THE SILKWORM
(BOMBYX MORI)

A Segment on the culture of silkworms
Sericulture
The silkworm has long ago been bred for its silk. Silk is an amazing fabric. It can stretch and then resume its normal shape. It stays warm during the winter and cool during the summer. Also, silk is finer and has more of a sheen than other fabrics, and it also doesn’t harbor static electricity. According to legend, silk was discovered in China, at around 2700 B.C. The emperor’s mulberry trees were being damaged by silkworms. His wife was picking a cocoon off the tree, but dropped it into hot water by mistake. Afterward she discovered that the cocoon could be unwound to produce a lustrous fabric. A fabric we now know as silk. At the time the secret of silk was closely guarded and reserved only to China’s emperors and other important people. As time passed the secret to the creation of silk spread to India and Europe. Now the whole world knows about silk. This fiber has remained in high production and remains on top of many new fibers. A strand of silk is even stronger than a strand of steel of the same size. For these reasons silk is still widely used by the world today.
Although silkworms are raised largely by huge companies for silk, they are also raised for reptile food and sometimes as pets. Raising silkworms is easily done and the caterpillars have many uses.

**SILKWORMS AS PETS**

You can easily raise silkworms by yourself. Silkworms aren’t normally used as pets, but there are some perks from owning them. The silkworm is a large bug and it also makes silk. A silkworm’s life cycle is also really short. This makes the worm a fast developer and an easy pet. The caterpillars can be kept together and a bunch of them eating can sound like rain. In your silkworm habitat they share leaves, and a bunch of big silkworms can demolish leaves in minutes. If you raise silkworms as pets, you’ll need a container with a top and some food. Just add silkworms and you’re set. The worms will eat like crazy and eat faster as they get older. When the worms shed, they lift their head high off the ground and stay still. The shedding worms shouldn’t be disturbed, and if you try to remove them from whatever they are standing on you could tear the worms legs off. Your silkworm or silkworms rely a lot on you to feed them. They eat really fast so you have to give them lots of mulberry leaves several times a day. The silkworms will go through several stages, or Instars. The first Instar is after hatching, then the caterpillars will molt four times. With cocooning comes the fun part. After the silkworms fourth shed, (or fifth Instar) the bulge on the silkworm’s neck will enlarge and the worm will stop eating, dump the undigested food(in the form of a greenish stringy splat) then start spinning. You might want to help out and give the worms some toilet paper tubes or
mulberry branches to spin in. Otherwise they will spin in the leaves, and on the container lid and sides. The caterpillar will start laying the foundation by making a stringy support for its cocoon. Afterward it will lose a lot of size and it will spin a cocoon.

The silkworm first makes a support then spins the cocoon.

After cocooning you can remove them and spin some silk, or you can wait until they hatch (they will hatch in about a month). Silkworm moths only live for a few days and must mate as soon as they emerge from their cocoons. The female silkworm moth has tiny wings and a large abdomen. The male has larger wings and a small abdomen. Since silkworms have lost the ability to fly, they might need you to put the male with the female for mating. Once they mate, the female will lay hundreds of eggs (if you plan on breeding put the female and the male on a sheet of paper first). Once the eggs turn from yellow to black, you can refrigerate them. Refrigeration comes with a lot of fiddling with temperature. Put the sheets in a bag and add a sponge if the eggs tend to dry out. They can be stored for years under the correct temperature.
Silkworms as food

This silkworm (Bombyx Mori) is food to reptiles and amphibians. Silkworms are a nutritious part of any reptile’s diet. To top it off, silkworms make tasty treats for any reptile because it is slow moving and comes in all different sizes. The worms in their second instar, are large enough to be fed to reptiles and amphibians. The great things about these guys as food is that they don’t stink and they don’t try to hurt your reptile. Reptiles, with the exceptions of snakes and some lizards like their food alive. A large bunch of uneaten live crickets may decide to swarm or even eat a small gecko. Silkworms contain less fat then most feeders, and they contain much more calcium which is good for reptiles. Then nutrition facts are listed below along with some other top feeders.

