



The Taxonomic Report

OF THE INTERNATIONAL LEPIDOPTERA SURVEY



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

JACQUE WOLFE

459 East 2700 South Apt 16, Salt Lake City, UT 84115

JACK HARRY

47 San Rafael Court, West Jordan, UT 84088

TODD STOUT¹

1456 North General Drive, Salt Lake City, UT 84116

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. Therefore, 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.

¹ Staff Member, The International Lepidoptera Survey, Herndon, VA

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 oviposit 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 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 desiccation. 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 evermanni 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 dracuncululus*, *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 scoticum*

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 dracuncululus*

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 *Cymopterus* 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 parishii*, *T. arguta*

Lab host: *Lomatium graveolens*

Papilio indra fordii

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*

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* spp.

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* spp.

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: *Vaccinium 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: *Descurainia richardsonii*

Lab hosts: *Brassica nigra*, *Cardaria draba*, *Dentaria californica*, *Isatis tinctoria*, *Arabis holboelli*, *Arabis* sp., *Rorippa nasturtium-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 inflorescence 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*, *Descurainia 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*, *Descurainia 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 inflorescence 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 inflorescences.

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 inflorescence 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 inflorescence 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 oxycanthoides*

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 oxycanthoides*, *Ribes* sp.

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 Limenitis 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 wormsjoldi*

Remarks: This taxon has a 2-year life cycle; therefore, the larvae overwinter for two winters. After 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 treatment 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 treatment.

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: *Leucophyllum 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 deltooides*

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. engelmannii*. *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 neumogeni

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 populations 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 parasitized.

Satyrium liparops aliparops

Lab host: *Prunus virginiana*

Satyrium calanus godarti

Host: *Quercus gambeli*

Atlides haesus 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. fasciculatum*

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 fasciculatum*

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., *Polygonum 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 *Oarisma* 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 desiccate. 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 *Erynnis*.

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 hederacea*, *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 *Pyrgus 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 confertifolia

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 4th to 6th 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.

Oarisma 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.

