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TIPS ON COLLECTING AND REARING IMMATURES OF 375 BUTTERFLY AND SKIPPER TAXA

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ABSTRACT: Rearing techniques are discussed for 375 different butterfly and skipper taxa from Utah and beyond.

Additional keywords: ova, larvae, pupae, over wintering, obtaining and caring for immatures

INTRODUCTION

The authors of this paper, Jacque Wolfe, Jack Harry, and Todd Stout, with contributions from Dale Nielson have over 100 years combined experience collecting and rearing butterflies. This publication includes natural and lab host plants. We hope that this information will help you avoid some of the mistakes and losses we have experienced. We also hope that this publication will encourage someone who has only collected adults to give rearing a try.

For those new to rearing we encourage starting small. Not only can rearing provide perfect specimens but also provide knowledge regarding the life histories of butterflies, which includes how to find caterpillars or how to entice live females to lay eggs. The advantages justify the time and effort it requires.

Another advantage of rearing is that some species, like *Papilio indra* and *Megathymus* species, are difficult to collect as adults. Therefor, rearing them can be much easier. For example, collecting larvae or netting a single live female can result in obtaining a nice series of perfect specimens.

Remember not to be discouraged when you have setbacks. There is a learning curve involved with rearing that this paper will help to accelerate. Good luck.

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GENERAL METHODS OF OBTAINING IMMATURES

For most species, it is both faster and easier to collect gravid females and confine them on their host plant to obtain ova. For larger butterflies, such as *Limenitis, Adelpha*, and *Papilio*, we use a 12 to 24-inch cubicle cage constructed with a frame made with thin strips of wood or aluminum and covered with nylon window screen (Fig. 7). With a screen lid and no bottom it can be placed on a flat surface. For Lycaenids a 6-inch cubicle cage works well.

Another type of container that is used for larger females is a 5-gallon plastic bucket pail with a screen top. Our favorite container for all but the largest butterflies is a 3-quart plastic container with a chiffon top. Place a 2-inch thick piece of foam rubber that fits tightly in the bottom. A 1½-inch diameter hole is made in the center so that a 1½-inch diameter by 2½-inch tall water container can be inserted. These containers, which are used to hold pills, can be purchased at many pharmacies. The foam rubber keeps the host plant from falling, therefore creating a very portable arrangement. It can ride on the dashboard or seat of your vehicle and sit in filtered sunshine while you are out collecting. Place a small container that has a honeywater soaked sponge in it set on the foam rubber for females to nectar (Figs. 1-2).

The proper amount of host plant placed in the container that houses a live female is critical. There needs to be sufficient plant but the females must also have room to fly. Most butterflies will ovipsoit under artificial light. Use a 60 or 100-watt bulb placed about 6 inches from the container. We use a 24-hour timer and have it set for 3 hours on and then 3 hours off during the day and then switched off overnight.

Using indoor light has several advantages. First, the females won't overheat, which is always a danger when using direct sunshine that passes through a window. Second, you can get eggs on an overcast day. If you do use direct sunlight take precautions to prevent overheating. Place the container in partial shade or filtered sunlight through a window. Venetian blinds can be very helpful to filter sunlight. Having 3 or 4 females in a cage or container is ideal as they keep each other active. Sometimes a solitary female will not be very active without other stimuli. Sometimes females become active with a change of light from overcast to sunshine and vice versa.

For some groups of butterflies large numbers of ova or larvae may be found. With a few taxa, field collecting of immatures is preferable to searching for elusive females. Actual methods will be discussed in each genus or species account.

Searching for eggs or larvae in the field can be advantageous for several reasons. First, it can extend the productivity of a day of collecting in the field. Not only can you can check host plants for immatures from sunrise until the time of day when the adults begin to fly, but also from the time of day they stop flying until dusk. At the same time, if overcast weather keeps the adults grounded, you can still spend a full day in the field looking for immatures. Second, if you are unable to collect adult butterflies during one of their flight periods, you can always look for immatures either before or after their main flight depending upon the species.

For species that diapause as larvae you can collect these in the early spring. This not only gives you a wider timeframe for having immatures, but also extends your collecting season, which can be beneficial after a long winter. Even in the dead of winter there are collecting opportunities. For example, you could have an enjoyable and productive day looking for *Limenitis* hibernacula adjacent to river courses or *Hypaurotis crysalus* eggs near the buds of oak trees until the new growth of spring makes them too hard to find.

Collecting post-diapause larvae means you should have some adults without having to overwinter your larvae. A word of caution is that many species of checkerspot larvae, if smaller than 4th instar, may feed for an instar and then rediapause. There are many possible explanations for this. If the larvae are somehow overcrowded or if the quality or quantity of hostplant is somehow restricted, these checkerspot larvae can diapause until later that spring or for another year. Also exposing the larvae to extra warm temperatures can cause re-diapause.

GENERAL REARING

Lab rearing necessitates that larvae be protected from predators, such as spiders, earwigs, etc. The only size requirement for containers and cages is that they must be large enough to hold sufficient host plant without crowding the larvae. For rearing in larger numbers, common 3 or 5-gallon pails or 10-gallon terrariums (Fig. 14) can be effective. When larvae are small, many can be placed in a container, but at most 15 to 20 larger larvae. Overcrowding must be avoided.

As stated earlier, these containers or cages must have chiffon, fine mesh, or screen covering. Chiffon is preferable as the porous top allows light and air into the container and allows moisture to escape. This is also essential as it keeps caterpillar frass dry. Frass should be removed from the rearing environment frequently and deteriorating host plant should be replaced regularly. Overexposing larvae to their own wet frass or deteriorating plant can cause disease in many varieties of butterflies and should be avoided.

Place the food plant stems into a small bottle of water through the neck of the bottle. There must be no spaces for the larvae to crawl or fall into the water through the neck of the bottle. Wrapping the stems with the correct amount of plastic wrap is an effective way to seal the opening. Also, an effective method to create an understory where the larvae can hide, rest or pupate is to place sections of white paper towel loosely around the bottle.

As stated earlier, food plant cuttings deteriorate and lose nutritional value and need to be replaced regularly. When larvae are small do not wait until all the plant has been consumed before changing it. The amount of time that the hostplant remains useable depends on the plant species itself. Good rules of thumb to follow is to replace host plant cuttings every 3 days in your cage or container and obtain a fresh supply of refrigerated cuttings about every week or so. Again, the timing on these replacements needs to be fine tuned depending upon the plant species.

Disinfection of any cage or container is also important. A mild bleach and water mixture applied for ten minutes is effective. Lysol or any other 2-long-chain quat, sold in an aerosol can, can also be effective. Avoid handling the larvae as much as possible, but when necessary, a small larva can be picked up with a camel's-hair brush dipped in water. A toothpick dipped in water or teasing needle also works.

Most larvae can be transferred by laying the section of plant that they are attached to onto a new plant. After the larvae crawl onto the fresh plant the old pieces can be removed. Larvae that are set to molt from one instar to the next NEVER should be forced off their host plant which is why cutting them away from the host as described above is always advisable.

Using potted hostplant is much less labor intensive and the plant is always fresh (Fig. 15). We recommend 1½ to 2-gallon pots. They are small enough for easy handling and large enough for a good supply of plant. To contain the larvae bend two 4-foot long 9-gauge wire lengths into a U-shape. Push the ends of the wire loop into the soil with the loops at 90 degrees to each other. Place a mesh sleeve over the wire and secure to the pot with twine or elastic cord. 5-gallon paint strainers from home improvement stores are ideal for this.

An effective method to keeping plants watered is to place the potted plant in a plastic pan with about 2 inches of water. If you keep plants outside replace water regularly as mosquitos can reproduce in standing water. With this method the plant is watered from the bottom. Place your plants in the sun for 3 or 4 hours a day and then back in the lighted lab before it gets dark. If left alone for 3-4 days, the plants will be okay inside.

A similar technique to potting plants is to place a mesh or chiffon sleeve around a live branch or branches that contain larvae. Naturally, the plant must be in a secure area. Make sure that the netting is sealed tightly around the branch. This technique is not recommended when rearing larvae that need to be exposed to 24-hour photoperiod or reared in a different manner. All special handling will be listed in the individual accounts.

Pupae should be placed in a container with a paper towel or cardboard lining so that emerging adults can climb to the mesh top to expand their wings. Pupae should be regularly misted with water until emergence or until they are put in diapausing containers to be placed under an overwintering process.

After the freshly emerged adults have expanded their wings they should be put in an individual paper-lined container and kept in subdued light or a dark closet for 1½-2 hours. If they are not crowded, 3 or 4 that emerge at the same time can be placed in the same container. They should then be put in the refrigerator for a minimum of 24 hours (5-6 days for *Euphydryas*). After being refrigerated they can be put in the freezer. Specimens should be briefly thawed and placed in glassine envelopes and stored in an airtight container and kept in the freezer. They will stay fresh enough to spread for a few months.

OVERWINTERING TREATMENT OF DIAPAUSING IMMATURES

It is necessary to have a refrigerator that is used exclusively for overwintering immatures. Put a thermometer inside so the temperature can be monitored. Adjust the cold until the temperature is 30-32 degrees. We use the largest plastic storage container that will fit in our large refrigerator. We place 2-4 small plastic containers, containing water, into the large container, which provides 100 percent humidity in the large container. The immatures are put in plastic containers that either have small holes poked in them or simply a chiffon top. Some loosely wadded white paper towels can be put in a container for the larvae to cling to but it is not necessary. The immatures should be kept in the winter conditions for at least 4 months but longer is okay. After the immatures begin diapause, during the summer, we simply put them in the containers and store in the lab until fall. They must be misted every other day or so until put in the refrigerator.

Post-winter treatment of immatures:

Ova: Overwintering ova should only be brought out of cold conditions and exposed to room temperature when suitable hostplant is available. Specific strategies will be discussed in the species accounts.

Larvae: After overwintering, the larvae should be placed in the rearing container, on their host, just like the one used to rear them to diapause. You can however, until diapause is broken, have many more larvae in a container. Until the larvae begin to feed they must be sprayed 2-3 times each 24 hours to prevent dessication. As is true with rearing pre-diapausal larvae, when plant condition starts to deteriorate it must be changed. Keep the larvae under 24-hour photoperiod. This procedure may be modified for larvae that were reared to diapause using a special method. This too will be covered in their account.

Mature larvae: Mature larvae finish all feeding prior to overwintering. Therefore, they need to be treated exactly the same way pupae are treated both before and after they pupate.

Pupae: For the first 7 days, pupae should be kept moist. Soaking with a spray bottle quite often can do this. For less attention, cover with a few layers of white paper towel and spray until soaked. This is necessary during the transition time from being exposed to colder temperatures to the lab with a long photoperiod. After the first week they can just be misted 2-3 times a day. Pupae that need different handling will be covered in the genus or species accounts.

Adults: In spite of efforts, we have not as of yet, created a suitable overwintering technique for those groups of butterflies, i.e; *Polygonia, Nymphalis, Zerene, Phoebis, Eurema*, etc. that overwinter or spend the dry season as adults.

Please see http://raisingbutterflies.org for updated content from this article, which also includes text, photos, and videos on raising butterflies. This site is collaborative and will invite others to share their best practices as well.

ARRANGEMENT OF SPECIES/SUBSPECIES ACCOUNTS

Host(s): Larval food plants as documented in nature by one of the authors. Documentation is defined as finding larvae or eggs on a species of plant and rearing them on that species of plant.
Lab host(s): Plants we have used in the lab to obtain ova or rear the larvae.
Other's host(s): Ova or larvae were collected by persons other than the three authors but were reared by one of the authors.
Remarks: Special handling or collecting methods, behavior, etc.