<table>
<thead>
<tr>
<th></th>
<th>fat %/kcal</th>
<th>Calcium mg/kcal</th>
<th>phosphorus mg/ kcal</th>
<th>protein %/kcal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silkworm</td>
<td>43</td>
<td>0.5</td>
<td>0.6</td>
<td>54</td>
</tr>
<tr>
<td>Mealworm</td>
<td>60</td>
<td>0.1</td>
<td>1.2</td>
<td>37</td>
</tr>
<tr>
<td>Waxworm</td>
<td>73</td>
<td>0.1</td>
<td>0.9</td>
<td>27</td>
</tr>
<tr>
<td>Cricket</td>
<td>44</td>
<td>0.2</td>
<td>2.6</td>
<td>50</td>
</tr>
</tbody>
</table>
Even though most pet stores don’t carry silkworms, you can easily grow your own. Get a large container free of escape possibilities, a top with a bunch of holes(to retain heat), and a lot of silkworm feed or mulberry. Since reptiles eat A LOT of bugs, you should have to raise quite a few. The basic silkworm needs are 78-82°F and a lot of food. You can place the silkworm containers next to the reptile tank for heat since reptiles often need lamps. Silkworms tolerate room temperature, but their growth is slowed. If there is a mulberry leaf shortage you can buy some powdered silkworm food(add water). Rearing silkworms for food calls for a constant supply of silkworms for your reptile. If you can get eggs, you should start from them. Rearing the caterpillars from eggs is less expensive. Grow the silkworms at different times so you get a constant steady stream of caterpillars. Let the eggs warm up slowly. As soon as they hatch they need to eat. The worms will look black and hairy in their first instar. The baby worms need a little more moisture than adults, so put fewer holes in the top to retain moisture(don’t overdo it). Once the worms have grown to size, either cool them slightly or feed them slightly less(silkworms still need to eat a lot). This will force them to remain this size and will slow growth.

**CAUTION**: some frogs may not eat it as they go for moving prey.

Another, lesser known use for silkworm pupa is…..
CANNED HEALTH FOOD!

SILKWORMS aren’t only for reptiles, in some parts of the world, silkworms are an important low fat source of protein. The silkworm pupa has no Carbs. There is also a certain type of nutritious fungus that grows with silkworms.

SILKWORMS FOR THREAD
The silkworm’s special talents of spinning thread have been utilized for more than four thousand years. The most available of silkworms is Bombyx Mori, the species described. There are many different species that live off of many different leaves, including oak. However, Bombyx Mori produces the finest of silk in color and structure. Bombyx Mori silk in its finest form is pure white, shiny and stronger than steel. Fine silk nowadays comes from machines that can mass produce the stuff. In the past silk was reeled and collected by hand. Silk
production is a tedious task and requires TONS of silkworms and even more mulberry. To create good silk you have to have many containers and a huge supply of mulberry leaves. You can get silk in small amounts by dumping hatched cocoons into boiling water to loosen the threads and just unwind by hand, or you could try a finer method. This method involves killing the developing moths for whole cocoons. The whole cocoons produce a finer quality of silk and the filament can be unwound carefully into one long thread. The thread the silkworms create is a continuous figure eight pattern that can reach huge lengths. The silkworms are first killed by baking them at 180°F for 30-40 minutes on a tray. Be careful not to burn yourself or the cocoons. After the pupae are stifled, the cocoons are all put in boiling water, then transferred to cool water (be sure to use a heavy mason glass jar as ordinary containers won’t survive the temperature shock). After that you can use a toothbrush to help you push away the foundation threads to find the one the whole cocoon is made of. Once you do collect 5-15 threads from 5 to 15 separate cocoons. Now you can either roll them into thread in your hand or pass them through a button and onto a reel. The purpose of the reel is to quickly unwind the threads from the cocoon. Silk reels are old fashioned and can cost hundreds of dollars. A crude, makeshift clock reel can be made from wood to save money. As the thread is being unwound onto the reel make sure not to overlap the thread too often. As you reel, the cocoons will lose thread and once all the thread has been unwound from a cocoon only a clear sack with a brown pupa inside. The sack is called a cradle. You should remove it from the silk.

This is a diagram for simple and complex silk reeling.
The pupae are killed so that the silk that is produced comes off the cocoon in one long, continuous strand.

The heavy mason jar is used because a thin jar would break under the temperature shock. The cocoons are boiled to loosen the gum or sericin, the glue that holds the cocoon threads together.

A toothbrush is used to separate the support that the caterpillar makes from the actual cocoon threads. The silk fuzz that is collected by the toothbrush is not used for reeled silk.
Take a small button and attach it to a stand with a wire. Then thread several cocoon filaments through. The sericin on the threads acts like a natural glue, bonding the filaments together and combining them into silk.

The button hole is used to condense the threads into one usable thread for silk reeling. The condensed silk can now be reeled onto a clock reel.

SILKWORM CARE SHEET

Sum up of silkworm care

CAGE/TERRARIUM/AQUARIUM- Silkworms can be housed in virtually any container. The main requirements for the silkworm habitat are a clean piece of paper on the bottom of the enclosure and a lid with small holes in the top. Silkworms need a lid so they stay mildly humid and heated. Silkworms need to be protected from smells. Sweat, perfume, and other scents are damaging to silkworms.

