

TRIP TO GUAM, ROTA AND SAIPAN

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A brief survey of 3 islands of the Marianas group was made for the purpose of determining if one of the islands would be suitable for use as a site for an oriental fruit fly eradication experiment utilizing methyl eugenol. This powerful male attractant would be dispersed in combination with a suitable poison (such as G-22008) by whatever method best suits local conditions so as to attract and kill all male flies before they reach sexual maturity.

Two large-scale tests in Hawaii, each extending over periods of 15 to 18 months, effected apparent reductions of 70 to 100 per cent in oriental fruit fly infestations near the center of the areas at operating costs of less than 25¢ per acre per year. However, small area applications have not been successful because of fly movement. Complete eradication of males before sexual maturity is attained cannot result in complete control as long as fertile females can move into the treated area, yet the overall effect is certain to be much greater in non-isolated areas than can be measured.

Eradication or severe suppression of the whole male population in an infested area could conceivably lead to complete prevention of reproduction in the absence of sources of reinfestation. This new method of controlling an insect deserves further study inasmuch as it could be a very useful supplement in any eradication attempt should the fly reach the mainland. Furthermore, a successful demonstration of this new method of control would provide ample justification for intensifying the search for and utilizing male attractants in other insect control problems, particularly where, as with D. dorsalis, a male lure is available that is 100 or more times as powerful in its attraction to males as is the best female lure to that sex.

Islands in the Hawaiian group are either too large or too close to sources of reinfestation for use. Rota was suggested by Mr. Christenson as a possibility. Saipan seemed a possibility when Nicolas Guerrero, a University of Hawaii student from there called attention to the heavy fruit fly infestation developed in Saipan and Tinian since 1949. Guam was considered after Mr. George D. Peterson, Jr., Guam Dept. of Agriculture Entomologist, reported having observed up to 20 D. dorsalis on single ripe papayas in November toward the end of the 1952 rainy season.

Through the excellent cooperation of the Civil Aeronautics Administration, Navy personnel here and on Guam (Commander Fink) and Saipan (Commander Law and Agriculturalist Frank J. Brown), Trust Territory officials here and on Guam, Messrs. Peterson and Director Joaquin Guerrero (Dept. of Agr. Gov. of Guam), and Dr. O. N. Liming of the Bureau, it was possible to fly to Guam and thoroughly cover the 3 islands at comparatively little cost and in a minimum of time.

My itinerary was as follows (times are local):

June 5/53

- Left Honolulu 10:00 A.M. via GAA, DC-4.
Arrived at Guam 2:00 P.M. June 7 after stops at Midway and Wake (overnight) with 1 day lost crossing International Dateline.

- June 8, 9 - Distributed 48 traps throughout Guam.
- June 10, 11 - To Rota and return. Special air transportation--Beechcraft and DC-3 provided by Navy.
- June 12-15 - To Saipan and return. Air transportation by Navy.
- June 16-18 - Visited and recorded catches in all Guam traps.
- June 19 - Left Guam 8:30 A.M. via Pan American Airways. Arrived Honolulu same day, 6:30 A.M.

Midway has 15 or 20 false kamani that are bearing a good crop but no other hosts were seen and because the stop was unanticipated I was unable to expose methyl eugenol. Wake was nearly stripped by the 1952 typhoon and no fly hosts were observed. No flies came to methyl eugenol left exposed 2 hours.

Guam, Rota, and Saipan are located some 3,500 miles WSW of Honolulu at latitude 13°-15° N. In June the dry season was approaching its end and fly populations were believed to be at their lowest ebb of the year. Temperatures were generally in the 80's or low 90's with a constant high relative humidity, mild ENE trades and extremely bright, clear skies. The rainy season was due to start and on Saipan and Rota farmers were getting land ready for planting after the extremely dry weather ends. On all three islands the principal *D. dorsalis* hosts appeared to be wild papaya (still breeding in the boondocks that have overgrown much of the abandoned farmland), breadfruit which is common everywhere, and mangos now beginning to ripen. The latter seems to be chiefly the common Hawaiian variety and has probably been cultivated to some extent though the trees are scattered and there are no commercial fruit plantings of any size other than banana. A few small papaya, citrus and avocado plantings were observed. A great variety of vegetables are produced, but corn, beans, cucurbits, tomatoes, and egg plants seemed to have more than their share of insect and disease problems.

