# Fruit Flies Caught in Plastic Traps Baited with Cue-lure in Okinawa

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## Introduction

It has been our policy that we keep quarantine against injurious insects which do not occur in the main islands. Japan produces a large amount of agricultural food including several kinds of fruits. In order to keep the fruits pest-free, stringent steps including a ban on the import of fresh fruits from outside of the main islands. Not only from abroad, some fruits may not be introduced even from the domestic islands where the injurious fruit flies occur. The territories where the injurious fruit flies occur fall under two regions; the Amami island group and the Bonin islands.

In Okinawa or the Ryukyus, which is now under the U. S. jurisdiction and scheduled to be returned to Japan this year, also occur two species of the fruit flies of economic improtance; the oriental fruit fly, *Strumeta dorsalis* (HENDEL) and the melon fly, *S. cucurbitae* (COQUILLETT). The former is the same species as distributed in the Amami group and in the Bonin islands, whereas the latter does not occur in the two areas.

Host plants of the melon fly have been law-prohibited from gaining entry from Okinawa as a whole since the end of World War II in 1945. Complaints about the stringent control of the prohibited articles started among the people in Okinawa. They claimed that the melon fly is virtually confined to the Miyako and the Yaeyama island groups, and does not occur on Okinawa Island, the largest island in Okinawa.

## Melon Fly Survey in Okinawa

Okinawa consists of the three island groups, that is, Okinawa, Miyako, and Yaeyama (See MAP 1). The melon fly is not a native insect in Okinawa as first found on a small island of the Yaeyama group near Formosa in 1919. Then, in 1929, the fly was reported from the Miyako group. Shortly after the end of World War II, in 1947 and 1948, the fly was found on Okinawa Is. of the Okinawa group. This occurrence, however, did not last and the fly has seemed to be extinct, although there is no evidence for this (AZUMA and TARAMA, 1965).

In 1970, an extensive survey was jointly organized by the Government of the Ryukyus and Japanese Ministry of Agriculture and Forestry to know if the melon fly still occurs on Okinawa Is. The present author went to Okinawa to join the survey.

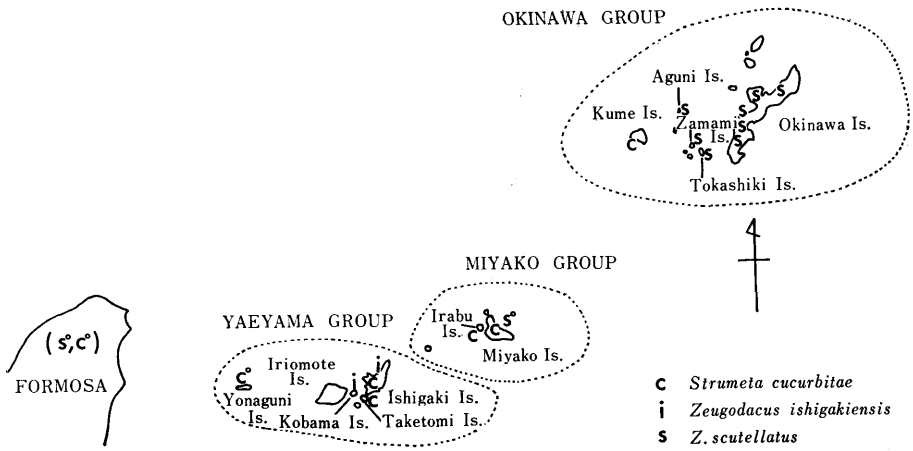
A total of 580 plastic traps baited with cue-lure were set up over Okinawa and Kume Islands, while the potential host fruits, mostly of the family *Cucurbitaceae*, were cut open and examined for the presence of the melon fly larvae (ANON., 1970). The survey was continued for two successive months during the summer.

No melon flies were detected out of Okinawa Is., however, a series of specimens of the melon fly were obtained out of Kume Is., which is located about 90 km of Okinawa Is. Additional data on the fruit flies were obtained out of a trip to the Miyako and the Yaeyama groups and included here.

## Fruit Flies Attracted to Cue-lure

Cue-lure, 4-(*p*-acetoxyphenyl)-2-butanone, is a potent attractant for the male melon fly (ALEXANDER *et al.*, 1962). The species attracted to cue-lure is the melon fly, but some others have been recorded, for example, *D. tryoni* (FROGGATT) and *D. ochrosiae* MALLOCH (BEROZA and GREEN, 1963). In Okinawa, the species attracted to cue-lure have been two species; the melon fly and *Zeugodacus scutellatus* (HENDEL) (AZUMA, 1964). A third species was attracted on Ishigaki Is. of the Yaeyama group and subsequently identified by the present author as *Zeugodacus ishigakiensis* SHIRAKI, of which the type locality is Ishigaki Is. This is the very species described by Dr. T. Shiraki in 1968. It was revealed that *Z. ishigakiensis* had been mistakenly identified as *Z. scutellatus* so far in Okinawa.