Parnassius smintheus sayi
Host: *Sedum lanceolatum*
Remarks: Post-diapause larvae are easy to see as they feed out in the open. Larvae can be seen as one walks, so many plants can be checked in a short time. This is preferable to getting eggs from a female because you have adults one year sooner. This is one genus where wing-caught specimens may be more desirable than reared ones because reared females do not have a sphragis. Females have been observed ovipositing on rocks adjacent to host *Sedum.* Ova hibernate.

Parnassius eversmanni thor
Remarks: In nature, the females oviposit near the probable host, which is *Corydalis pauciflora*. In captivity the females readily oviposit on material near the *Corydalis* plants.

Papilio
Remarks: *Papilio* eggs perish if kept in an airtight container. They should be kept on white paper towel in a plastic container with a chiffon top and misted occasionally. Larvae can be transferred to the host with a camel's-hair brush or teasing needle as they hatch, or when hatching is near the eggs can be put on the host.

Papilio machaon group females normally oviposit readily in captivity. *Papilio glaucus* group females are rather fussy about ovipositing in the lab. Females that were reared on *Foeniculum vulgare,* after mating, will oviposit on *F. vulgare*.

Papilio coloro
Host: *Thamnosma montana*
Lab hosts: *Foeniculum vulgare, Ruta graveolens*
Remarks: Adult abundance is greatly determined by sufficient and timely moisture. The best plants to find larvae on are those growing on the shoulder of the road or other places where the road was bulldozed, stimulating fresh growth (or germination) of the plants. Due to run-off, available moisture is much greater here, resulting in the new growth on which the females love to oviposit. To be sure of getting both adult color forms, it is best to obtain ova from captive females. Since *Thamnosma* plants do not have much food growing on them, the lab hosts are preferable for rearing. In Utah, black adults (form *clarki*) seem to increase in abundance during the summer months. They are never common in Utah.

Papilio bairdii (including ssp. ***oregonius***)
Hosts: *Artemisia dracunculus, Cymopterus duchesnensis, Lomatium grayi grayi* (In years with a population explosion, we have found larvae on *Lomatium junceum*).
Lab host: *Foeniculum vulgare*
Remarks: Population numbers can drastically fluctuate, producing large numbers in some years and very few in other years. Checking plants that are growing near a watercourse can be very productive where population size warrants. Where yellow (*brucei*) and black (*bairdii*) forms fly together, obtaining eggs from captive females is a good way of obtaining numbers of both forms. *P. bairdii* is multiple-brooded so the pupae usually emerge in the same year.

Papilio brevicauda bretonensis
Lab hosts: *Daucus carota, Lomatium dissectum, Foeniculum vulgare*
Other's host: *Lingusticum scothicum*
Remarks: Keep watch on pupae for a month or so, as some may break diapause. Most larvae reared on *Lomatium dissectum* will die as large fifth-instar or prepupa.

Papilio zelicaon (including form ***nitra***)
Hosts: *Lomatium dissectum, L. grayi grayi, Zizia aptera, Sphenosciadium capitellatum*
Lab host: *Foeniculum vulgare*
Other's host: *Musineon tenuifolium*
Remarks: The surest way to get both forms, in good numbers, is to get ova from captive females. Larvae can be found.

Papilio machaon aliaska
Host: *Petasites sagittatus*

Papilio machaon pikei
Host: *Artemisia draucunculus*
Lab host: *Foeniculum vulgare*
Remarks: With both *machaon* subspecies, some larvae can be found.

Papilio polixenes asterius
Lab host: *Foeniculum vulgare*

Papilio indra indra (includes western Nebraska ssp.)
Hosts: *Lomatium graveolens, Cymopterus terebinthinus*
Other's host: *Musineon tenuifolium*
Remarks: *P. indra* colonies in Salt Lake and Davis counties use *Lomatium graveolens.* To the north in Cache County, they use *Cymopterus terebinthinus. Papilio indra* in Cache County die when reared on local *Lomatium graveolens* but do fine on *Lomatium graveolens* from Davis or Salt Lake County. This inconsistency is puzzling. It may have to do with the soil where it is growing. We have found that *L. graveolens* and *C. terebinthinus* may be used to rear many indra subspecies. We have had many losses on *L. graveolans* and none on *C. terebinthinus.* The older stalks on the periphery of each *Lomatium* should be discarded when gathering plant to feed larvae. The stalks in the center are fresher and last longer. Unlike most plants, *Lomatium* and *Cympoterus* spp. will stay fresh longer if they are not put in a tub or vase of water. Put the cuttings in a plastic garbage bag and place in an ice chest. Refrigerated plant is safe to use for 3 days but no longer. Eggs from a female are good of course but females of all subspecies can be hard to locate at times. Eggs and larvae can be collected in good numbers. Plants that are growing against rocks are the most productive. Eggs and small larvae will usually be found on the plant's periphery. Larger larvae may be hiding in the center of the plant, or off the plant entirely.

Papilio indra minori
Hosts: *Lomatium junceum, L. eastwoodii, L. parryi, Cymopterus terebinthinus*
Lab hosts: *Lomatium graveolens*
Remarks: Population numbers vary greatly due to parasitism and rainfall. Keep pupae under long photoperiod for a month or more, watch closely, and mist daily. Some might emerge.

Papilio indra (UT west desert segregate)
Host: *Lomatium grayi* var. *depauperatum*
Lab hosts: *Lomatium graveolens, L. junceum, Cymopterus terebinthinus calcerea.*

Papilio indra calcicola
Hosts: *Lomatium parryi, L. scabrum*
Lab host: *Lomatium junceum, Cymopterus terebinthinus*
Remarks: A highly variable taxon.

Papilio indra shastensis
Host: *Cymopterus terebinthinus, Lomatium macrocarpum*
Lab host: *Lomatium graveolens*

Papilio indra pergamus
Hosts: *Taushia parishi, T. arguta*
Lab host: *Lomatium graveolens*

Papilio indra fordi
Host: *Cymopterus panamintensis*
Lab host: *Cymopterus terebinthinus*
Remarks: Late instar larvae feed fine on *Lomatium parryi* but first-instars do not do as well on it.

Papilio canadensis
Lab hosts: *Populus fremontii, P. tremuloides*

Papilio rutulus
Hosts: *Populus tremuloides, P. lombardii, Salix* spp.
Lab host: *Populus fremontii*
Remarks: Immatures can be found.

Papilio glaucus
Host: *Prunus serotina*
Lab host: *Salix exigua*
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Papilio multicaudatus
Hosts: *Fraxinus pennsylvanica, Prunus virginiana*
Remarks: Frequently large numbers of larvae can be collected. Try places of new construction where it has been landscaped with many small host trees. Also, seek out isolated host plants with new growth. We have also found larvae in numbers in Evanston, Green River, Rock Springs, and Rawlins, Wyoming, where cultivated ash grows in corporate areas of these cities.

Papilio eurymedon
Hosts: *Ceanothus velutinus, Prunus virginiana*
Lab host: *Prunus serotina*
Remarks: On several occasions we have had a small number of pupae remain in diapause until the second spring.

Papilio cresphontes
Host: *Citrus* sspp.
Remarks: Larvae can be found in good numbers on isolated plants. Always seek out new growth especially suckers coming out from near the trunk of the mature tree. Larvae do not feed on older leaves.

Papilio xuthus
Host: *Citrus* sspp.

Battus philenor philenor
Host: *Aristolochia watsoni*
Lab hosts: *Aristolochia tomentosa, A. druior, A. fimbriata*
Remarks: *Aristolochia watsoni* is a very prostrate plant. It would usually go uncut if the area were mowed. Many larvae can be collected in the late afternoon, however. As soon as the sunlight hits at a sharp angle many larvae crawl up on tall plants. They can be easily seen from quite a distance. By carefully searching the understory below the larvae that you see you will usually find its host. More often than not there will be more larvae on it. You can collect until it is too dark to see or for a while later if you have a good lantern.

Battus philenor hirsuta
Host: *Aristolochia californica*
Remarks: Pupae can be found in the winter, often in good numbers. The host is a large vine usually growing around a tree or shrub. Pupae can be found on the vine or nearby trees and posts. The pupae on the trees or posts are usually no more than 3 feet above the ground. They are easy to see when there is no foliage to block your view. In season, larvae should be easy to find.

PIERIDAE:
Remarks: Monitor hatching ova or separate ova, as hatching larvae will often eat other ova.

Colias:
Remarks: For large numbers of immatures of all *Colias*, it is best to get ova from females. The larvae of *Colias eurytheme*, *Colias alexandra*, and *Colias philodice* will not diapause if reared with a 24 hour photoperiod. It is best to use a 24 hour photoperiod for all species of *Colias*. Constant light accelerates larval development and, with some individuals or species, prevents diapause. Any taxon that might not diapause (that we are aware of) will be mentioned in the species account. *Colias* are very hard to rear as they are highly prone to disease. The easiest and best way to rear all *Colias* is to use potted plants.

Colias larvae that always diapause will not leave drying plant in search of fresh food, but will just diapause on the plant. Potted plants stay fresh and the larvae will grow to their maximum diapausing instar. If only cut plant is available the containers must be designed so they can be placed in the sun for a few hours a day and then put in the lighted lab before sundown. Ultraviolet rays greatly reduce the chance of disease. Once a day carefully remove the sleeve and check the plant for freshness and add water to the water bottle. When the plant freshness starts to decline transfer each larvae to the leaf of a fresh plant.

Colias eurytheme
Hosts: *Medicago sativa, Lupinus argenteus, Astragalus lentiginosus*
Lab host: *Thermopsis montana*

Colias philodice eriphyle
Hosts: *Medicago sativa, Astragalus cicer, A. lentiginosus, Lupinus argenteus*
Lab host: *Thermopsis montana*

Colias interior
Lab hosts: *Vaccinium caespitosum, V. angustifolium, Vaccinium* sp.
Remarks: Females fly in open timber. When shadows are long few females are flying.

Colias pelidne skinneri
Lab host: *Vaccinimum myrtilloides*
Remarks: In timbered areas, females do not fly much when sunlight comes at too low of an angle.

Colias gigantea gigantea
Lab host: *Salix exigua, Salix* sp.
Remarks: An occasional larva will not diapause when reared with 24-hour photoperiod. These have always been females.

Colias gigantea inupiat
Host: *Salix lanata*
Lab host: *Salix exigua*

Colias gigantea harroweri
Host: *Salix* spp.
Lab host: *Salix exigua, Salix* sp.

Colias scudderi
Hosts: *Vaccinium caespitosum, V. myrtilloides, Salix planifolia*
Lab host: *Salix exigua*

Colias boothi thula
Hosts: *Hedysarum mackenziei, Astragalus arcticus*

Colias canadensis
Host: *Lupinus arcticus*
Lab hosts: *Hedysarum boreale, Lupinus* (russell hybrids)

Colias hecla glacialis
Hosts: *Astragalus arcticus, Hedysarum mackenziei*
Lab Host: *Astragalus cicer*

Colias nastes nastes
Remarks: Oviposition observed on *Astragalus arcticus*

Colias nastes aliaska
Host: *Oxytropis borealis*

Colias nastes streckeri
Lab hosts: *Astragalus cicer, Astragalus* sp.

Colias palaeno chippewa
Host: *Vaccinium uliginosum*
Lab host: *Vaccinium caespitosum*

Colias mossi
Remarks: Oviposition observed on *Astragalus uniflores.*

Colias lesbia
Host: *Medicago sativa*

Colias dimera
Remarks: Oviposition observed on *Medicago sativa, Trifolium* sp.