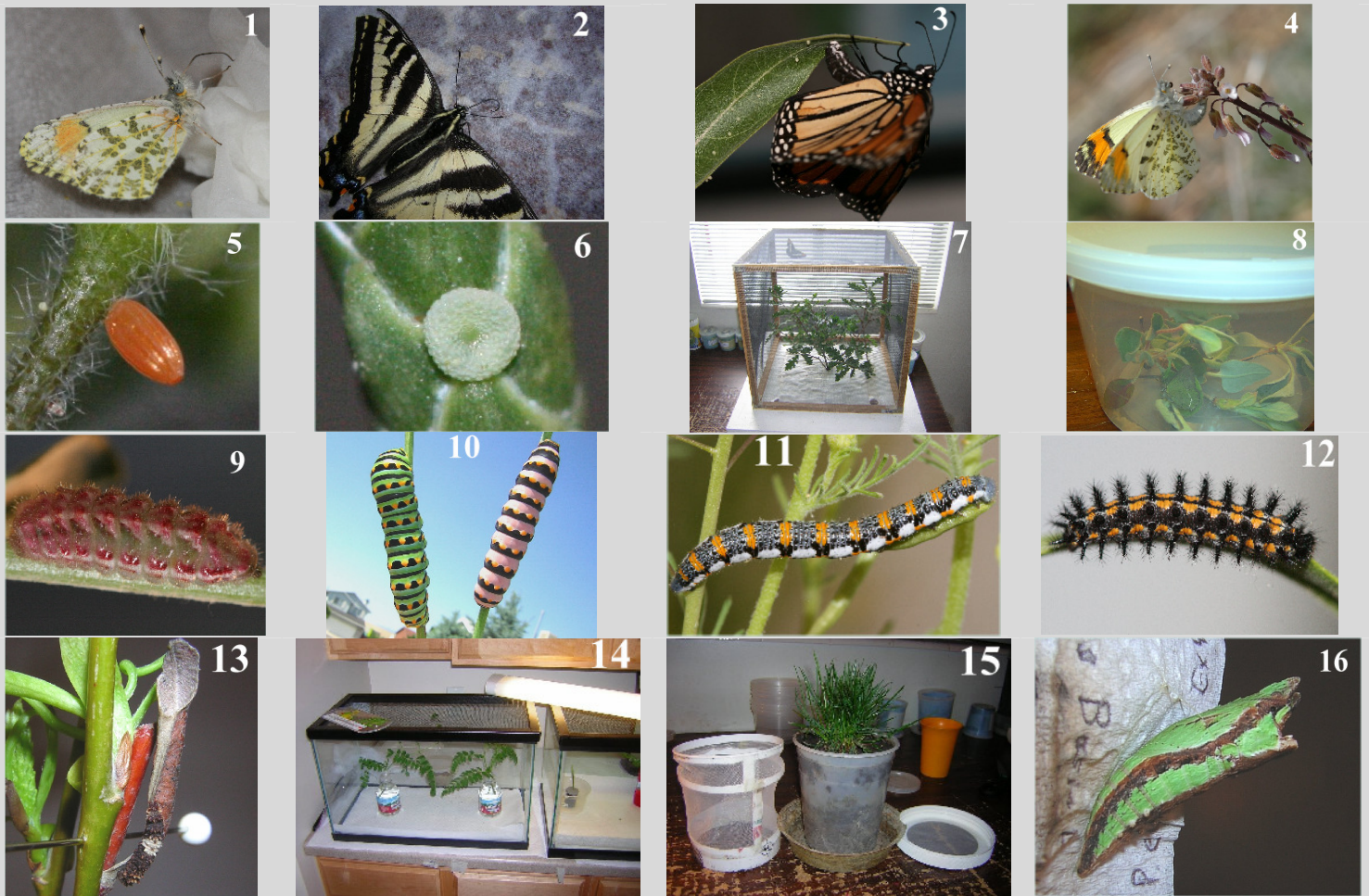


Fig 1-2. *A. julia browningi* and *P. eurymedon* females nectar on honey water. **Fig 3.** *D. plexippus* female oviposits on *Asclepias speciosa*. **Fig 4.** *A. sara* female oviposits on *Arabis perennans* (Dennis Walker). **Fig 5.** Ovum of *A. julia browningi* on *Arabis* sp. **Fig 6.** Ovum of *M. 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 oviposits 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.

The Taxonomic Report
is a publication of
The International Lepidoptera Survey (TILS)
(a tax exempt non-profit scientific organization)

The Taxonomic Report is published for the purpose of providing a public and permanent scientific record. It appears on printed paper in sequential issues, is regularly disseminated to institutional and individual subscribers, and is also available as separate issues free of charge upon request at the discretion of authors and/or the editor. Contents are peer-reviewed but not necessarily through the anonymous review and comment process preferred by some publishers of serial literature.

TILS Purpose

TILS is devoted to the worldwide collection of Lepidoptera for the purpose of scientific discovery, determination, and documentation, without which there can be no preservation.

TILS Motto

“As a world community, we cannot protect that which we do not know”

Articles for publication are sought

They may deal with any area of research on Lepidoptera, including faunal surveys, conservation topics, methods, etc. Taxonomic papers are especially welcome. Before sending a manuscript, simply write to **TILS editor, Harry Pavulaan, P.O. Box 1124, Herndon, VA 20172** to set up discussion on how to best handle your material for publication; or email harrypav@hotmail.com

**Donations are needed
to support and further our efforts
to discover and protect butterflies worldwide.**

All donations are US tax deductible. Please help generously.

Donations should be mailed to: **TILS, c/o Harry Pavulaan, P.O. Box 1124, Herndon, VA 20172.**

Checks should be made payable to: **TILS.** Please indicate if you need an individual receipt.

Visit *The International Lepidoptera Survey* on the World Wide Web at:

<http://www.tils-ttr.org>

and

Join the discussion at our list serve on Yahoo!Groups at:

TILS-Leps-Talk

<http://groups.yahoo.com/group/TILS-leps-talk/>