Guam, the southernmost island, has a population of about 60,000, and is some 210 square miles in extent with a maximum elevation of 1334 feet. It is about 30 miles in length and 5 to 6 miles in width. Its south half is mountainous (there being 5 peaks ranging from 1020 to 1334 ft. in elevation), with several small rivers and with most agricultural areas in the valleys opening on the south-east and south coasts. The north half is an elevated limestone plateau of about 300 ft. elevation (with 4 hills ranging up to 870 ft.) with many abandoned farms overgrown with jungle. Much of the area is included in that controlled by the Navy.

Forty-eight traps were distributed as evenly as possible in the accessible portions of the island on June 8 and 9 with transportation and assistance provided by Mr. Peterson and staff and Dr. Liming. Since Mr. Peterson may wish to continue these traps to determine if the fly population will build up with the onset of the rainy season, they were left in position. Four disappeared but the other 44, located as indicated in fig. 1, captured 3,259 flies during the 8 or 9 days they were observed.

The heaviest catches were made in the north half of the island in jungle areas near Taguan (1120 flies) and Urumo Points (416 flies) whereas catches in the areas now being farmed in south Guam were very low. Only 8 traps failed to catch dorsalis males. Four of these were at the highest elevations trapped (above 1000'). It is of importance to note that the per-trap-day mean catch of 9 flies is far above the .07 index obtained in 1950 by Ross or the 1 fly caught by Maehler in 32 traps in December of 1947. Ross and Maehler used the less attractive citronella, but nevertheless it is certain that the current fly population is much greater than was that of 1950.

Rota, located some 45 miles north of Guam, and about the same distance south of Saipan and Tinian, covers an area of 36 square miles. It consists of a small 500' mountain separated by a narrow strip of land (on which the village is located) from the main island. The latter is made up of a 1600 ft. high plateau and the remainder by a plateau of 400 to 600 ft. elevation with a rugged coast line around much of the island. It lacks the deeply eroded gulches of the Hawaiian Islands but instead has very steep contours rising in several steps, or escarpments. The high mountain plateau was extensively farmed at one time when the island was controlled by the Japanese as was the lower east plateau, but jungle growth and sword grass have taken over much of the area. An abandoned railroad circles the island. It was originally used, primarily for hauling cane, but the roadbed is now lost in jungle. The population of 900, all living in the villages (one of the cleanest seen in the Pacific area), are almost all farmers and commute to their farms via water buffalo or surplus Navy jeeps or weapon carriers.

The pilot of our Beechcraft obligingly flew parallel to the south and east coast lines at a distance and elevation that made it possible to obtain a good series of kodachromes. Likewise on the return, the DC-3 pilot flew the north coast and a similar photographic record of that portion of the island is available.

Transportation and lodging on the island was furnished by Dr. Chin Tom Mee, medical officer in charge. Food for us was a problem. The island rarely has visitors. The inhabitants, mostly Chamorros, do not yet understand English well but are anxious to learn and are particularly interested in insect control problems. They produce vegetables chiefly and at this time were being plagued particularly by the Philippine cucumber beetle, the tomato fruit worm, and D. cucurbitae. A few hogs, cattle and chickens are also raised. No insecticides are available except on Guam and there they are supplied at near cost by the entomological laboratory. Rota exports and imports chiefly via small inter-island motor vessels. There is no commercial air traffic, however, both Navy and Trust Territory planes use the coral air-strip.

Ten plastic traps baited with a methyl eugenol-G22008 impregnated cotton roll were placed at the locations shown in fig. 2. They caught 1,280 flies in from 20 to 24 hours for a per-trap-day index of 128.