ACCESSORIES- Silkworms need little supplies. The only accessories are a heat and moisture retaining lid with holes, and a heat source. Silkworms need to have a mildly moist environment heated to 78-82 degrees Fahrenheit for optimum growth. Room temperature may slows their growth.

HEATING/LIGHTING/AND HUMIDITY-Silkworms prefer a shaded habitat. Light is not essential for their growth. In order for silkworms to reach maximum capability, they should be heated to 78 degrees. Silkworms must have a slightly humid environment. However, the most dangerous thing about humidity is that parasites and molds often grow on silkworms.
and their feces. Commercial silkworm food and silkworm feces should be aired out regularly and the lid should have enough holes to allow air circulation. This is especially imperative for silkworms reared for reptile consumption.

DIET- Silkworm diets are widely known. Silkworms can be fed commercial silkworm food or mulberry leaves. Silkworms constantly eat leaves and a large supply of food is needed. Silkworms may also eat other plant material, but most plants will kill the silkworms or cause them to develop slowly and stunt their growth. Prepared or dry silkworm food is available over the internet, but mulberry trees are also common in most areas. Silkworms should be fed several times a day.

WATER- Silkworms shouldn’t need a water supply. Fairly moist silkworm food, or fresh mulberry leaves should be given to the silkworms as a source of water. A sponge shouldn’t be included as a properly heated tank in conjunction with the sponge will cause the tank to become too moist. The main cause of silkworm death is over humidity.

DISEASE- Silkworms are fragile physically and can develop a few diseases. Of them include fungus/mold, parasites, and Grasserie. Silkworms are also very sensitive to heavy smells.

FUNGUS AND MOLD- fungus and mold should only form when the tank has too much moisture. Over wetting the silkworm environment is common. Since it is hard to treat insects prevention is the best option. Use a lid with plenty of holes or air out the habitat once in a while. Too much moisture can also cause the silkworm feces to smell.
PARASITES- Certain species of wasp lay eggs into caterpillars. The wasp eggs will hatch and the wasp larva will consume the caterpillar. Parasites aren’t noticeable, and the wasp eggs aren’t contagious. The best treatment is to flush the silkworm who has the eggs before they hatch. Parasites can be prevented by having a clean, aired environment with a lid.

GRASSERIE- This disease is caused by eating contaminated food, or by sharing and enclosure with sick silkworms. Grasserie is a viral disease caused by Borrelina. This virus causes the silkworms to develop thick bamboo like segments. The worms skin turns begins to turn dark and fragile. The silkworm’s skin may ooze milky liquid. They may get hernias. The silkworms get a grey color, then they stop eating, stop moving, then stop breathing. The silkworms should be removed carefully or they break and ooze. The ooze is contagious, so watch for sick worms and remove them before they start oozing. The habitats should be washed, and all food taking out (in case they are the cause). To prevent any disease, clean out the cage once in a while and feed good leaves.

ALWAYS DISINFECT YOURSELF AFTER HANDLING ANY PET, DISEASED OR OTHERWISE.

THINGS TO AVOID - Strong smells will irritate the silkworms. Silkworms should be kept in a draft free heated environment. They should be kept aired out and only slightly humid. Silkworms are needy, and when placed too far from a leaf they starve. However, do not place leaves on cocooning or shedding silkworms as it could interrupt with cocooning or cause a shedding worm to get stuck in its old skin.
SETTING UP AND DAILY MAINTENANCE

First you need to find a container. A plastic tray with a dome lid, or a plastic tank. Any escape free container will do. The container needs to have a lid with holes. The lid will help keep the silkworms warm and the holes will allow air circulation. Next place a layer of ink free paper on the bottom of the container. If you are starting with eggs take the paper or petri dish they are kept on and place that on the paper. When the eggs have begun to hatch they must be supplied with fresh layer tender leaves. The leaves should be small or ripped and a new layer added when the leaves are gone. The procedure for caterpillars is the same.

Maintaining the enclosure is easy. Replace the leaves frequently, at least twice every day. If the silkworms are molting or cocooning place the leaves around them.