Colias weberbaueri
Remarks: Oviposition observed on *Trifolium* sp. and *Medicago sativa.*

Colias vauthieri vauthieri
Host: *Trifolium* sp.
Lab host: *Medicago sativa*

Colias vauthieri cunninghami
Remarks: Oviposition observed on *Astragalus* sp.

Colias flaveola mendozina
Remarks: Oviposition observed on *Astragalus* sp.

Nathalis iole
Host: *Bidens cernua*
Lab host: *Tagetes* sp.

Eurema nicippe
Hosts: *Senna hirsuta* var. *glaberrima, S. covesii*

Zerene eurydice
Host: *Amorpha californica*
Remarks: Larvae refuse *Medicago sativa* and *Melilotus officinale* in the lab. Larvae that fed on *Trifolium repens* in the lab perished either because of lab host incompatibility or disease.

Pieris napi macdunnoughi
Pieris napi sequoia
Pieris napi reicheli
Pieris napi venosa
Pieris napi marginalis
Hosts: *Desucurainia richardsonii*
Lab hosts: *Brassica nigra, Cardaria draba, Dentaria californica, Isatis tinctoria, Arabis holboelli, Arabis* sp., *Rorippa nastertium-aquaticum*
Remarks: If larvae are reared with an 8-hour photoperiod the adults will be the dark spring form. A long photoperiod produces the light summer form. *Rorippa nasturtium-aquaticum* is a usable lab host from early spring to fall.

Pieris rapae
Hosts: *Cardaria draba, Isatis tinctoria, Arabis sparsiflora*
Remarks: Wherever unsprayed crucifers grow in cities, suburbs, or disturbed areas, larvae and ova can be found.

Pieris occidentalis
Hosts: *Thlaspi montanum, Descurainia californica, Cleome serrulata, Brassica nigra*
Lab hosts: *Brassica nigra, Isatis tinctoria, Cardaria draba*

Pieris protodice
Hosts: *Brassica nigra, Sisymbrium officinale, Stanleya pinnata, Cleome serrulata, Cardaria draba, Sisymbrium altissimum*
Lab host: *Cardaria draba*

Pieris beckerii
Hosts: *Stanleya pinnata, Brassica nigra, Cleome serrulata, Descurainia pinnata, Sisymbrium altissimum*
Lab host: *Isatis tinctoria*
Remarks: Occasionally larvae can be found in large numbers. Last instar larvae provide conspicuous feeding damage as they strip the inflorescense of the host.

Pieris sisymbrii
Hosts: *Arabis microphylla, A. sparsiflora, A. perennans, Isatis tinctoria, Descurainia pinnata, Cardaria draba*
Lab hosts: *Sisymbrium altissimum*

Pieris sisymbrii nigravenosa
Hosts: *Streptanthus cordatus, Descurainia pinnata, Arabis holboelli*
Lab hosts: *Arabis perennans, Cardaria draba, Isatis tinctoria, Sisymbrium altissimum*

Anthocharis lanceolata lanceolata
Lab hosts: *Arabis holboelli, A. sparsiflora*
Other's host: *Streptanthus tortuosus*

Anthocharis cethura pima
Hosts: *Streptanthella longirostris, Descurania pinnata, Caulanthus lasiophyllum* var. *utahensis, Sisymbrium irio*
Lab host: *Arabis perennans*
Remarks: We have had mixed results using *Sisymbrium irio* as a lab host even though females occasionally oviposit on it in nature. Pupae can diapause for up to 11 years in the lab and still produce healthy adults.

Anthocharis sara sara
Host: *Dentaria californica*
Lab hosts: *Arabis sparsiflora, Isatis tinctoria*

Anthocharis sara pseudothoosa
Hosts: *Descurainia pinnata, Arabis perennans* (Fig. 4)
Lab hosts: *Arabis glabra, Isatis tinctoria*

Anthocharis thoosa thoosa
Hosts: *Arabis perennans, Arabis holbellii, Descurainia pinnata, Streptanthella longirostris, Isatis tinctoria*
Lab hosts: Any species of *Arabis* will serve as a lab host. Larvae eventually die on *Streptanthus cordatus* and *Brassica nigra*.

Anthocharis thoosa colorado
Hosts: *Descurainia pinnata, Arabis* spp.
Lab hosts: Any species of *Arabis* will serve as a lab host.

Anthocharis thoosa inghami
Hosts: *Arabis perennans, Descurainia pinnata, Streptanthella longirostris,*
Lab hosts: Any species of *Arabis* will serve as a lab host.

Anthocharis julia julia
Hosts: *Arabis glabra, A. holboelli, A. perennans, Descurania pinnata, Streptanthella longirostris*
Lab hosts: *Isatis tinctoria*

Anthocharis julia browningi
Hosts: *Arabis glabra*, *A. perennans, A. sparsiflora* var. *subvillosa, Arabidopsis thaliana, Descurainia pinnata*
Lab hosts: *Arabis microphylla, Isatis tinctoria, Streptanthella longirostris.* (Note: Any species of *Arabis* will serve as a lab host. Larvae accept but perish on *Sisymbrium altissimum, Cardaria draba,* and *Chorispora tenella.* Larvae refuse *Capsella bursa-pastoris* and die.

Anthocharis julia stella
Hosts: *Arabis perennans, Descurainia pinnata*
Lab hosts: *Isatis tinctoria*
Remarks: Females from the *Anthocharis julia stella* TL near Marlette Peak, Carson City, Nevada, do not oviposit on the inflorescense as do many other taxa within the *Anthocharis sara* complex. They oviposit on the center stalk towards the middle. This likely happens because deer or other animals consume inflorescenses.

Anthocharis julia sulfuris
Hosts: *Descurainia pinnata, Arabis drummondii, Arabis* sp.
Lab host: *Isatis tinctoria*
Remarks: Females of *Anthocharis julia sulfuris* from Boise County, Idaho oviposit near the inflorescense of *Descurainia pinnata* whereas females of *Anthocharis thoosa thoosa* oviposit more towards the middle to the upper two thirds of the plant.

Anthocharis julia flora
Lab hosts: *Arabis glabra, Isatis tinctoria*

Anthocharis julia alaskensis
Lab host: *Arabis glabra*
Remarks: Pupae develop to produce adults approximately 6 days earlier than do Colorado *Anthocharis julia julia* under identical lab conditions.

Anthocharis midea annickae
Lab host: *Arabis holboelli, A. sparsiflora, A. perennans*
Other's host: *Arabis glabra*

Euchloe hyantis lotta
Hosts: *Sisymbrium altissimum, Descurainia pinnata, Stanleya pinnata, Streptanthus cordatus, Caulanthus lasiophyllum utahensis*
Lab host: *Isatis tinctoria*
Remarks: Can occasionally find larvae in good numbers. Females oviposit towards the inflorescense of the host. Adults fly usually after *Pieris sisymbri nigravenosa* and *Anthocharis thoosa thoosa* have reached their peak flight.

Euchloe hyantis hyantis
Lab hosts: *Arabis holboelli, Arabidopsis spp.*
Other's host: *Streptanthus tortuosus*
Remarks: Larvae accept but die on *Cardaria draba* in the lab.

Euchloe ausonides coloradensis
Hosts: *Arabis sparsiflora, A. perennans, Isatis tinctoria, Descurainia pinnata, Cardaria draba*
Lab hosts: *Arabis holboelli, Arabidopsis spp.*
Other's host: *Streptanthus tortuosus*

Euchloe olympia
Hosts: *Arabis glabra, Boechera fendleri, Descurainia pinnata,*
Lab hosts: *Arabis* sp.*, Isatis tinctoria*
Remarks: Larvae are similar to *Euchloe ausonides coloradensis* at early instars but look darker at later instars. Like other Euchloini larvae prefer fruits and flowers.

Ascia monuste monuste
Ascia monuste phileta
Hosts: *Capparis* sp.
Lab host: *Tropaeolum majus*
Other's host: *Lepidium virginicum*
Remarks: Length of photoperiod does not appear to affect the darkness of adults.

Neophasia menapia menapia
Hosts: *Pinus edulis, P. ponderosa*
Remarks: Overwinters as ova. Larvae camouflage well against its host. Before years of heavy flights, post-diapause late instar larvae can be found if portions of tree are mist sprayed with water because the larvae jerk back and forth violently. This suggests that the mist may be perceived as some sort of predator making the larvae very conspicuous.

Daunus plexippus
Host: *Asclepias speciosa* (Fig. 3)
Remarks: Females seem to prefer plants that are growing among scattered trees or shrubs.

Daunus gilippus thersippsus
Hosts: *Sarcostemma cynanchoides, Asclepias speciosa, A. erosa*

Agraulis vanillae incarnata
Host: *Passiflora* sp.

SATYRIDAE:
Remarks: Overall, female satyrids will oviposit liberally in the lab. If you feel comfortable dealing with potted grasses and sedges rearing many multivoltine taxa of satyrids is not too difficult. The problem arises with some univoltine taxa that are difficult to force through to adult under lab conditions. Diapause for many satyrids is not the rigid concept it can be for many other species of butterflies, except skippers. For example, some species of satyrids, i.e., *Coenonympha tullia brenda*, will feed through to 4th instar and then slow down its feeding and growth rate to the point that larvae will not grow nor progress to the next instar. It is not always clear as to when these larvae should be placed into diapause or attempted to be forced through to adults under a 24-hour light scheme.

Megisto cymela, Erebia magdalena, and *Neominois ridingsi* are other examples of satyrids which feed extremely slow under lab conditions. Their feeding rate seems to slow down even further as they approach mature fifth-instars, suggesting that some *Neominois* may overwinter in that stage.

Coenonympha tullia ampelos
Coenonympha tullia brenda
Coenonympha tullia eryngii
Lab Host: *Poa pratensis*
Remarks: Obtain ova from live females. Females prefer to oviposit on dead blades. Larvae will feed on many species of potted grass. It is not generally difficult to push larvae of multivoltine populations of the *Coenonympha tullia* complex through to adult under lab conditions. However, univoltine populations either diapause at 3rd or 4th instar, or slow down their feeding rate as to continue feeding without growing or molting to the next instar.

***Cercyonis* spp.**

Remarks: Use a similar rearing strategy for *Cercyonis pegala, C. sthenele, C. meadi* and *C. oetus*. Set up live females in a small cage. Females seem to prefer to oviposit on dead blades of any bunch grass, including *Poa pratensis*. In the lab ova postpone hatching for roughly 17 days and unfed 1st instar larvae diapause. This is oddly similar strategy as compared to *Speyeria* spp. Larvae can be forced out of diapause by placing them on fresh grass blades and placing them under 24 hours of light. Once larvae start feeding it is advisable to then rear them through the fall/winter months on any convenient species of potted grass.

Cercyonis meadi mexicana

Lab hosts: *Bouteloua gracilis, Poa pratensis,* Most species of grasses will serve as a lab host.

Megisto cymela

Lab host: *Bromus inermis*

Remarks: Both *Megisto cymela* and *Megisto rubricata* larvae have taken a long time to rear through to adults under lab conditions (4-5 months) either due to the usage of problematic grasses or artificial photoperiod problems.

Megisto rubricata cheneyorum

Lab host: *Bromus inermis*

Remarks: Like many satyrids, larvae will accept many species of grasses in the lab. Mature larvae will aestivate and not pupate until exposed to treatments of mist spraying, simulating summer monsoons in the desert southwest.

Neonympha areolata areolata

Lab host: *Poa pratensis*

Remarks: Females will oviposit on grasses as well as sedges. Larvae will accept grasses in the lab but generally do better on sedges.