The most flies were caught near Sasonjaya Bay on the southwest side of the mountain in an area of many breadfruit and mango trees but the concentration of these hosts was no greater here than on the north slope. Flies appeared at the traps in the village almost before they could be lifted from the jeep after our arrival. A picked ripe mango from a tree on the north slope contained at least 30 second and third-instar dorsalis larvae and several females were seen ovipositing in the tree. The trap, however, only caught 22 males. Four of the 10 traps caught no flies. These included the 2 at the highest elevation and the two at the windward end of the island. Because of the ancient vintage and poor condition of the jeep we were unable to follow some of the roads that will have to be traveled if this island is worked. For the most part a much higher percentage of Rota is accessible via jeep than is Guam or Saipan.

We (Peterson, Liming and I) returned to Guam on the afternoon of June 11 and left early the next day for Saipan where we were met by Commander Law and Navy Agriculturalist Frank J. Brown. Mr. Brown's assistant Vincent Benavente drove us around part of the island. We placed 10 traps the first day, collected and reset them at the other end of the island the second day and made the final collections on the third so that we had the equivalent of 20 trap-days' operation during which 716 dorsalis were taken. See fig. 3.

No flies were caught at 6 of the locations including 3 of the 4 highest traps. Saipan covers about 50 square miles and has a 1500' mountain near its center. Its population of about 6,000 natives is supplemented by Navy personnel and contractors. The north end of the island was a classified area and inaccessible. The maximum catch made by any one trap was 203 flies (in 24 hours) by the one nearest the inaccessible area in kiaws near sea level. As on Rota the native population is made up mostly of farmers. Messrs. Brown and Benavente, as well as at least one farmer and one of the Navy officers each remarked that the oriental fruit fly (it is still referred to as the mango fly) was most severe in 1951 being much worse than previously or since and that all mangoes were infested that year. This is 2 to 3 years after the peak population occurred in Hawaii. No parasites of dorsalis were seen on any of the 3 islands so reasons for the decline lie elsewhere.

The European corn borer is again building up to serious levels after having once been practically eliminated by introduced parasites.

The tendency for flies to be absent from the highest elevations on all 3 islands is considered highly significant. Temperatures at these levels were more nearly optimum than those near sea level. In Hawaii the fly breeds at much higher levels and lower temperatures. As indicated by observations in Hawaii, dorsalis' tendency to concentrate at low elevations may be more a result of differences in degree of cloudiness vs. sunlight than of temperature preference. The lower areas are almost invariably more sunny than the upper.

No mention has been made of the guava situation. We were interested in its distribution since the tortricid Spilonota holotephra (Meyrick) has been credited with the biological control of guava, Psidium guajava, in the Marianas and the desirability of introducing it to Hawaii has been considered several times. A bill was even introduced in the last legislature in support of this. According to Swezey the bud moth was found in Guam only on guava. We found it on no other

hosts but similar injury was observed on a cotton plant near infested guava. Guava trees up to 15 ft. tall and probably 6 to 8 years of age were observed at several locations in Agaña, Guam, particularly in the Heights area. Altogether at least 150 trees were seen. None were found in other parts of the island. Nearly all had good crops of fruit ranging from 1/2 inch in diameter to mature although a few were still blooming. Larvae of what appeared, from the type of injury, to be Spilonota were present on nearly every plant. No adults or eggs were found. The injury was of a typical leaf roller type, much like that of Amarbia emigratella here in Hawaii. Many buds were attacked but most injury was to older unfolded leaves near the terminals. The abundance of fruit made it obvious that the insect was not preventing heavy fruiting at present population levels and unless it could build up a population far greater than anything observed it is extremely doubtful that it could effectually control guava. No damage was seen that was the equal of that caused by the leaf roller Amarbia emigratella here in 1950 after guavas were sprayed with dieldrin or aldrin.

