months.

Due to the interest taken by Governor McCandlish, every facility was rendered by his staff, particularly the department of agriculture. Most helpful was the cooperation of Mr. A. I. Cruz, in charge of the Root Agricultural School, through whom we contacted the Chamorro farmers whose fields and gardens in the various districts of the island were explored for prevailing insect pests.

Guam is quite a good-sized island, being nearly 30 miles long and 4 to 8 miles wide. It lies between $144^{\circ} 37'$ and $144^{\circ} 57'$ east longitude and $13^{\circ} 15'$ to $13^{\circ} 40'$ north latitude. It is 3,330 miles from Honolulu and 1,520 miles from Manila, being the southern-most of the Marianas group of islands. The northern half of the island is an elevated limestone plateau of coral reef origin, which is about 300 feet high, with a few regions as high as 600 feet. At the margin are precipitous jagged limestone cliffs 200 to 300 feet above sea level,

and there are no coastal villages. This plateau was originally covered with a tropical jungle containing several kinds of large trees such as banyan, breadfruit, *ifil* (*Intsia bijuga*) and *joga* (*Elaeocarpus joga*). *Pandanus* of several species and many kinds of ferns, vines, and smaller trees make up the lower jungle growth. Much of the forest still remains, even though there is little soil covering the porous limestone.

Areas with sufficient soil for agricultural purposes are occupied by gardens and small farms, and there are a few small settlements. An automobile road traverses the western half of this area and extends to the north point of the island. Many of the small farms are connected by bullock cart trails through the jungle, from a half mile to three or four miles from the main road. Similarly, a branch road penetrates the eastern portion of the forested plateau. Guam has about 100 miles of automobile road. These roads and trails gave ready access for our study of the forest insects as well as those of the farms in the midst of the jungle, many of which still had logs and stumps among the growing crops.

The southern half of Guam is of quite different structure and topography. There is a low mountain range of volcanic origin near the western shore, with a few peaks above 1,000 feet, the highest towards the southern end being 1,334 feet in altitude. Permanent streams are formed on both sides of this mountain range, those on the eastern slope being the larger, draining a considerable plateau area which is mainly grassland, forested along the stream valleys. At the mouths of the valleys are located the coastal villages, at least a half dozen of some importance with populations ranging from 100 to 1,000. Much of the farming is carried on in the valleys, especially rice culture. On the plateau region are some cattle ranches of considerable area.

Agana, the capital, near the middle of the western coast, has a population of about 12,000, which is about half the population of Guam. Here are situated the Governor's Palace, post office, bank, hospital and government offices. The docks are at Piti, four and one half miles to the southwest, and ships anchor in Apra Harbor which lies to the south of Piti. The southern enclosure of the harbor is a westerly projecting peninsula, on which are located the marine barracks, the cable station and the Pan-American Airways offices, all at Sumay. The various features of topography, etc., are shown on the map, which is reproduced from an outline map constructed by Mr. Bryan, and was previously used in the Hawaiian Planters' Record, 44 (3) : 152, 1940.

The rainfall is generally distributed on the island, and amounts to about 90 inches annually, mostly during the months of July to November. Rice is the only irrigated crop and is grown in stream valleys which have sufficient level areas, during the period when water is available from the streams. The one crop a year is planted in September. Not enough rice is grown to supply local needs, and in 1936 importations were being made from Japan. The other

important crops are corn, copra and many kinds of fruits and vegetables. The insect pests which were found on these various crops have been listed with respect to food plants in a paper entitled "A Survey of the Insect Pests of Cultivated Plants in Guam" [Hawaiian Planters' Record, 44(3): 151-182, 1940]. This list contains about 50 species which are not known in Hawaii. No doubt there are many among them which would become serious crop pests if they should reach Hawaii and become established.

Many entomologists—each a specialist in the respective families or groups studied—have assisted in the work of determining for publication the insect material obtained in this survey. Thanks are due to all of them for their painstaking efforts. There are more papers on other groups or families on which studies have not been fully completed. These are to be printed in a second volume. It is appropriate that the publication is being done by Bishop Museum, which cooperated in this survey. The Museum is keenly interested in all entomological research in Pacific islands, and has already published results of surveys in other islands in Polynesia.—O. H. SWEZEY.