Satyrodes appalachia appalachia

Hosts: *Carex stricta*

Lab host: *Cyperus esculentus*

Remarks: Females will oviposit on sedges. Larvae will accept many varieties of sedges in the lab. Finding larvae in the field can be difficult.

Erebia magdalena magdalena

Lab host: *Poa pratensis*

Remarks: In the field females oviposit haphazardly around rocks and talus near its native grasses. Under lab conditions, females do not necessarily even need grasses or a lot of sunlight to oviposit. Young instar larvae are extremely wary and should be raised on potted grasses surrounded by nylon netting or chiffon to avoid escape (Fig. 15). Young instars that wander off into water have proven to be drown-resistant. Larvae take many months in the lab to feed from first to fifth-instar. Larvae likely diapause as mature 5th instar; but this is not proven.

Neominois ridingsi dionysius

Lab host: *Pseudoroegneria spicata*

Remarks: Caterpillars grow very slowly in the lab and likely diapause as 5th instar.

Neominois wyomingo

Host: *Pseudoroegneria spicata*

Remarks: Unfed 1st instars diapause; however, larvae will feed on fresh grasses if provided. Larvae grow very slowly in the lab.

Asterocampa clyton texana
Asterocampa clyton clyton
Asterocampa clyton flora
Host: *Celtis reticulata*
Lab host: *Celtis occidentalis*
Remarks: Larvae and pupae can be found.

Asterocampa celtis celtis
Asterocampa celtis montis
Asterocampa celtis antonia
Host: *Celtis reticulata*
Lab host: *Celtis occidentalis*
Remarks: Larvae can be found. New growth on isolated plants may be best.

Asterocampa leilia
Host: *Celtis pallida*
Remarks: Larvae can be difficult to find. The best strategy is to look for new growth on isolated plants. 1st instar larvae refuse *Celtis reticulata* in the lab

Nymphalis antiopa
Hosts: *Salix exigua, Celtis reticulata, Ulmus pumila*
Remarks: Occasionally larvae can be collected in large numbers.

Nymphalis californica
Hosts: *Ceanothus velutinus, C. martinii*
Remarks: Large numbers of larvae can be found, sometimes in varying sizes in close proximity. They can defoliate their host.

Nymphalis milberti
Host: *Urtica dioica*
Remarks: Larvae are easily collected in large numbers. Larvae are gregarious at early instars and then tend to scatter somewhat at later instars and make nests similar to *Vanessa atalanta*.

Vanessa atalanta
Host: *Urtica dioica*
Remarks: Occasionally larvae can be found in good numbers. Larvae create nests.

Vanessa cardui
Hosts: *Cirsium undulatum, Carduus nutans, Lupinus argenteus, L. sericeus, Helianthus annuus*
Remarks: Larvae can be found in good numbers. It can be a common urban dweller.

Vanessa annabella
Hosts: *Malva neglecta, Sida hederacea*
Remarks: Larvae and ova can be collected in good numbers on isolated plants. Late summer, until a hard freeze, is the most productive time. Host *Malva neglecta* is somewhat cold weather resistant. Normally adults overwinter but larvae at any instar can survive the winter as well. Instead of diapausing larvae can feed at a very slow rate during the winter when temperatures are above freezing.

Vanessa virginiensis
Host: *Anaphalis margaritacea, Gnaphalium palustre*
Remarks: Can find ova and larvae in good numbers.

Precis coenia
Hosts: *Plantago major, P. lanceolata, Antirrhinum majus*
Remarks: Larvae can be found on host in agricultural areas. Adult phenotypes can vary in the lab when larvae are subjected to variable photoperiod and temperature.

Precis nigrosuffusa
Lab host: *Antirrhinum majus*
Other's host: *Mimulus* sp.
Remarks: Larvae can be found.

Anartia jatrophae guantanamo
Host: *Lantana* sp.
Lab host: *Plantago major*

***Polygonia* spp.**
Remarks: Some *Polygonia* species have two seasonal forms. Larvae of these reared with 24-hour photoperiod produce the non-hibernating form. Those reared with 8-hour photoperiod produce the hibernating form.

Polygonia faunus arcticus
Polygonia faunus cenveray
Host: *Salix scouleriana*
Lab host: *Salix* sp.
Remarks: Larvae can be found.

Polygonia satyrus (coastal and inland forms)
Host: *Urtica dioica*
Remarks: Larvae make a conspicuous nest. See http://utahbutterflies.ning.com/video/satyr-comma-and-milberts for video tutorial showing the differences between larval nests of *Polygonia satyrus* vs. *Nymphalis milberti.*

Polygonia gracilis zephyrus
Hosts: *Ribes montigenum, R. viscosissimum, R. cereum*
Lab host: *Ribes oxyacanthoides*
Remarks: Last instar larvae tend to feed and strip leaves towards the ends of branches on shrubs. Larval strip pattern is noticeable and last instar larvae can be found if timing is correct. Larvae that feed on *Ribes montigenum* can camouflage themselves well.

Polygonia oreas oreas
Polygonia oreas threatfuli
Lab hosts: *Ribes oxyacanthoides, Ribes s*p.
Other's host: *Ribes divaricatum*
Remarks: Females will often hover next to the host. They prefer using scattered bushes interspersed in an open clump with other shrubs or small trees.

Polygonia interrogationis
Lab host: *Ulmus pumila*

Adelpha eulalia
Hosts: *Quercus turbinella, Q. gambelii*
Lab hosts: *Quercus robur, Q. alba*
Remarks: Can find an occasional larva. Most females are reluctant to lay in captivity. In nature females have been observed ovipositing on leaves that are more concealed within the body of the bush, making the finding of immatures more difficult. Similar to *Limenitis*, 1st instar larvae construct a perch extending the vein of the leaf.

Limenitis lorquini lorquini
Limenitis lorquini burrisonii
Limenitis lorquini pallidafacies
Hosts: *Salix* spp., *Populus angustifolia, Amelanchier alnifolia*
Lab hosts: For all *Limenitis, Populus fremonti, Salix exigua*
Remarks: Most *Limenitis* that are reared with a 24-hour photoperiod will not diapause. Freshly molted 2nd instars are especially sensitive to monitoring photoperiod. 1st instars do not. In habitats where the hosts are scattered or confined ova and small larvae can be collected. During the late fall or winter when most of the leaves have fallen it is not too difficult to spot hibernacula. As is true with other *Limenitis* species, females oviposit well in a cage with high humidity and exposed to filtered sunlight. Immatures of all *Limenitis* can be found.

Limenitis lorquini x ***Limenits weidemeyeri***
Hosts: *Prunus virginiana, Salix* sp.
Remarks: A very occasional hibernacula can be found along a willow-lined stream. Less than a hundred feet up on the dry hillside, short, scattered chokecherries were growing. Nearly every *Prunus* plant had a hibernaculum and sometimes as many as six. This is a typical scenario in the dry southwest.

Limenitis weidemeyeri weidemeyeri
Limenitis weidemeyeri oberfoelli
Limenitis weidemeyeri angustifascia
Limenitis weidemeyeri latifascia
Hosts: *Amelanchier alnifolia, Populus tremuloides, P. angustifolia, Salix* sp., *Prunus virginiana*

Limenitis archippus archippus
Limenitis archippus obsoleta
Limenitis archippus lahontani
Limenitis archippus floridensis
Hosts: *Salix exigua*, *S. laevigata, Populus fremontii*
Remarks: Females prefer to lay on branches that are hanging over water

Limenitis archippus obsoleta x ***Limenitis astyanax arizonensis***
Host: *Salix* sp.
Lab host: *Populus fremontii*

Limenitis astyanax astyanax
Limenitis astyanax arizonensis
Hosts: *Prunus serotina, P. virginiana, Salix* sp., *Populus* sp.

Limenitis arthemis rubrofasciata
Host: *Salix* sp.
Lab hosts: *Populus balsamifera, P. tremuloides*

Euphydryas phaeton phaeton
Euphydryas phaeton ozarke
Hosts: *Chelone glabra*
Lab hosts: *Castilleja chromosa, Penstemon cyananthus*
Remarks: Post diapause larvae have been found on *Castilleja coccinea* and *Virburnum recognitum.*

Euphydryas gilletti
Hosts: *Lonicera involucrata, Veronica wormskjoldi*
Remarks: This taxon has a 2-year life cycle; therefore, the larvae overwinter for two winters. Afer the first winter the second diapause can be avoided by rearing with a 24-hour photoperiod. Egg clusters and small larvae are easy to locate. Females like scattered plants near a stream or on a dry hillside above it. Post-diapause larvae can be found in good numbers in leaf litter under the host or on branches in the plants interior.

Euphydryas anicia anicia
Euphydryas anicia maria
Euphydryas anicia alena
Euphydryas anicia bernadetta
Euphydryas anicia windi
Euphydryas anicia macyi
Euphydryas anicia veazieae
Euphydryas anicia wheeleri
Euphydryas anicia hermosa
Hosts: *Penstemon gloriosus, P. utahensis, P. cyananthus, P. palmeri, Penstemon* sp.*, Castilleja chromosa, Lonicera involucrata, Symphoricarpus oreophilus*
Lab hosts: All *Euphydryas* that use *Castilleja* or *Penstemon* will switch from one to the other.
Other's host: *Bessaya wyomingensis*
Remarks: Egg clusters and prediapause larvae can be found. Prediapause larvae feed gregariously in silk nests and disperse to plants up to 500 feet away before diapause and can be found as post-diapause larvae on these plants the next year. An individual female will normally lay her eggs in a relatively small area. *Euphydryas* break diapause early and can be found as soon as their host has useable growth. Even if no larvae are visible on a plant, search all the understory and debris nearby. Post-diapause larvae that feed on shrubs are not sensitive to dry and warm conditions and may be taken directly to the lab for rearing. Post-diapause larvae like to rest on dead foliage. Post-diapause larvae can rediapause if overcrowded. However, larvae that have re-diapaused can break diapause yet again the same year if exposed to another cold treatement of one month.

Euphydryas colon nevadensis
Euphydryas colon sperryi
Hosts: *Symphoricarpus oreophilus*
Lab hosts: *Penstemon cyananthus, Symphoricarpus* sp.
Remarks: Post diapausal larvae can be found in good numbers. They are easiest to see in early spring when the host has just leafed out. *Penstemon* and *Castilleja* grows very common among the *Symphoricarpus* but no larvae were found on them.

Euphydryas chalcedona chalcedona
Euphydryas chalcedona olancha
Euphydryas chalcedona klotsi
Euphydryas chalcedona macglashani
Hosts: many *Penstemon* spp., *Keckiella antirrhinoides*
Lab hosts: *Penstemon cyananthus, Penstemon palmeri*

Euphydryas editha lehmani
Euphydryas editha colonia
Euphydryas editha baroni
Hosts: *Castilleja chromosa*
Lab hosts: *Penstemon cyananthus, Collinsia* sp.
Other's host: *Penstemon* sp.*, Plantago lanceolata*

Phyciodes mylitta mylitta
Hosts: *Cirsium undulatum, C. vulgare*
Remarks: Occasionally larvae can be found in good numbers. When reared with a 24-hour photoperiod most *Phyciodes* will not diapause. Females will sometimes oviposit on young *Cirsium vulgare* basal rosettes in the fall where the larvae overwinter under the leaves.

Phyciodes orseis orseis
***Phyciodes orseis* ssp.** (CA)
Lab host: *Cirsium undulatum*
Other's host: *Cirsium cymosum*
Remarks: At least a few larvae will not diapause when reared with a 24-hour photoperiod. In some populations, most of the larvae will not diapause. Immatures can be found with regularity. Females like to use plants that are growing against a rock, tree or windfall.