On Rota only 1 guava plant was seen. It was along a pasture fence at the highest point on the island and though severely cut back by cattle feeding it contained a full crop of fruit and a few Spilonota.

On Saipan a few guavas were seen and these also were infested lightly by Spilonota. Two, planted 6 years ago by Mr. Brown, contained fruit up to 1-1/2 inch in diameter but he stated that the fruit always dropped before it ripened. These plants, however, were on shallow coral filled soil within 100 yards of the ocean and only a few feet above high tide. Normally the current crop would be expected to mature at the onset of the rainy season. A sudden change in water supply often causes guava trees to shed their crop.

Climates having alternate long dry and wet seasons are not likely to favor guava and the non-occurrence of this plant in parts of Guam and the other islands may be due to soil and climate limitations rather than the bud moth. In Agaña the trees were generally near residences and undoubtedly were occasionally watered.

Recommendations:

It is hoped that Mr. Peterson will be able to examine and service the 48 traps on Guam once or twice monthly through the rainy season to determine if the present population level is low or high compared to normal and if the fly can increase to where it may be a serious threat to future expansion of fruit production on the island.

Guam is too large for our experimental purposes and has too much area that is restricted, classified, or inaccessible for reasons of terrain. Saipan is in a similar category and is too close to Tinian to provide suitable isolation.

Rota, with a heavier fly population, adequate isolation from sources of airborne flies, absence of restricted areas, and greater accessibility of most of the land area, should be the best available site for an eradication experiment. It is small enough to be handled by a small crew.

It is believed that the experiment if started soon after the end of the current rainy season and not later than Jan. 1, 1954, and operated for 12 months, could be handled at a cost of about \$15,000 exclusive of the salaries of the employees transferred from our present staff. Two dependable GS-3 or 4 employees would have to be stationed on Rota. Living quarters, in a local quonset, would be available through the courtesy of the Trust Territory. Equipment needed would include a 4-WD jeep preferably of the utility type in first-class condition. There are no repair facilities on the island. Gasoline would have to be shipped via motor vessel from Guam in returnable drums.

No commercial airplanes are available for treatment of the island hence the methyl eugenol-poison would have to be dispersed on permanent feeding stations along roads and other accessible locations and on expendable or natural surfaces along trails and in areas difficult of access or where too much time would be lost in trying to locate permanent stations each month. If the experiment is undertaken, the island first would have to be covered with 40-50 well distributed traps to measure the population before treatment. The feeding stations (some 1,500 would be required) would subsequently be distributed 10 per mile along transects spaced at quarter-mile intervals running from upper to lower roads so that men traveling the trails could be picked up at lower levels or at the end of their routes and returned to the next starting point. Two local laborers plus the 2 Honolulu transferees should provide sufficient manpower to cover the island once monthly. A few additional men might be needed at the beginning if much clearing of overgrown roads is required. It is estimated that some 150 miles of bait lines would have to be established.

The traps would be used to observe effectiveness supplemented by occasional fruit collections and rearing records. The object would be to so reduce the fly population that trap catches would drop to zero and remain there until the end of the year. The traps would also show where control was failing if such occurred.

Detailed plans have not been prepared and the experiment cannot be attempted unless the personnel available for use on Rota is completely dependable with sufficient initiative to make sure that no areas, however difficult of access, are missed in their attempt to blanket the island with the odors.

If funds are available and the experiment is authorized, supplies and equipment must be ordered and sent on its way not later than October 1. Because of the great amount of work still to be done in Hawaii in the field testing of insecticides no further reduction in that phase should be made in order to finance the Rota experiment. Whether curtailment of laboratory screening of insecticides and lures should be done to finance the project will depend on developments in these projects during the next few months.

Figure 1. — *D. dorsalis* catches on Guam.