Localities where the three species of the fruit flies have been found are plotted on MAP 1. As to Miyako Is., Shiraki's data (SHIRAKI, 1968) are adopted. According to Dr. S. Ito, *S. cucurbitae* is also distributed on Yonaguni Is. of the Yaeyama group.




**MAP 1.** Distribution of three species of fruit flies caught in plastic traps baited with cue-lure in Okinawa in 1970–71.

Localities plotted: *Strumeta cucurbitae*, YAEYAMA: Ishigaki Is.; Taketomi Is.; MIYAKO: Miyako Is.; Irabu Is.; OKINAWA: Kume Is. *Zeugodacus scutellatus*, OKINAWA: Kunigami; Motobu; Yomitan; Gushikawa; Shimajiri; Aguni Is.; Zamami Is., Tokashiki Is. *Z. ishigakiensis*, YAEYAMA: Ishigaki Is.; Kobama Is. (Letters with a degree ° refer to data by SHIRAKI and ITO).

## Pictorial Key to the Three Species

On 28th July, 1970, in a lecture at Naha city, Okinawa, for the people of agricultural circles, mostly the non-taxonomists, the present author showed a pictorial key for identifying the species attracted to cue-lure in Okinawa. The key is reconstructed here for reference. Of the three species attracted to cue-lure, the melon fly may be distinguished from others in having smaller body size, large apical spots on wings, and rather paler colouring of the body. The size of the two species of *Zeugodacus*, body length 6–8 mm, is larger than that of the melon fly, the body being blackish.

## Discussion

The cause of the extinction of the melon fly from Okinawa Is. has not been established. Some people

FRUIT FLIES CAUGHT IN PLASTIC TRAPS BAITED WITH CUE-LURE IN OKINAWA
A PICTORIAL KEY TO THE SPECIES
—MALES— (Females are not normally attracted)

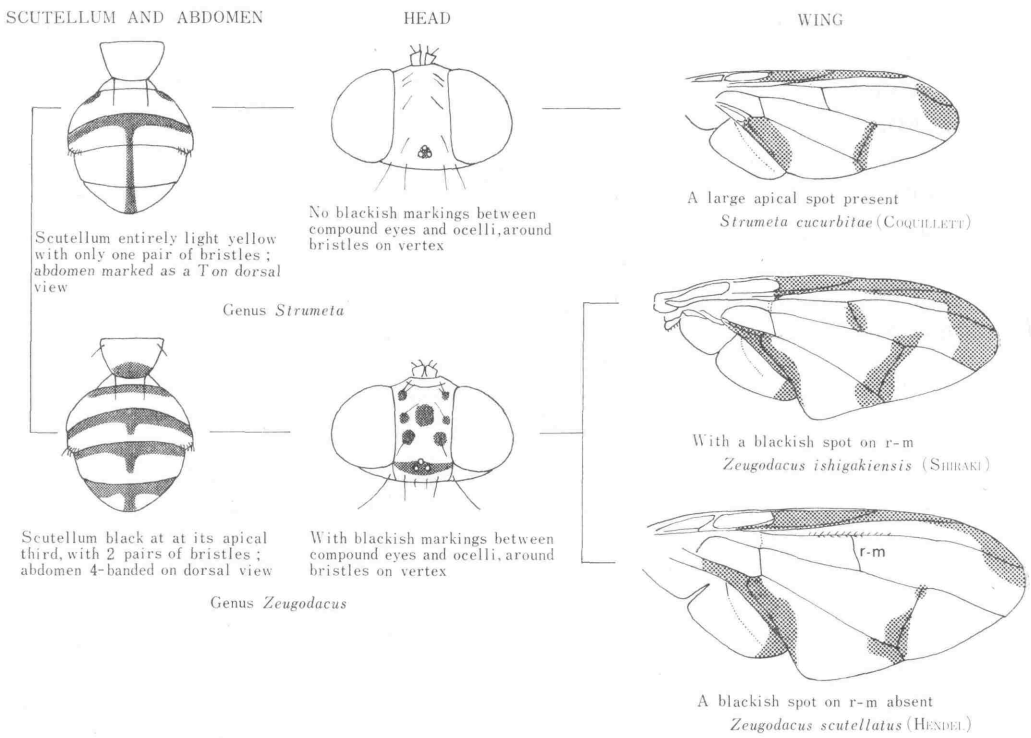



**FIG. 1** Fruit flies caught in plastic traps baited with cue-lure in Okinawa.

in Okinawa refer the extinction to severe winter conditions which prevailed soon after the melon fly invaded the island. It may be justified that the introduced population was not so cold-hardy enough to survive the winter then. Other factors might have played an important role in the extinction, however, it is almost impossible now to work over these factors.