Phyciodes pulchella pulchella
Phyciodes pulchella shoshone
Phyciodes pulchella Camillus
***Phyciodes pulchella* ssp.** (CA)
Host: *Aster foliaceus*
Lab Hosts: *Aster chilensis*, *Aster* sp.
Remarks: Larvae can be found.

Phyciodes pallida pallida
Phyciodes pallida barnesi
Lab host: *Cirsium undulatum*

Phyciodes cocyta cocyta

Phyciodes cocyta selenis
Lab hosts: *Aster foliaceus, A. chilensis, Aster* sp.

Phyciodes texana texana
Lab hosts: *Dicliptera resupinata, Beloperone guttata*
Remarks: Immatures have been found.

Poladryas arachne arachne
Hosts: *Penstemon utahensis, P. humilis*
Lab host: *Penstemon cyananthus*
Remarks: Occasionally post-diapause larvae can be found. Post-diapause larvae refuse *P. cyananthus* but larvae obtained from ova thrive on it. Most larvae reared from ova will not diapause when reared with 24-hour photoperiod.

Thessalia leanira leanira
Thessalia leanira wrighti
Thessalia leanira alma
Thessalia leanira elegans
Thessalia leanira oregonensis
Hosts: *Castilleja chromosa, C. sulphurea*
Lab host: *Castilleja* spp.
Other's host: *Castilleja affinis*

Remarks: Depending on sufficient moisture, large numbers of post-diapause larvae can be collected. In areas where *Euphydryas* are sympatric, *leanira* will be found after most *Euphydryas* have finished. The reason for this is that post-diapause larvae will molt before resuming feeding in the spring, whereas *Euphydryas anicia* complex larvae will feed immediately, placing *Euphydryas* larvae ahead of *Thessalia* larvae by approximately 1-2 instars. Most larvae will be found in the understory and surrounding vegetation. Larvae can be found as much as 3 feet from the host. Larvae of *elegans* will go through to adult if reared with a 24-hour photoperiod. The other subspecies diapause. Larvae of *wrighti* that have re-diapaused will resume feeding 1 month later if separated and placed on fresh host after a cold treatement.

Thessalia theona thekla
Hosts: *Castilleja lanata, C. laxa*
Lab host: *Castilleja chromosa*
Remarks: Post-diapause larvae can be found in good numbers. Larvae of *T. fulvia* and *T. cyneas* may be found in the same area. The larvae lack bright coloration.

Thessalia fulvia fulvia
Thessalia fulvia coronado
***Thessalia fulvia* ssp.** (mostly AZ)
Lab host: *Castilleja chromosa*
Other's hosts: *Castilleja laxa, C. lanata, Castilleja* sp.
Remarks: Immatures can be found in good numbers.

Thessalia cyneas
Lab host: *Castilleja chromosa*
Other's host: *Castilleja laxa*
Remarks: Post-diapause larvae can be found in limited numbers.

Thessalia chinatiensis
Host: *Leucophylum minus*
Remarks: Larvae can be found in numbers

Chlosyne janais
Host: *Anisacanthus wrighti*
Remarks: The host is a low spreading shrub that grows in dense colonies. Often larvae of all instars can be found as well as pupae. When the plants are bathed in sunshine the larvae are hiding in shady interior branches or the understory. Larvae are up on the plant feeding in early morning and evening.

Chlosyne californica
Host: *Viguiera deltoides*
Remarks: When moisture has been sufficient larvae can be found in good numbers.

Chlosyne lacinia form ***adjustrix***
Chlosyne lacinia form ***crocale***
Host: *Helianthus annuus*
Remarks: Larvae of all sizes can be found. Early spring larvae usually produce form *adjustrix* adults. Larvae collected mid-summer will produce both forms.

Chlosyne gorgone gorgone
Lab host: *Helianthus annuus*

Chlosyne harrisi harrisi
Chlosyne harrisi liggetti
Chlosyne harrisi albimontana
Lab host: *Aster engelmannii*
Other's host: *Aster umbellatus*
Remarks: Have obtained ova and reared larvae on *A. engelmanni*. *C. harrisi liggetti* post-diapause larvae can be found in good numbers on *Aster umbellatus* near Spruce Knob, West Virginia.

Chlosyne nycteis nycteis
Chlosyne nycteis drusius
Lab host: *Helianthus annuus*
Other's host: *Helianthus annuus*

Chlosyne palla palla
Chlosyne palla eremita
Chlosyne palla flavula
***Chlosyne palla* ssp.** (3-CA)
***Chlosyne palla* ssp.** (MT)
Host: *Aster engelmannii*
Lab Host: For all subspecies: *Aster englemannii*
Other's hosts: *Aster* sp.
Remarks: When reared with a 24-hour photoperiod only an occasional larva will not diapause. Rearing post-diapause larvae with constant light is best. With a natural photoperiod about 50 percent of the larvae will rediapause. With 24 hours of light, 30 percent or less will rediapause.

Chlosyne hoffmani segregata
Lab host: *Aster engelmannii*
Other's host: *Aster brickellioides*
Remarks: With 24-hour photoperiod only an occasional larvae will rediapause.

Chlosyne gabbi gabbi
Lab hosts: *Aster chilensis, Corethrogyne filginifolia*
Remarks: Four females laid 5 egg clusters (one was very small) on *Aster engelmannii* as no natural host was available. Upon hatching the larvae fed for about 30 days before eventually dying. Females would not lay on *A. chilensis* but larvae thrived on it. When reared with 24 hour photoperiod an occasional larva will not diapause.

Chlosyne sterope sterope
Chlosyne sterope dorothyi
Chlosyne sterope acastus
Hosts: *Chrysothamnus viscidiflorus, C. greenei, Machaeranthera canescens, Pyrrocoma radiatus*
Lab host: *Aster engelmannii*
Remarks: Ova and larvae can be found in good numbers including an occasional pupa. Prediapause larvae of *C. sterope acastus* have always diapaused when reared under constant light. Of approximately 300 *C. sterope dorothyi* larvae reared from collected ova and 1st instar larvae, 92 went through to adults. 17 larvae of *C. sterope sterope* went through to adults (all females) and 87 larvae diapaused.

Chlosyne neumoegeni
Host: *Machaeranthera tortifolia*
Remarks: As with all desert species abundance is determined by sufficient timely moisture. Larvae can be collected in good numbers. They can be seen at a distance but a stealthy approach is advised. The slightest vibration of the host plant causes them to "jump ship" and drop to the understory.

***Chlosyne damoetas* ssp.** (UT, WY)
***Chlosyne damoetas* ssp.** (MT)
Lab host: *Aster engelmanni*
Remarks: These taxa are associated with *Solidago multiradiata* and *Erigeron leiomeris* the likely larval host plants. Females from all locations have laid egg clusters and the larvae have been reared on *Aster engelmanni.* Obtained ova from the UT and WY poplulations in 2001 and reared the 162 larvae to diapause. The majority diapaused as large 2nd instars, 14 molted to 4th instars, which fed very briefly and diapaused. The remainder diapaused as 3rd instars. In 2002, raised post-diapause larvae under 24-hour photoperiod where all but two larvae grew an instar and rediapaused. The two that went through to adult emerged as females. In nature, I think all would have diapaused. 2003 was a repeat of 2002. Two more female adults emerged and the rest diapaused as either large 3rd or 4th instars. In 2004 two males and one female emerged. All of the larvae diapaused as 4th instars. Sometime in the fall of 2004 all of the diapausing larvae died. In 2006 we obtained 200-300 eggs from the distinctive Montana subspecies and 13 larvae went through to adults; 5 males and 7 females. 31 diapaused as large 4th instars and the rest as large 3rd instars. In 2007 fifteen went through to adults. About 30 percent of the larvae diapaused as 4th instars; the rest as 3rd instars. In 2008 only a few larvae were alive when spring arrived, all died without breaking diapause.

***Boloria* spp.**
Remarks: There is an alien species of *Viola* that is toxic to *Boloria* and *Speyeria* larvae. This *Viola* is frequently grown in gardens.

Boloria kriemhild
Host: *Viola* sp.
Remarks: Larvae diapause at mid-instars when reared in the lab.

Boloria frigga sagata
Lab host: *Salix exigua, Salix* sp.*, Viola* sp.
Remarks: If reared with 24-hour photoperiod a good percentage will not diapause. The females oviposited on *Salix* sp. Larvae do well on *Salix* or *Viola*.

Boloria eunomia ursadentis
Host: *Viola adunca*

Speyeria diana
Lab Host: *Viola* sp.
Other's host: *Viola papilionacea*
Remarks: *Speyeria diana* can be reared on potted *Viola tricolor* but some do not do well on it. Unfed 1st instars will diapause. If you have *Viola* available you can break the larval diapause. Place the newly hatched larvae in a petri dish with new growth *Viola* leaf. Use 24-hour photoperiod and make sure the *Viola* is always fresh. This method gives you adults several months sooner and avoids the danger of your diapausing larvae dying. *Speyeria* females will oviposit well if placed in a paper grocery bag with a couple of *Viola* leaves. Fold the top shut and hold it closed with clothes pins or large paper clips.

Speyeria cybele charlotti
Speyeria cybele leto
Speyeria cybele letona
***Speyeria cybele* ssp.** (MT)
Lab hosts: *Viola adunca, V. tricolor*
Other's host: *Viola papilionacea, Viola* sp.

Speyeria nokomis apacheana
Lab host: *Viola* sp.

Speyeria idalia
Lab host: *Viola* sp.
Other's host: *Viola papilionacea, V. pedatifida*

Speyeria mormonia luski
Lab host: *Viola* sp.
Other's host: *Viola adunca, Viola* sp.

Speyeria atlantis nausicaa
Lab Host: *Viola* sp.
Other's host: *Viola* sp.

Speyeria edwardsi
Lab host: *Viola* sp.
Other's host: *Viola nuttalli*

Euptoieta claudia
Lab host: *Viola* sp.
Other's host: *Passiflora* sp.

Apodemia mormo mormo
Apodemia mormo virgulti
Apodemia mormo deserti
Apodemia mormo cythera
Apodemia mormo mejicana
Apodemia mormo duryi
Apodemia mormo nigrescens
Hosts: *Eriogonum inflatum, E. corymbosum, E. fasciculatum, E. brevicaule, E. umbellatum, E. wrightii, Krameria glandulosa*
Remarks: Larvae can be collected in good numbers. Larva usually live in a nest of leaves silked together. Larva using *Eriogonum inflatum* chew a hole into the inflated pod when it is green. They hide and eventually pupate in the dried pod. If the hole in the pod is silked over you know it is occupied. The larger the larvae you collect the better because they grow very slowly.

Apodemia palmeri
Hosts: *Prosopis glandulosa, Prosopis pubescens*
Remarks: When rearing in the lab, small larvae are reluctant to crawl from unusable plant if its cutting is laid on fresh plant. The larvae should be transferred with a camel's-hair brush.

LYCAENIDAE:
Remarks: When possible remove prepupae from rearing containers. Larvae are highly cannibalistic and will often eat prepupae or pupae.

Theclini:
Remarks: Almost all of the Theclini can best be reared by obtaining ova from females. The only reared Theclini that were obtained by other methods are *Habrodais grunus, Hypaurotis crysalus citima, Satyrium californicum, Satyrium tetra, Sandia mcfarlandi, Incisalia fotis, Callophrys comstocki, and Strymon bazochi*. These will be discussed with each species. *Habrodais grunus* and *Hypaurotis crysalus* are notorious for refusing to oviposit in captivity. To rear, they must be obtained as ova or larvae. Both species overwinter as ova. All *Satyrium* overwinter as ova. All *Callophrys, Incisalia*, and *Mitoura* overwinter as pupae.