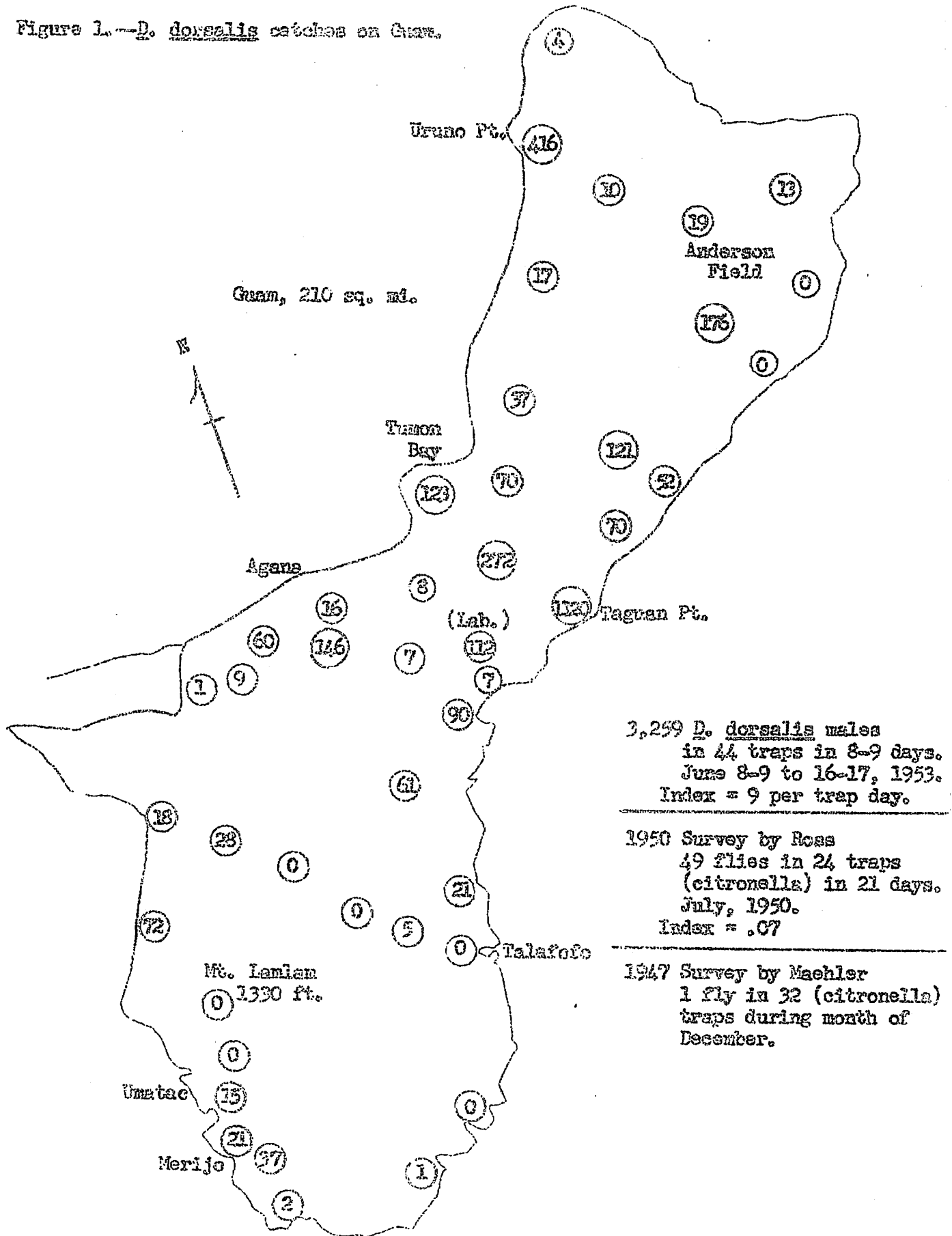


Figure 2.--Number of *D. dorsalis* in methyl eugenol-G22008 baited plastic trap in 20-24 hours circled at approximate trap location.