NETTING

When a layer of leaf bits develop on the tray the worms need to be moved for cleaning. If you have a few large worms you can pick them up and transfer them (see handling). If you raise a lot of worms picking them up is not efficient. Use a process called “netting” to temporarily transfer the worms. In the netting process a mesh is placed over the caterpillars. Then a layer of fresh leaves are placed over the mesh. The caterpillars eagerly climb to the surface to eat, the worms can then be lifted by the mesh, leaves and all to a temporary location so you can clean the cage. Use different meshes for different size caterpillars. If any caterpillars remain on the leaves they might be diseased. Check them for signs and if they’re healthy, move them individually.
CLEANING THE TRAY

Cleaning is a main task for the pet owner. Cleaning the cage may be a tedious task for other pets, but cleaning a silkworm tray is easy. Remove the silkworms(see netting) and transfer them to a safe location. To clean the cage just dump the leaf bits into the trash, they should come off with the paper you placed on the tray. (Be sure not to dump any silkworms you might’ve missed). Rinse the lid and wipe it clean. Wash the tray with hot soapy water and rinse the tray well(try to use a soap without an extra strong smell). Make sure that the cage isn’t too moist as molds may grow. Then place a clean piece of paper on the tray and transfer the worms back. Cleaning the habitat keeps the worms healthy and keeps mold from forming.

HANDLING

Silkworms are fragile caterpillars. Handle them by lifting the leaf they should be attached too. As the silkworms grow, they become easier to handle. If you raise numerous silkworms use the “netting” technique. Handle silkworms when you need to move them. If you do, be sure to place them back on their food. The safest way to handle silkworms is to lift them up by the leaf. Silk moths can be carried on the cocoon they hatched from.

SPECIAL NEEDS

Your pet silkworms need you to take care of them. Silkworms are fairly easy to manage, but they need to be constantly fed. Feed them as many times a day as possible(minimum two) as silkworms can demolish a layer of leaves in a few hours. It’s best to have a large mulberry tree in
your back yard to satisfy the silkworms’ hunger. Silkworms complete the caterpillar stage from egg to cocoon in about a month, however, the caterpillars will develop slower if not constantly fed.

SILKWORMS IN THE WILD

This species of silkworm, Bombyx mori, is extinct in the wild. Silkworms have been so long raised in captivity that they have become dependent on humans. The caterpillars cannot walk for its food, its legs are not strong enough. The adult moths don’t have to fly to find a mate, they are paired in captivity. The moths have also lost their ability to eat. If released into the wild, the silkworm would immediately get itself eaten or starve. Birds will find that Bombyx mori has little or no self defense. Bombyx mori has been extinct in the wild.

OTHER SILKWORMS

Making silk is common with moths. Many wild moths create a silken cocoons. Of them is the Chinese Oak Moth, Robin Moth, and the Luna Moth. Most of these moths and their caterpillars are much prettier than the Bombyx mori. However, Bombyx Mori is used to make silk because of the silk’s quality. Most silk moths do not create workable silk.

The Chinese Oak Moth creates a coarser, browner silk than the Bombyx Mori. This silk is called Tussah and is mostly used as filling. The oak moth caterpillars are hairy and green, and the cocoon is hard and brownish. The caterpillars eat oak leaves. The moth that emerges is a beautiful peachy color.
The Robin Moth belongs in the family of giant moths. It is a large moth with a red body and darker wings. The caterpillar of this moth is yellow with black hairs. As it grows, the skin of the caterpillar turns green and the caterpillar develops yellow, blue, and red stubs all over its body. The caterpillar, when it is ready to cocoon looks multicolored. Its cocoon is large and brown, and not suitable for silk making.

The Luna Moth also creates silk that is not valued, however, the moth itself is beautiful. It is a very large moth with eye spots. Its wings are shaped nicely and it is colored green.
SILKWORMS ARE FUN TO RAISE AND CARE FOR...

**EASE OF CARE** = SIMPLE  
**HOUSING** = ANY CONTAINER WITH A LID  
**ACCESSORIES** = PAPER, MESH (OPTIONAL TOILET PAPER TUBES FOR COCOON SPINNING)  
**HEATING/LIGHTING** = OPTIONAL NOCTURNAL HEATING LAMP IN COLD CLIMATES  
**TEMPERATURE/HUMIDITY** = 78 DEGREES FAHRENHEIT, LOW HUMIDITY  
**DIET** = MULBERRY LEAVES OR SILKWORM FOOD. FEED SILKWORMS OFTEN.  
**WATER** = FROM LEAVES  
**HEALTH** = KEEP HEATED AND LOW HUMIDITY TO AVOID MOLDS. CLEAN CAGE OFTEN TO AVOID DISEASE AND DON’T FEED SILKWORMS CONTAMINATED FOOD.  
**HANDLING** = ONLY WHEN NEEDED, AND USE MESH NETTING. SILKWORMS ARE FRAGILE

**COST** = LOW-MEDIUM ($15.00--$20.00+)