Habrodais grunus
Host: *Quercus chrysolepis*
Remarks: Larvae can be collected in good numbers. Larvae can be found by inspecting the foliage or by placing a tarp under the branches and beating them with your net handle. If most of the larvae are small, beating will be more profitable. Some larvae may be *Satyrium auretorum.* There will also be a good supply of spiders, earwigs, moth larvae, etc.

Hypaurotis crysalus citima
Host: *Quercus gambelii*
Remarks: During the winter and spring following a good flight, eggs can be found in good numbers. Eggs are deposited at the base of next year's leaf buds. Cuttings of host do not stay fresh very long.

Harkenclenus titus immaculosis
Lab host: *Prunus virginiana*
Remarks: To obtain ova confine females on cuttings that have cracks and imperfections in the stems. Few leaves are needed. Also lay some twigs at the base of the cuttings to construct an understory.

Satyrium californica
Hosts: *Purshia tridentata, Cercocarpus montanus, Amelanchier utahensis, Ceanothus velutinus, Prunus virginiana*
Remarks: All attempts to obtain ova from females in captivity have been unsuccessful. Oviposition has been observed in nature (although this is very time consuming) and the ova were taken. Larvae are usually difficult to find. However, in one good colony we were able to find a good supply of larvae by looking for attendant ants. Racemes of *P. virginiana* or *C. velutinus* are the best to use for rearing. We have found pupae in good numbers on two occasions.

Satyrium sylvinus putnami
Satyrium sylvinus megapallidum
Host: *Salix exigua*
Remarks: Females lay best on cuttings with cracks, holes and other imperfections. If each cutting has twig stubs, that helps also. Females like to tuck all their eggs in such places. Very few leaves are needed.

Satyrium saepium
Hosts: *Ceanothus velutinus, Ceanothus* sp.
Remarks: Small larvae prefer flowers. Larvae were obtained by beating the hostplant branches adjacent to the flowers, and allowing them to fall into a net or other container.

Satyrium behri behri
Hosts: *Purshia tridentata, P. mexicana, Cercocarpus montanus, C. ledifolius*

Satyrium fuliginosum semiluna
Hosts: *Lupinus sericeus, L. argenteus*
Remarks: Ants, in some colonies, hollow out areas under most of the plants where S. *fuliginosum* flies and the larvae hide in these holes, tended by the ants. Often there are 3 or 4 larvae in a hole. The ants not only protect them from 6 and 8-legged predators but also from each other. They are very cannibalistic and must be reared separately. If you check the same holes a month earlier, you will find *Plebejus icarioides* larvae. Occasionally you find a late finisher when the *fuliginosum* larvae are quite small. Females oviposit in the ground at the base of the Lupine plants. To obtain ova from females the base of the plant must have some soil surrounding it. It probably also helps to have a few twigs and leaves on the soil.

Satyrium auretorum
Host: *Quercus chrysolepis*

Satyrium tetra
Host: *Cercocarpus betuloides*
Remarks: *S. tetra* larvae were obtained by the beating method. Many were parasitzed.

Satyrium liparops aliparops
Lab host: *Prunus virginiana*

Satyrium calanus godarti
Host: *Quercus gambeli*

Atlides halesus estesi
Hosts: *Phoradendron juniperinum, P. californicum*
Remarks: Host will last for days in the lab with the stem of the mistletoe hostplant in water. If only raising a few larvae, using a closed container works when you replace host plant and container daily.

Sandia mcfarlandi
Host: *Nolina erumpens*
Remarks: Larvae can be found in good numbers, and can be found in the blossoms and resting at the base of the plant. Also, ova have been obtained from females. Four different color morphs of larvae were found on the same plant.

Incisalia eryphon eryphon
Incisalia eryphon purpurascens
Lab host: *Pinus monophylla*
Other's hosts: *Pinus contorta, P. monophylla*
Remarks: Larvae like the new growth of spring. Females prefer to oviposit on new growth and refuse to oviposit on older growth.

Incisalia augustinus
Hosts: *Ceanothus velutinus, Purshia tridentata, Arctostaphylos uva-ursi, Prunus virginiana*
Remarks: Oviposition observed on *Cuscuta* sp. Larvae have been collected from *Ceanothus velutinus* using the beating method.

Incisalia mossii
Host: *Sedum lanceolatum*

Incisalia fotis fotis
Host: *Purshia mexicana*
Remarks: Larvae can be found in good numbers. Since larvae can be found, no attempt has been made to obtain ova from females. Adults will emerge soon after pupae are put into a warm room in winter or spring. Some have even emerged in an unheated garage (or even in a refrigerator) in February.

Mitoura spinetorum
Hosts: *Arceuthobium americanum, A. divericatum*

Mitoura johnsoni
Lab host: *Arceuthobium americanum*
Other's host: *Arceuthobium campylopodum*

Mitoura siva siva
Mitoura siva chalcosiva
Hosts: *Juniperus osteosperma, J. scopulorum*

Mitoura loki
Lab host: *Juniperus californica*

Mitoura loki thornei
Lab host: *Cupressus forbesii*

Callophrys sheridani neoperplexa
Hosts: *Eriogonum heracleoides, E. racemosum, E. corymbosum, E. umbellatum, E. brevicaule*
Remarks: Females will oviposit in a squat tub closed container with host lying at the bottom (Fig. 8). Females respond well to artificial light that is utilized intermittently, turn the light on and off every 20 minutes or so.

Callophrys affinis affinis
Hosts: *Eriogonum umbellatum, E. elatum, E. racemosum, E. heraclioides*
Remarks: Larvae can be found.

Callophrys apama apama
Hosts: *Ceanothus fendleri, Eriogonum racemosum, E. alatum*

Callophrys comstock comstocki
Hosts: *Eriogonum corymbosum, E. hermannii, E. fasiculatum*
Remarks: Larvae can be found in good numbers on the dorsal side of host leaves. Ova have been obtained from females, but most of our rearing was done by finding larvae.

Callophrys dumetorum
Host: *Lotus scoparius, Eriogonum fasiculatum*

Strymon melinus franki
Hosts: *Eriogonum racemosum, E. kearnyi, E. alatum, E. heraclioides, E. umbellatum, E. corymbosum, Astragalus utahensis, Malva neglecta, Malvella leprosa, Hibiscus mocheutos, Althea rosea, Medicago sativa, Hedysarum boreale, Lupinus argenteus, Sidalcea oregana, Iliamna rivularis*
Remarks: Larvae can be very abundant. If you are collecting other Lycaenid larvae and you find one with a double row of dashes down the back, you have a *melinus*. They have many color morphs. Larvae are very cannibalistic so must be reared separately.

Strymon bazochii
Host: *Hyptis pectinata*
Lab host: *Lantana camara*
Remarks: Ova and larvae have been found in good numbers. Therefore, no attempt has been made to obtain ova from females.

Erora laeta
Lab host: *Salix exigua*
Other's host: *Corylus cornuta*

Erora quaderna
Lab host: *Salix exigua*

***Lycaena* spp.**
Remarks: In the Rocky Mountains, all *Lycaena* overwinter as eggs except *L. cupreus* and *L. phlaeas.* To obtain ova of the species that use *Rumex, Oxyria*, and *Polygonum* (except *cupreus* and *phlaeas).* It is necessary to have soil surrounding the base of the plant because females oviposit in the soil. A few twigs and leaves on the soil help. *L. cupreus* and *L. phlaeas* females oviposit on the leaves of the hostplant.

Lycaena gorgon
Host: *Eriogonum nudum*
Remarks: Larvae and ova can be collected in good numbers. Large larvae can be seen at a distance, eating the very top of the flower stem.

Lycaena mariposa penroseae
Lab host: *Vaccinium caespitosum, Vaccinium* sp.

Lycaena phlaeas arctodon
Host: *Oxyria digyna*

Lycaena phlaeas weberi
Lab hosts: *Rumex acetosella, Oxyria digyna* (reared by Dale Nielson), *R. acetosa alpestris*
Remarks: Obtained ova on *Rumex acetosa alpestris* from the colony and *Oxyria digyna*. Larvae refused *Rumex acetosella* hybrid that *Lycaena cupreus* and *Lycaena editha* do well on. Larvae accepted but perished soon thereafter on *Rumex crispus*. Reared under natural photoperiod but in a warm lab many larvae pupated and emerged. Some of the ova diapaused. As day length lessened; pupae and half-grown larvae diapaused.

Lycaena phlaeas feildeni
Lab hosts: *Oxyria digyna, Rumex acetosa*

Lycaena xanthoides xanthoides
Lycaena xanthoides dione
Lab host: *Rumex crispus*

Lycaena rubidus sirius
Host: *Rumex crispus*
Remarks: Larvae can be found in large numbers. If the plant is growing in hard-packed soil with no understory there will be no larvae. Larvae are found in loose understory, plant debris or gravel. Larvae may be 4 or 5 inches below the surface and 7 or 8 inches away. Once 92 larvae were found under one small plant.

Lycaena hyllus
Host: *Rumex maritimus*
Lab host: *Rumex crispus*
Remarks: Larvae can be found in large numbers. Look in the understory as with prior species. Females will also oviposit on plants growing in water. On these, the larvae will be on the *Rumex.*

Lycaena helloides helloides
Lycaena helloides megaloceras
Lab hosts: *Rumex crispus, R. paucifolius*
Remarks: Obtained ova of *megaloceras* on *Potentilla concinna.* Larvae were offered two other species of *Potentilla* besides *concinna,* and they refused all.

Lycaena heteronea heteronea
Lycaena heteronea northi
Hosts: *Eriogonum umbellatum, E. racemosum, E. corymbosum*
Lab host: *Eriogonum heraclioides*

Lycaena nivalis browni
Lab hosts: *Rumex crispus, Rumex* sp., *Polygnium douglasii*
Remarks: Some larvae eat *Rumex* but only a few lived. Most females will not oviposit on *Rumex*. An occasional female will lay but usually only a few eggs. Females oviposit well on *Polygonum douglasii* and larvae flourish on it. It is best to pot thick clumps of *douglasii.* It takes several individual plants to rear a single larva.

Lycaena arota schellbachi
Host: *Ribes leptanthum*
Lab host: *Ribes* spp.
Remarks: As soon as it is warm and sunny in the morning the females are active. Look for yellow composites near the host.

Lycaena editha montana
Lab host: *Rumex acetosella* hybrid
Remarks: Larvae will feed on other *Rumex* spp. besides their known hosts but most will die in the late instars.

Lycaena cupreus cupreus
Lab hosts: *Rumex acetosella* hybrid, *Rumex paucifolius*
Remarks: Most larvae diapause at 3rd instar; but some will go through to adult in the lab. Most females are reluctant to oviposit in captivity.

Lycaena cupreus snowi
Host: *Oxyria digyna*
Remarks: Larvae can be found but normally only a few. Females oviposit readily on leaves of *digyna* in a closed container.

Brephidium exilis
Hosts: *Salsola iberica, Atriplex canescens, Portulaca oleracea*
Remarks: Put cardboard or a dark tarp under plant and beat with net handle. Larvae and pupae can be collected in good numbers using this technique.

***Agriades* sp.** (MT)
Other's host: *Douglasia montana*
Remarks: Post-diapause larvae can be found. Females will oviposit well in the lab.

Lampides boeticus
Lab host: *Pisum sativum*
Remarks: Reared on fresh snow peas purchased at the supermarket.

Hemiargus ceraunus gyas
Host: *Melilotus officinalis*
Lab host: *Pisum sativum*
Remarks: Female oviposited on *Melilotus officinalis* but larvae accepted fresh snow peas purchased at the supermarket.