Total - 1280
Mean - 128 per trap day

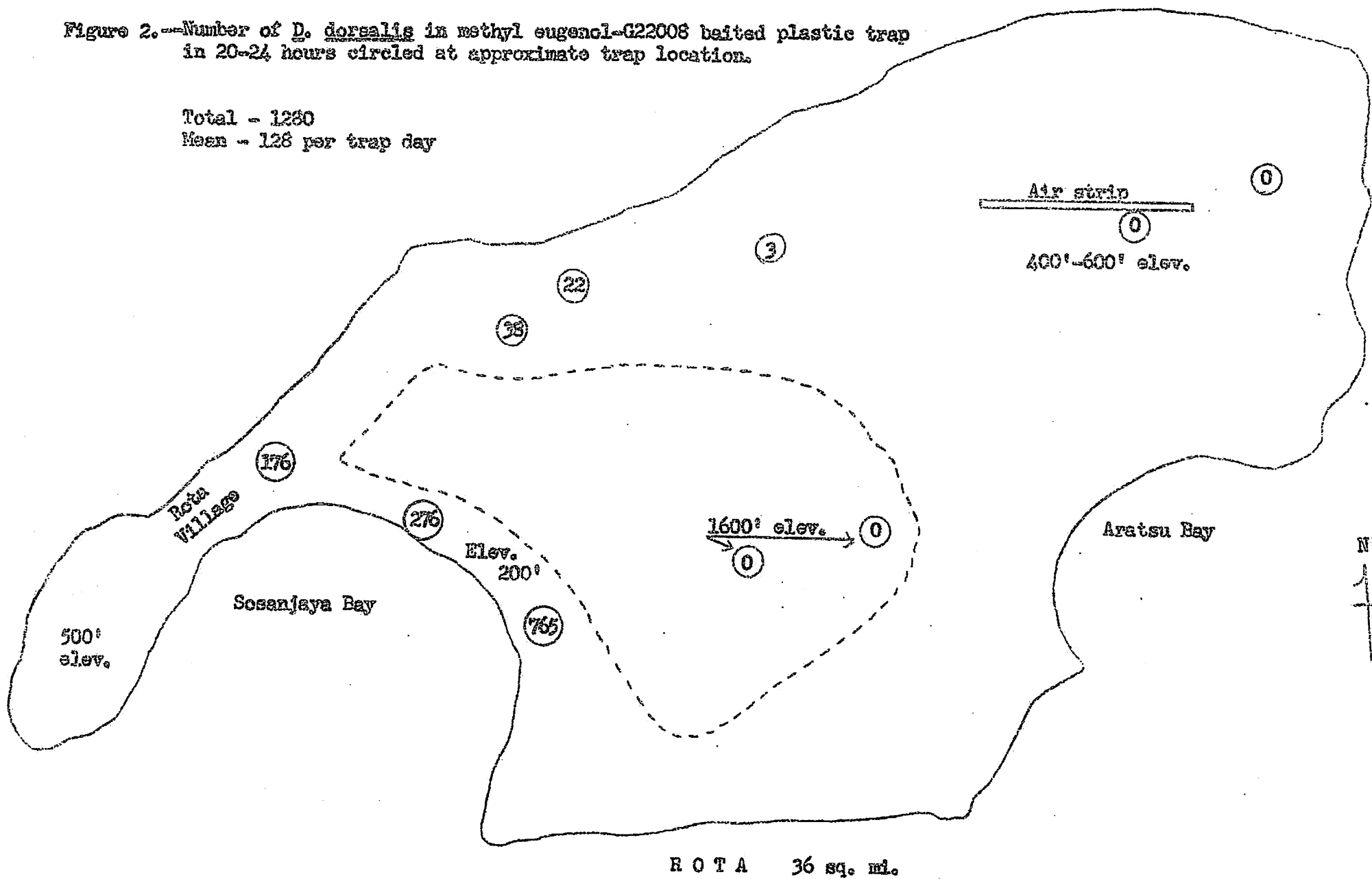
