

HANDLING LEPIDOPTERA

COLLECTING

Caterpillars

There are many techniques for collecting caterpillars. The most basic approach is to visually search through plants where feeding damage and perhaps feces (frass) are evident. Another method of search involves clipping and collecting foliage and inspecting it indoors, under controlled lighting, with a magnifying glass or perhaps a microscope. Other collection techniques require sifting soil to find pupating or root-feeding caterpillars, or the use of sweep nets, beating sheets, burlap skirts, and funnel traps. The sweep net is similar to an aerial net, and is used to brush over vegetation and dislodge and capture caterpillars. Beating sheets are held under plants and collect caterpillars as they fall from shaken or beaten foliage. Burlap skirts can be tied around tree trunks to trap caterpillars while they are moving between feeding, resting or hiding places. Funnel traps can be set under plants to collect caterpillars as they drop from the foliage.

An excellent means of acquiring caterpillars is to capture live adult females and rear the caterpillars from their eggs. This can be difficult, however. Many species require specific and unique conditions of light, temperature, humidity, flying space, and a substrate for oviposition before the female will lay her eggs.

Adults

There are many ways to observe and collect moths and butterflies. The best way to collect day-flying moths is with an aerial net similar to one used to collect butterflies. One of the simplest and most productive methods is to place a white sheet under or behind an ultraviolet, white or halide light at night. Moths will rest on the sheet after being attracted to the light. Light traps can be purchased or assembled to collect moths throughout the night (Figure 11). Attractants other than light include



Figure 11 A light trap setup includes a containment bucket (a killing agent optional for unattended sampling), funnel, plastic veins holding the UV lightbulb, top fastened down with bungee cords, and electrical wires equipped with a photoswitch attached to a 12-volt battery. This setup can be used to sample night-flying moths for up to four consecutive nights.

fermented baits, commercially available (manufactured) pheromones, and live virgin females.

As with caterpillars, a good way to acquire adults—and in excellent condition—is to capture live adult females and rear the caterpillars that hatch from their eggs through metamorphosis to emergence. Another way is to locate caterpillars on host plants in the field and either (1) place screen sleeves over the foliage, or (2) collect them from host plants and rear them through emergence indoors in containers. In either case, caterpillars will require suitable foliage for feeding, an appropriate site for

pupation, and frequent observation to note the time of adult emergence to prevent the moths from damaging their wings while being contained.

In all cases, take care to protect Lepidoptera habitat. Avoid trampling plants and disturbing unstable soils. Try to grow the foodplants the caterpillars need. If you can't, prune wild foodplants with care and an eye to the future; you might need to return to the plants for more food. Collect as few moths as your study requires for accurate and proper documentation. If possible, upon completing your study, release specimens back into the environment from which they came. Be aware of any Federal and local regulations regarding collecting and releasing Lepidoptera. Take extra care to protect rare and endangered species, and **do not release exotic species into the wild.**

REARING

The rearing of caterpillars is helpful in: associating field-collected larvae with the adult, testing foodplants for suitability, or associating parasitoids and diseases with the caterpillar stage of respective species. Caterpillars can be reared in cages in the field or indoors.

There are advantages and disadvantages to rearing caterpillars indoors. One advantage is that you are not likely to lose the specimen. Another is that, because of warmer temperatures, caterpillars will likely grow faster indoors. Faster growth will allow you to observe changes in size and color patterns for each instar sooner than you might observe them in the field. A disadvantage to indoor rearing is that food must be provided by potted plants, clipped foliage from the field, or replaced through artificial diets. Another is that unsuitable rearing conditions will result in high mortality. Temperature control, dehydration, fungal growth, starvation, cannibalism, and overcrowding are common problems. Closed containers may cause problems due to excessive condensation and poor sanitation. Cannibalism and disease may be reduced by raising the caterpillars individually. Placing slightly moistened peat moss in containers will provide a suitable medium within which the caterpillar can bury itself prior to pupation, and the moisture helps to prevent desiccation, a common and avoidable problem when rearing in dry indoor conditions.

PRESERVING

Caterpillars

Preserved specimens are useful for eventual study of traits that photographs do not reveal. (**Note:** Improperly preserved caterpillars will rot and turn black, a condition unsuitable for archival material and identification.) The simplest method for preservation is a two-step process involving hot water and ethyl alcohol. Step one: heat water to 180°C. If you do not have a thermometer you can obtain an appropriate temperature by bringing the water to a boil, removing it from heat, and letting it stand for a couple of minutes. Place the caterpillar in the hot water for 3 to 4 minutes. (**Note:** Extremely hot water may cause the caterpillar to burst.) Remove the caterpillar and place it in a specimen vial filled with 70% ethyl alcohol (isopropyl alcohol is less desirable). Although this technique will provide a properly inflated specimen, an unfortunate side effect is that the caterpillar will lose most or all of its color. “Color” is best preserved through photographs (see Photographing, page 24). Labels placed inside the specimen vials should include information on place, date, and foodplant at time of collection. Additional information regarding preserving caterpillars, including freeze drying and blow drying, is presented in Peterson (1962) and Stehr (1987).

Adults

A properly mounted specimen involves placing an insect pin through the top of the thorax and spreading the forewings and hindwings: the hind edge of the forewing should be at a 90° angle to the body; the front edge of the hindwing should be under the forewing, such that the tip of the hindwing creates a small notch with the outer edge of the forewing (See chapter 5).

The pinned and spread moth or butterfly must be allowed to dry for a few days at room temperature on a spreading board. Once dried the forewings and hindwings will stay in place and the moth may be removed from the spreading board and placed in an enclosed drawer or cabinet for storage or display. A note of caution is in order—the specimens will rot if they are damp when placed in compartments; some colors will fade if subjected to direct sunlight; and museum beetles (dermestids),

which eat dead insects, may turn perfect specimens to dust. These and other problems can be minimized if the adults are stored in sealed containers and kept in a dark and dry location. Labels on the pinned specimens should include at least the details of the place and date that the specimen was collected. Additional label information could include collecting and rearing facts, such as emergence dates, and who collected the specimen. See Covell (1984) for additional information on preserving moths.

PHOTOGRAPHING

A color slide or print will provide a record of adults and caterpillars at various times of development. An excellent photograph can be acquired by using all of the following: (1) A 35 mm, single lens reflex camera with exchangeable lenses. Instamatic type cameras will not allow the photographer to get close to the subject or to fill the frame with the subject. A majority of the photographs presented here were taken with a 50 mm macro lens mounted on a 25 mm extension tube. (2) Film with a low ASA rating. A majority of the photographs in this handbook were taken with color slide film ASA 25. This film speed provides superior quality in grain but requires more light than faster films. (3) A flash system, either a bracket or a ring flash. I (JCM) use a bracket system which consists of two flash units that are mounted on opposite sides of the camera. The lens, film, and flash units allow shooting pictures at $f/16$ and $f/22$ at a distance of about 20 mm from camera lens to caterpillar. Photographs can be taken in the field but shadows, wind, cluttered backgrounds, and other unwanted features (like other insects) may interfere with obtaining the best picture. Most of the caterpillars illustrated in this booklet were field-collected but photographed in a staged indoor setting. Some of the photographs of adult Lepidoptera were obtained by using a digital camera equipped with a 90mm macro lens. The butterflies and moths were placed on a spreading board and properly mounted on a pin and dried. The spread adult was then photographed in a studio setting.