Celastrina ladon echo
Host: *Eriogonum racemosum, E. wrightii, Ceanothus velutinus*
Remarks: Larvae and ova can be found. Larvae found on *Eriogonum racemosum* in Sevier County, Utah, were oddly not tended by ants.

Celastrina ladon lucia
Host: *Ledum palustre*

Everes amyntula
Host: *Vicia americana*
Lab host: *Lathyrus lanszwertii*, *L. latifolius, L. odorata*
Remarks: Young larvae burrow into flower buds and remain there for as long as the bud will support them. Larvae turn brown before diapausing or pupating. Some larvae diapaused and some did not, when reared with 24-hour photoperiod.

Glaucopsyche lygdamus lygdamus
Glaucopsyche lygdamus oro
Hosts: *Astragalus* sp., *Lupinus sericeus, L. argenteus, Hedysarum boreale, H. mackenziei, Eriogonum wrightii*
Remarks: Larvae can be collected in good numbers. Look for ants tending larvae on inflorescens.

Glaucopsyche piasus daunia
Hosts: *Lupinus sericeus, L. argenteus*
Remarks: Where *lygdamus* and *piasus* fly together, *lygdamus* larvae are usually in mid to late-instar when *piasus* is found as eggs or small larvae. The majority of the larvae will usually be *lygdamus*. Females are reluctant to oviposit in captivity.

Plebejus acmon acmon
Plebejus acmon lutzi
Hosts: *Eriogonum umbellatum, E. kearneyi, E. racemosum, E. wrightii*
Remarks: Have found larvae usually when looking for *Callophrys* or *Euphilotes* larvae. Females oviposit well on *E. umbellatum*. Most *lutzi* larvae that feed on leaves in the lab do not diapause (John Emmel, pers. comm.).

Plebejus melissa melissa
Host: *Medicago sativa*

Plebejus icarioides ardea
Host: *Lupinus sericeus*
Remarks: Find larvae in ant holes beneath the plant. Mid-instar larvae usually diapause in nature but larvae can be forced through to adult if ova are obtained from live females in the lab.

Plebejus shasta minnehaha
Host: *Astragalus* sp.
Remarks: Larvae can be found in fair numbers.

Philotes sonorensis
Host: *Dudleya cymosa*
Remarks: Larvae can be found.

Euphilotes spaldingi
Host: *Eriogonum racemosum*
Remarks: Larvae can be found in good numbers. Examine food plant with a magnifying glass when you get to the lab. Often you will find small larvae. Rear separately. 1st and 2nd instar larvae, if reared under 24-hour photoperiod, will pupate and emerge the same year. The pupae must have the long photoperiod also. All of these methods apply to all *Euphilotes* we have reared. Diapausing *Euphilotes* pupae must be kept outside and monitored until emergence time (this coincides with the blooming of their hostplant). Without natural photoperiod and temperature they will not emerge.

Euphilotes pallescens pallescens
Euphilotes pallescens ricei
Euphilotes pallescens arenamontana
Host: *Eriogonum kearneyi*
Remarks: Larvae can be found in good numbers.

Euphilotes enoptes ancilla
Hosts: *Eriogonum heraclioides, E. umbellatum*
Remarks: Females tend to oviposit only on the open flower petals of *Eriogonum heraclioides*. Finding larger larvae on the hostplant can be difficult because they camouflage or hide themselves quite easily on the flowers or seedpods of the hostplant.

Megathyminae:
Remarks: The "Megs" included in this list (and possibly all Megs) can be reared with good results. *Megathymus* use only small to medium size plants and the larva usually kill the plant. To rear *Megathymus* Yucca plants were planted in the yard. Over a period of several to 25 years the crop of *Yucca herrimaniae* spread by rhizomes to constitute a sizable and dense patch of *Yucca* plants. The plants become too dense to use and must occasionally be thinned by cutting the stems at ground level, also plants that become large must be cut off at ground level. *Yucca angustissima* plants spread only sparingly by rhizomes, however, individual plants would continue to grow and develop a large root. These plants also must be cut off at ground level when they become large. After being cut off, the root would grow two new stems, each one on opposite sides of the root. When there is a large root the larva does not kill the plant and after a few years the plant is usable again.

Agathymus use *Agave* plants of any size in Utah. *Agave* plants were transplanted to the yard in the spring when they were going to be used. Most of the plants did not live permanently but would survive until the larvae pupated. When transplanted, the plants must be cleaned by removing the dead leaves and washing out the remaining good leaves. The dead leaves and rubbish harbor unwanted critters. It is easy to obtain ova from *Agathymus* females but very few of the newly hatched larvae become established in a leaf. It was quite successful to harvest first and second-instar larvae in nature and transplant to plants in the yard. Plants or group of plants must be covered with screen to keep the parasites and predators away from the larvae. Even with a screen cover an occasional larva would get parasitized or spiderized.

Megathymus ova are glued to a leaf and are quite easy to find. *Agathymus* ova are dropped in or near a plant and are nearly impossible to find.

Megathymus yuccae
Hosts: *Yucca angustissima, Y. bacata, Y. harrimaniae*
Remarks: Larvae build a silk tent in the center of the plant. This tent can easily be found and many *M. yuccae* pupae can usually be found. The pupae can be harvested shortly before flight time. Larvae finish eating long before flight time but diapause until shortly before flight time to pupate. If larvae are found within a couple months of flight time they can be kept in their silk tube and will eventually pupate or a paper tube can be used.

Megathymus streckeri
Hosts: *Yucca harrimaniae, Y. angustissima, Y. glauca*
Remarks: Larvae build their tent in the ground near the plant. The top of the tent is at ground level so it is very difficult to find the pupae. This taxon is best obtained by rearing. Many ova can be found easily after the females have been flying a few days.

Agathymus neumoegeni
Host: *Agave scabra*
Remarks: Pupae can be found by spotting the trap door in the *Agave* leaf or by spotting the frass.

Agathymus mariae
Host: *Agave lechugilla*
Remarks: Pupae can be found by spotting the trap door in the *Agave* leaf or by spotting the frass.

Agathymus alliae
Host: *Agave utahensis*
Remarks: Larvae make their trap door on the under side of the leaf. It is possible to find pupae in the field but searching can be a long arduous process with limited results. To get a good series it is necessary to rear this taxon.

Pyrginae, Hesperinae:
Remarks: Larvae of most hesperine and pyrgine (spread-wing skippers) construct nests. These skipper larvae differ from most moth larvae in that they exit in order to launch frass whereas most moths that make nests do not. In other words, finding larval nests on plants with frass means you have found a moth nest not a skipper nest. Females of most hesperine skippers will oviposit on and larvae will usually accept a far greater variety of grasses than is normally utilized in nature making lab rearing not too difficult. Rearing of some hesperine skippers from humid areas of the Midwest and Eastern U.S. requires the use of humidity (mist spraying) both for unhatched ova and for unfed first-instars in order to stimulate hatching and feeding.

Similar to Megathyminae, many (but not all) pyrgine and hesperine skippers pupate in the same nest they fed as larvae but seal up the entrance of the nest with silk. This extra layer of white silk is very noticeable in hesperine skippers. This increases the possibility of finding pupae in the wild.

Larvae of the Hesperine genera *Hesperia, Polites, Pseudocopaeodes, Hylephila,* and *Atalopedes* make nests down at the bases of bunch grasses and are nearly impossible to locate. Larvae of *Amblyscirtes, Atrytonopsis, Lerodea, Panoquina, Ochlodes, Poanes, Piruna, Thymelicus, Wallengrenia, Copaeodes* and *Oarisima* feed on taller, wide-blade species of grasses higher where they can be much more conspicuous. Some "skipperling" hesperine larvae make smaller nests or none at all.

Finding larvae of many pyrgine skippers is not too difficult when their population numbers are significantly high and hostplants are not too prevalent.

Epargyreus clarus
Hosts: *Glycyrrhiza mendota, G. lepidota, Robinia pseudoacacia, Lotus crassifolius*
Remarks: Larvae construct a nest among the leaves of the hostplant and are easily found in any instar. This is especially true when the host is *Glycyrrhiza mendota*. They are easiest to rear by finding 5th instar larvae so that they don't have to be fed very long. When the pupae are put into a warm room in the spring to emerge they must be moist for some time (to adjust to the warmth) or they will dessicate. This is easily accomplished by placing them on wet paper towels and covered by wet paper towels. Use lab host *Robinia pseudoacacia* over natural host *Glycyrrhiza lepidota* in an open terrarium setup. The problem with using cuttings of *Glycyrrhiza lepidota* is that cuttings will wilt in an open terrarium. The only way to keep cuttings erect is to increase humidity in the setup similar to a closed terrarium setup recommended for *Limenitis*. However, this increased humidity in the closed terrarium does not allow frass to dry and larvae can die as pupae. *Robinia pseudoacacia* is a much drier host. Larvae use this host naturally in the Eastern U.S. An open terrarium setup is fine with this host and larvae stay healthy. For multivoltine populations such as *Epargyreus clarus californica* keeping pupae humid is not necessary.

Polygonus leo savigny
Host: *Pisidium piscipula*
Remarks: Larval nests can be found on new growth of host. Larvae will pupate in nest.

Phocides pigmalion okeechobee
Host: *Rhizophora mangle*
Remarks: Larval nests can be found on host. Larvae will pupate in nest and pupae can be occasionally found. It is not advisable to use cuttings of the host, as larvae do not do well on cuttings. Try and obtain *R. mangle* (red mangrove) starts from a nursery and rear on potted plants. Use saline solution for potted plants.

Thorybes pylades pylades
Host: *Melilotus officinalis*
Lab Hosts: *Trifolium repens, Medicago sativa*
Remarks: Mature larvae hibernate. Larvae make nests. Females have oviposited on *Astragalus cicer* in nature but first-instar larvae refused to feed.

Thorybes mexicana nevada
Lab host: *Medicago sativa, Melilotus officinalis*
Remarks: Mature larvae hibernate. For some reason pre-diapausal 5th instars can easily die during the wintering process.

Thorybes diversus
Lab host: *Trifolium repens*
Remarks: Mature larvae hibernate.

Erynnis icelus
Hosts: *Populus tremuloides, Salix* sp.
Remarks: Mature larvae hibernate. Pupae do not hibernate. Occasionally, lab reared larvae in the fall will pupate and will emerge a few weeks later. This also applies to other species of *Erynni*s.

Erynnis brizo burgessi
Hosts: *Quercus gambellii, Q. turbinella*
Lab host: *Quercus alba*
Remarks: Seek out seedlings to find nests in the late summer or early fall. Mature larvae hibernate. Females oviposit only on very young tender new growth of leaves. Ova are white, usually turning orange 24 hours later.

Erynnis telemachus
Host: *Quercus gambellii*
Lab host: *Quercus alba*
Remarks: Finding late instar larvae in late summer can be a challenge even during larger flights. Finding isolated seedlings growing along roads or fresh cuts can improve chances of finding immatures. Larvae take 3-4 months to mature to last instar in the lab.

Erynnis meridianus
Host: *Quercus turbinella*
Lab hosts: *Quercus alba, Quercus gambellii*
Remarks: Double-brooded in southwest Utah. The key to finding immatures is to seek out ovae on very fresh succulent new growth of the host during the summer brood in mid to late August. New growth is usually hard to find on the host during this time of the year, therefore, when you do find it you usually will find an ova. Timing is important because finding smaller instar larvae on the same new growth is usually much less productive as young instars can be quickly consumed by predation.

Erynnis pacuvius lilius
Host: *Ceanothus velutinus*
Remarks: Larvae can be found.

Erynnis persius fredericki
Host: *Lupinus argenteus*
Remarks: Larvae can be found.