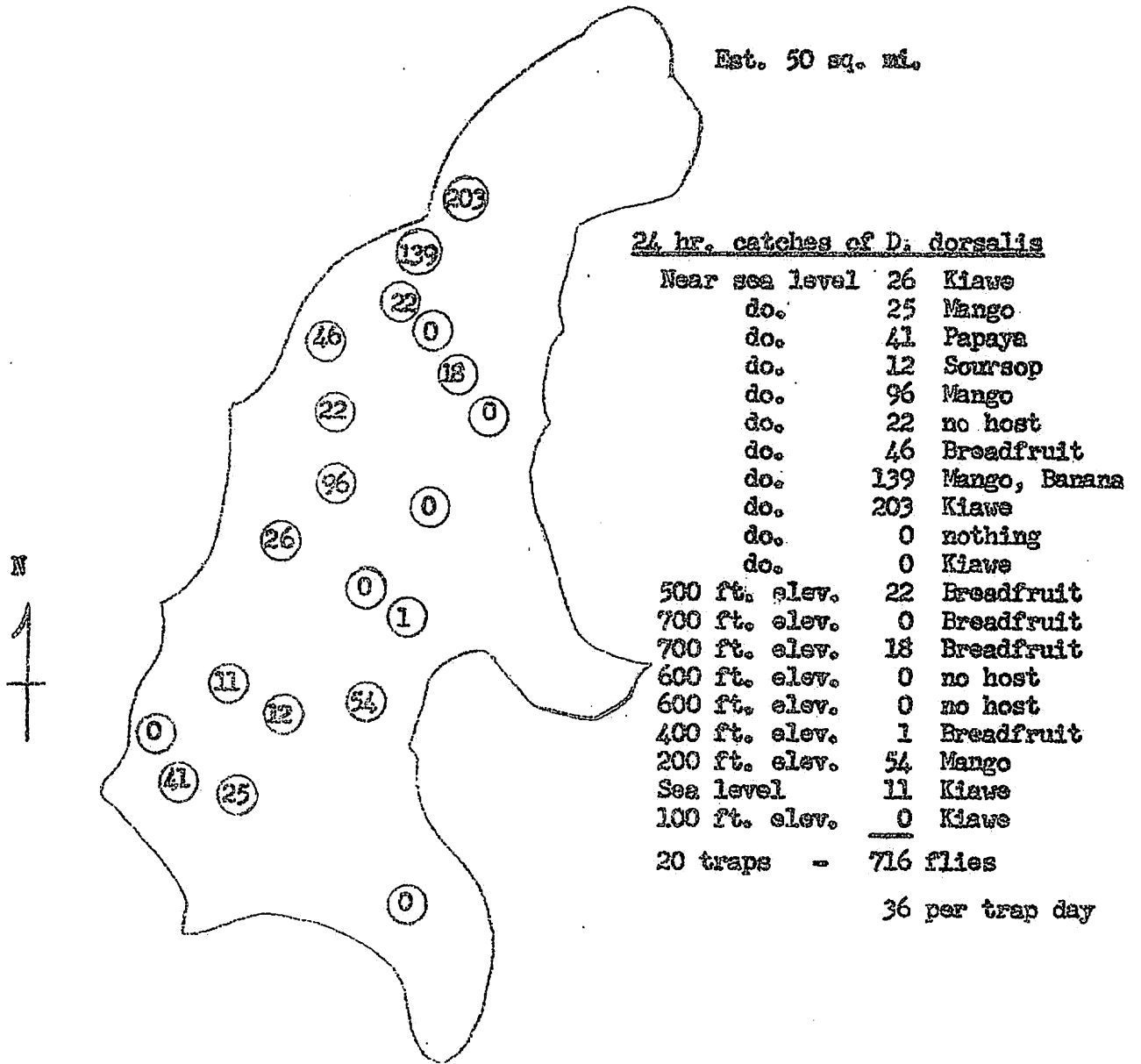


Figure 3. - Saipan, June 12-13, 1953.



Tinian