

## THE FIRST COMMERCIAL BUTTERFLY FARM AND PUBLIC EXHIBITION IN THE UNITED STATES

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### ABSTRACT

Butterfly World rears and displays at any time up to 60 species of butterflies, from 5 continents. The two areas of Butterfly World (farming and public exhibition) have four or five levels of containment. These are designed to prevent escape of the butterflies and their larvae, whose presence in nature might damage horticultural or agricultural plants.

Key Words: Florida, butterfly, native, exotic

### RESUMEN

Butterfly World ("El Mundo de las Mariposas") cria y mantiene en exhibición permanente, cerca de 60 especies de mariposas de cinco continentes. Las dos áreas, de crianza y de exhibición, cuentan con cuatro o cinco niveles de aislamiento designadas para impedir la salida de las mariposas y sus larvas al exterior, donde pudieran producir algún daño a la horticultura o agricultura.

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Butterfly World displays a minimum of 2,500 butterflies at all times. During each year about 150 species are housed, and at any time up to 60 species, from 5 continents, are on display. Butterflies are imported and reared, and some are exported. Butterfly World, like other zoological gardens, has several roles. The obvious ones are entertainment and education of the public. The less obvious ones are research into rearing methods, and supply of living specimens to researchers at universities. A potential role is restocking of endangered species of butterflies to their native lands, once the environmental disruptions that caused endangerment are rectified.

However, caterpillars (the larvae of butterflies and moths) are phytophagous, and therefore are classified under federal law and state law as "plant pests." Importation of "plant pests" into the USA is regulated by USDA-APHIS, and importation of all arthropods into Florida is regulated by FDACS-DPI. These laws are designed to prevent the escape into nature of non-native "plant pests" (federal laws) and non-native arthropods in general (Florida law).

The federal and state agencies permit importation of butterflies into escape-proofed holding facilities. Here, I explain how Butterfly World complies with the requirements suggested by federal and state officials. Federal and state concerns are expressed by Firko (1994) and Thomas (this symposium).

### BUTTERFLY FARMING

Butterflies in nature are attacked at all 4 life stages by parasites, predators, and pathogens. Farming butterflies requires many methods of protection from, and prevention of these, natural enemies. I will deal only with containment from escape in this symposium, even though some of the following safeguards and construction evolved from the need to protect the butterflies from natural enemies.

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Our buildings, laboratory, outdoor rearing areas, and flight areas, were designed and constructed to ensure that butterflies could not escape from their containment, either as caterpillars or as adults. Planning resulted from a partnership with Clive Farrell, owner of the London Butterfly House (England), and the design was created by James Gardner (of England). Butterfly World opened in 1988, and it has an advisory board of biologists.

Butterfly larvae are raised both indoors and outdoors depending on species and food-plant preference. Most are reared from egg to adult indoors. A laboratory is constructed in the inner part of the building, with hallways leading to the outside and a minimum of two doors to the outdoors. All walls and floors are kept spotless and are cleaned daily. All eggs and larvae are kept in special rearing containers which are sealed for the entire egg and larval period. The larvae raised outdoors are held in  $183 \times 183 \times 244$  cm ( $6' \times 6' \times 8'$ ) screened, enclosed cubicles. The base of each door is equipped with a rubber sweep. For a larva to escape to the wild, it would have to crawl through 5 doors, a series of hallways, and a distance of about 46 m (150').

The general public has no access to the larval-growth areas. Any special visitors allowed into these areas must be accompanied by laboratory personnel. All plants removed from the larval-growth areas are placed in a screen-enclosed nursery with a 2-door vestibule-like entry/exit. If any larvae or pupae were left on the plants, they would hatch in this enclosed environment.

The adult butterflies in the breeding areas are likewise kept in  $183 \times 183 \times 244$  cm cubicles. To escape, they first must get through the door of their cubicle, which puts them in a narrow hallway and very visible. From the hallway, they must get through two more doors to enter a protected screened nursery which has two more doors with vestibule to the outdoors.

#### EXHIBITION

The public exhibition areas are designed to contain adult butterflies for public viewing. The only egg-laying females or larvae allowed in these areas are of native species for educational purposes. Host plants for non-native species are not kept in the public areas. The general public has one entrance and one exit to the exhibition areas. The entrance requires passage through two doors, a long indoor hallway, and a high velocity blower. Butterflies cannot orient indoors without polarized light, so the two doors, hallway, and blower provide four levels of protection. At the exit, the public is reminded to check clothing for hitchhikers, then must pass through a set of doors, a set of plastic strips, a high velocity blower, and another set of doors. These give five levels of protection.

There are three openings to the public exhibition for workers from the laboratory or horticulture. Each opening consists of a two-door vestibule which opens into screened nurseries which again have two-door vestibules to the outdoors.

The grounds surrounding the public exhibition are planted with thousands of nectar-bearing plants (upon which adult butterflies might feed) and host-plants (upon which female butterflies might oviposit). This is designed to attract and retain any escapees.

#### CONCLUSION

The two areas of Butterfly World (public exhibition and farming) have four or five levels of containment. These are designed to prevent escape of the butterflies, whose presence in nature might damage horticultural or agricultural plants. The safeguards to escape have been refined since opening of Butterfly World in 1988.

In reality, few species of butterflies pose a threat to agriculture or horticulture. Among non-native butterflies which have become important pests in the USA are *Pieris rapae* (L.) [called "small white" in England, and "imported cabbageworm" in the USA including Florida, though Gerberg & Arnett (1989) call it "European cabbage butterfly"]. Its close relative *Pieris brassicae* (L.) [called "large white" in England, and "European cabbageworm" in the USA] has not yet colonized the USA and is a prime example of a butterfly species whose arrival would harm agriculture. It was against *P. rapae* that the first biological control project in the USA was attempted (Van Den Bosch et al. 1982).

Even native species of butterflies can be harmful to horticultural and agricultural plants. The atala butterfly (*Eumaeus atala* Poey subspecies *florida* Roeber) was considered virtually extinct in Florida from the late 1950s, but was reintroduced from a surviving population on Key Biscayne, and by the end of the 1970s was again widespread (Emmel 1991). Its larvae eat leaves of native and introduced species of *Zamia* (Cycadales), which have ornamental value, so the butterfly larvae may be considered to be pests. Larvae of *Dione vanillae* (L.) subspecies *nigrior* Michener (the gulf fritillary) feed on leaves of *Passiflora* spp., and those of various skipper butterflies feed on leaves of *Canna* spp. and bean plants, and are pests to those who try to grow these plants. It becomes a question of whether the grower of plants is willing to sacrifice damage to the plants in return for the pleasure awarded by the sight of the butterflies.

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