Erynnis afranius
Host: *Hedysarum boreale*
Lab host: *Lupinus argenteus*
Remarks: There are up to 3 broods at low elevations. Late instar larvae are not too difficult to locate. Poor-quality natural host in late summer produces smaller larvae and hence smaller adults for the first flight in the spring. Second brood adults are almost as large as *Erynnis telemachus.*

Heliopetes ericetorum
Host: *Sphaeralcea* sp.
Lab hosts: *Malva neglecta, Sida hederácea, Althaea rosea*
Remarks: Larvae of all instars overwinter.

Pyrgus scriptura
Hosts: *Sphaeralcea ambigua*, *Sida hederacea*
Lab host: *Althaea rosea*
Remarks: Larval nest is somewhat distinctive to *Pygus communis*. In the same habitat; larvae that are found on short hosts in dry areas are *P. scriptura. P. communis* larvae prefer healthier plants in wetter areas. Pupae overwinter.

Pyrgus communis
Hosts: *Sphaeralcea ambigua*. *Sida hederacea, Malva neglecta,*
Remarks: Females will oviposit in a small cage. Finding larvae in disturbed or suburban areas is not too difficult where the adults fly. Larvae change color from green to brown when overwintering.

Pyrgus ruralis ruralis
Hosts: *Potentilla glandulosa, Fragaria vesca*
Lab Host: *Potentilla fruticosa*
Remarks: Females will oviposit fairly well in captivity on the hostplant. Finding immatures in the wild can be very difficult. Larvae create nests but do not pupate in their nest. Pupae overwinter.

Pyrgus centaureae loki
Host: *Potentilla diversifolia*
Lab Hosts: *Potentilla glandulosa, Fragaria vesca.*
Remarks: Larvae accept *Fragaria vesca* in the lab but attempts to get pupae to emerge the following spring have failed. Current overwintering techniques that work for *Pyrgus ruralis ruralis* have not worked for *Pyrgus centaureae loki*.

Systasea zampa
Host: *Abutilon abutiloides*
Lab host: *Alcea rosea*
Remarks: Conspicuous larval nests are not too hard to find.

Pholisora catillus
Hosts: *Chenopodium album, Amaranthus retroflexus*
Remarks: Larvae can be found.

Hesperopsis libya libya
Host: *Atriplex canescens*
Remarks: Larvae can be found in areas where the host is not overly abundant. Look on plants along the periphery of the population. Larvae create nests and will pupate in nests.

Hesperopsis libya confertiblanca
Host: *Atriplex confertifolia*
Lab Host: *Atriplex canescens*
Remarks: Look on isolated plants. Sometimes multiple larvae can be found on one plant. 3rd through 4th instar larvae will semi-aestivate during the hot summer months and will not usually pupate until mid to late-July. Therefore, it is advisable to sleeve larvae on local *Atriplex canescens* then harvest the late instars or pupae later.

Hesperopsis alpheus oricus
Host: *Atriplex canescens*
Remarks: Larvae can be found. Like *Erynnis, Thorybes,* and *Amblyscirtes* mature last instar larvae overwinter and pupate the following spring.

Hylephila phyleus phyleus
Host: *Cynodon dactylon*
Lab host: *Poa pratensis*
Remarks: Females will oviposit fairly well on Bermuda grass. Under lab conditions the amount of time between the 1st instar larvae and pupae is roughly 9 weeks, which is much quicker than many species of *Hesperia* and *Polites.*

Atalopedes campestris campestris
Host: *Cynodon dactylon*
Lab host: *Poa pratensis*

Atalopedes campestris huron
Lab host: *Distichlis spicata*
Remarks: Females will oviposit on *Distichlis spicata.* Larvae are generalists and will accept many species of grass in the lab.

Polites vibex
Lab host: *Poa pratensis*
Remarks: Larvae feed quickly from hatchling 1st instar to pupa in about 9 weeks.

Polites origenes rhena
Lab host: *Bromus inermis*.
Remarks: Raising this skipper can be difficult. Exposing larvae to 24 hours of light does not guarantee that they will go through and pupate the same year. Many larvae slow down their metabolism at late instars neither completely diapausing nor growing. Some overwintered larvae resume feeding at a normal rate, pupate and emerge. Whereas others continue feeding at a very slow rate and eventually die.

Polites themistocles
Lab hosts: *Poa pratensis, Phalaris arundinacea*
Remarks: Females oviposit somewhat sparingly on Kentucky Blue Grass. Larvae will accept *Phalaris arundinacea* in the lab and will go through to adults the same year.

Polites sabuleti sabuleti
Host: *Poa pratensis*
Remarks: Last instar larvae can burrow at the base of the plant to make a nest. Rearing larvae on potted grass is advisable.

Polites sabuleti chusca
Host: *Distichlis spicata*
Remarks: Females will not oviposit on *Poa pratensis* in the lab.

Polites peckius
Lab host: *Poa pratensis*, *Phalaris arundinacea*

Polites sonora utahensis
Lab host: Sedges
Remarks: Females oviposit very sparingly on grasses, if at all.

Hesperia juba
Host: *Distichlis spicata*
Lab Host: *Phalaris arundinacea*
Remarks: As is the case with many *Hesperia*, larvae grow at a fairly slow rate, about 2-3 months from ova to adult.

Hesperia pahaska* nr. *martini
Host: *Bouteloua gracilis*
Lab Host: *Phalaris arundinacea*
Remarks: As is the case with many *Hesperia*, larvae grow at a fairly slow rate, about 2-3 months from ova to adult. Rear larvae under 24 hours of light and provide fresh host to avoid diapause.

Hesperia uncas lasus
Host: *Bouteloua gracilis*
Lab Host: *Phalaris arundinacea*
Remarks: Females will oviposit on *Distichlis spicata* in the lab. As is the case with many *Hesperia*, larvae grow at a fairly slow rate, about 2-3 months from ova to adult. Rear larvae under 24 hours of light and provide fresh host to avoid diapause.

Hesperia nevada nevada
Lab Host: *Phalaris arundinacea*
Remarks: Females prefer not to oviposit on *Poa pratensis.* Other natural bunchgrasses should be better.

Pseudocopaeodes eunus eunus
Host: *Distichlis spicata*
Remarks: To get a series, try and get as many females as is possible. Compared to other hesperine skippers, ova of *eunus* are very large and females are limited to how many ova they can oviposit.

Poanes taxiles
Host: *Bromus inermis*
Lab host: *Phalaris arundinacea*
Remarks: Larvae attempt diapause (or a feeding slowdown) at 4^{th} to 6^{th} instar. If larvae are given fresh host regularly they will feed through and produce adults the same year.

Poanes zabulon
Lab hosts: *Bromus inermis, Phalaris arundinacea.*
Remarks: Unlike *Poanes taxiles, Poanes zabulon* larvae only have five instars. Throughout much of its range, *P. zabulon* is multivoltine. Therefore, if larvae are given fresh host regularly they will feed through to pupae and produce adults the same year.

Poanes hobomok
Lab hosts: *Bromus inermis, Phalaris arundinacea.*
Remarks: Larvae have 6 instars and seem to insist on diapausing at the 4th instar.

Ochlodes yuma yuma
Host: *Phragmites australis*
Remarks: Larvae and pupae can be found. Ova have been found on *Sorghum halepense*. See http://utahbutterflies.ning.com/video/finding-yuma-skipper-larval for a video tutorial on how to find larval nests on *Phragmites*.

Ochlodes sylvanoides napa
Hosts: *Phalaris arundinacea, Bromus inermis*
Remarks: Larvae can also be found. Larval nests are conspicuous. Last instar larvae diapause for roughly 2-6 weeks before finally pupating, producing a late summer flight. Unfed 1st instars hibernate by silking the tips of the leaves.

Amblyscirtes vialis
Host: *Bromus inermis*
Lab Host: *Phalaris arundinacea*
Remarks: Females will oviposit in the lab. Mature last instar larvae hibernate. In the lab some mature last instar larvae will pupate, producing adults soon thereafter.

Amblyscirtes fimbriata
Host: *Phalaris arundinacea*
Remarks: Larvae can be found. Mature last instar larvae hibernate. However, in the lab many last instars will pupate and produce adults soon thereafter.

Amblyscirtes eos
Host: *Sorghum halepense*
Lab Host: *Phalaris arundinacea*
Remarks: Larvae can be found.

Lerema accius
Host: *Sorghum halepense*
Lab Host: *Phalaris arundinacea*
Remarks: Larval nests can be found.

Lerodia eufala
Host: *Sorghum halepense*
Lab Host: *Phalaris arundinacea*
Remarks: Larval nests can be found. Larval nests, coloration, and feeding patterns are oddly similar to *Thymelicus lineola.*

Wallengrenia egeremet
Host: *Panicum* sp.
Lab Host: *Phalaris arundinacea*
Remarks: Females will oviposit on a variety of grasses. Ova seem to need humidity to hatch.

Oarisima garita
Host: *Bromus inermis*
Lab Host: *Phalaris arundinacea*
Remarks: Larvae can be found. Using potted grasses is advisable for rearing this taxon.

Thymelicus lineola
Host: *Phalaris arundinacea*
Remarks: It is not too hard to find larval nests in the field. However, late instars use nests to a lesser degree or not at all. Larvae pupate on grass blades and are not too difficult to locate. This skipper overwinters as ova.

Ancyloxypha numitor
Remarks: It's not too hard to find larval nests in semi-wet habitats. Larvae pupate in grass blades in such a tight fashion as to making their removal quite problematic. It is advisable to leave the nest intact for emergence purposes.

Ancyloxypha arene
Lab Host: *Phalaris arundinacea, Bromus inermis*
Remarks: Populations are very local in wetland areas. Larvae pupate in grass blades in such a tight fashion as to making their removal quite problematic. It is advisable to leave the nest intact for emergence purposes.

Copaeodes aurantiacus
Host: *Cynodon dactylon*
Lab Host: *Phalaris arundinacea*
Remarks: To get a series, try and get as many females as is possible. Compared to other skipperlings ova are very large and females are limited to how many ova they can oviposit. Larvae show interesting similarities to some Satyrids.

Copaeodes minima
Lab Host: *Phalaris arundinacea*
Remarks: Females will oviposit in the lab.

Piruna pirus
Host: *Bromus inermis*
Lab Host: *Phalaris arundinacea*
Remarks: Females seem to be fussy about ovipositing in the lab in numbers. Larvae feed through rapidly to adult in the lab even though they diapause in nature.

Fig 1-2. *A. julia browningi* and *P. eurymedon* females nectar on honey water. **Fig 3.** *D. plexippus* female oviposits on *Asclepias speciosa.* **Fig 4.** *A. sara* female oviposits on *Arabis perennans* (Dennis Walker). **Fig 5.** Ovum of *A. julia browningi on Arabis* sp. **Fig 6.** Ovum of *M. siva chalcosiva* on *Juniperus osteosperma.* **Fig 7.** Female *A. eulalia* set up in a screen cage with cuttings of *Quercus gambellii.* **Fig 8.** Female *C. sheridani neoperplexa* set up to ovipsosit in a squat tub with *Eriogonum racemosum.* **Figs 9-12.** Last instar caterpillars of *C. affinis affinis*, *P. bairdi, P. indra minori, A. cethura pima,* and *T. leanira wrighti.* **Fig 13.** *L. lorquini burrisoni* 3rd instar caterpillar crawls out of its hibernaculum. **Fig 14.** Open terrarium setup for *Colias meadi* larvae under 24 hours of light (Nicky Davis). **Fig 15.** Potted grass setup for *E. magdalena* larvae. **Fig 16.** *P. eurymedon* pupa.

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