It is not certain when and how the melon fly invaded Kume Is. A Japanese entomologist who paid a visit there in 1952 reported no occurrence of the melon fly (ANON., 1965). According to Mr. S. Azuma of the Ryukyu Agricultural Experiment Station, a few plastic traps baited with cue-lure were first set out several years ago on Kume Is., but the result was negative. Judging from the above, the melon fly seems to be introduced rather recently into the island. As to a possible source of the infestation, infested fruits that fishery boats from the south left near the island are suspect. There is a good chance that the offsprings of the fruit fly larvae inside the fruits become established particularly in the areas with rich vegetation. Actually, on Kume Is., a large number of wild cucurbits grow by the seaside, which may harbour the fruit fly upon arrival. It is not likely that the fertile female flies were wind-borne from the south, the Miyako or the Yaeyama group, because Kume Is. is located far from there.

*Z. scutellatus* is a very common species of wide distribution throughout Japan, namely, in the Amami group, Kyushu, and Honshu (SHIRAKI, 1933), however, it is not so economically important. The only trouble is that this species is sometimes caught in traps in great profusion and renders the species identification more difficult. SHIRAKI (1968) mentions male flowers of *Cucurbita moschata*, a cultivated cucurbit, as a host plant of *Z. scutellatus*, whereas in the mainland the species is known to feed on male flowers of

*Trichosanthes cucumeroides*, a wild cucurbit of wide distribution (ITO, 1965). *Z. scutellatus* has been also recorded from the Miyako group and Formosa (SHIRAKI, 1933 and 1968). It is interesting that the species have a patchy distribution according to the islands in Okinawa. The occurrence in the Yaeyama group of *Z. ishigakiensis* as a substitute for *Z. scutellatus* is noteworthy from the zoogeographical point of view. Of the three species discussed here, the two *Zeugodacus* are probably native to Okinawa.

The three species can be identified on-the-spot by the characters above, however, this pictorial key will facilitate positive identification of the species even by partly broken specimens. Teneral specimens have not been caught so far and not studied here.

## Summary

In Okinawa or the Ryukyus, a survey was organized in 1970 to know if the melon fly, *Strumeta cucurbitae* (COQUILLETT), still occurs on Okinawa Island. Plastic traps baited with cue-lure were set up over Okinawa and Kume Islands. Host fruits were cut open and examined for the presence of the larvae. The species of the fruit flies attracted to cue-lure in Okinawa are three, the melon fly, and two *Zeugodacus* species, the distribution of which is plotted on a map. A patchy distribution of the two *Zeugodacus* species is noteworthy from the zoogeographical point of view. A pictorial key to the three species is provided.

## Acknowledgements

The author is indebted to Mr. K. IHA and his colleagues of Ryukyu Plant Protection Station for their willing co-operation during his stay there.

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## 摘　　要

# 沖縄で Cue-lure に誘引されるミバエ

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沖縄本島では，戦後1947，48年にかけてウリミバエが発生したため，わが国は沖縄全体をウリミバエの汚染地域とし，現地からのウリ類を中心とする寄主植物の輸入を禁止してきた。しかし，沖縄側からウリミバエは宮古，八重山のいわゆる先島だけに発生し，沖縄本島には発生していない，従って本島産のウリ類の輸出を解禁してほしい旨，要望がだされた。1970年の6月から7月にわたる2か月間，Cue-lure を使ったトラップが沖縄本島，久米島の580カ所に設置され，幼虫を調べるために，並行してウリ類，野生ウリ科植物を中心に果実の切開が行なわれた。

沖縄本島からはウリミバエは発見されなかったが，久米島からウリミバエが発見された。これは比較的新らしい侵入と思われ，その経路としては，漁船等による島の近くでの被害果の投棄が考えられる。飛来による侵入の可能性は，久米島がウリミバエの常発地である先島から遠く離れているので，非常に薄い。

Cue-lure に誘引されるミバエとしては，*Dacus* (*Strumeta*) 属が知られていたが，沖縄で東 (1964) が記録した *Zeugodacus scutellatus*，ミスジミバエ，さらに，今回判明した *Z. ishigakiensis*，イシガキミバエのような大型のミバエが誘引されるのは興味深いことである。この *Zeugodacus* 属の2種は，直接農作物に害をあたえるものではないが，大量に誘殺されると，ウリミバエの検出を困難にする。ミスジミバエは本州，九州，奄美大島，さらに沖縄本島，宮古島，また台湾にも分布するが，八重山群島にはおらず，かわりにイシガキミバエが分布している。ミスジミバエとイシガキミバエは非常に近縁であるので，種の地理的分布からみても興味深い。

Cue-lure に誘引されるミバエ3種の沖縄での分布および検索図を示した。