Mealworms, Waxworms, and Superworms (Various Taxonomy)

Introduction

Several different species and life stages of various moths, beetles, and other insects have long been widely used as staples in the live feeder diets for many different reptiles, amphibians, birds, and other animals. Some of the most popularly utilized larvae include mealworms, waxworms, and superworms. Each of these have their own nutritional and dietary considerations to keep in mind, and the age, size, and species of animals that they are fed to should also be considered for dietary compatibility.

In a nutshell, mealworms are the larval stage of the darkling and mealworm beetles (*Tenebrio spp*.), which as adult beetles, have hard and chitinous shells, making them of little to no use as suitable feeders. Larval mealworms do have chitin as well, and can be difficult for many animals to digest. Therefore, the number of mealworms given should be limited. Waxworms are the caterpillar larvae of various species of wax moths, or snout moths (Pyralidae), with two species being the most commonly used as feeders. These include the lesser wax moth (*Archroia grisella*) and greater wax moth (*A. mellonella*). Waxworms have softer exoskeletons, making them a great source for protein and moisture, and thus are very nutritious and readily eaten and digested by many species. Superworms, or *Zophobas morio*, are the larval form of darkling beetles known as Zophobas. Superworms are less chitinous than mealworms, but have very large, shelled heads and bodies that can be difficult for many animals to digest. As with mealworms, feeding with superworms should be done in moderation.

Taxonomy-Mealworms:

Life: All living, physical, and animate entities
Domain: Eukaryota
Kingdom: Animalia
Phylum: Euarthropoda
Class: Insecta
Order: Coleoptera
Family: Tenebrionidae
Genus: Tenebrio
Species: *Tenebrio molitor**
**Taxonomy subject to change and revision.*

Taxonomy-Waxworms:

Life: All living, physical, and animate entities
Domain: Eukaryota
Kingdom: Animalia
Phylum: Euarthropoda

Class: Insecta
Order: Lepidoptera
Unranked: Obtectomera
Superfamily: Pyraloidea
Family: Pyralidae*
**Taxonomy subject to change and revision.*

Taxonomy-Superworms:

Life: All living, physical, and animate entities
Domain: Eukaryota
Kingdom: Animalia
Phylum: Euarthropoda
Class: Insecta
Order: Coleoptera
Family: Tenebrionidae
Genus: Zophobas
Species: *Zophobas morio**
**Taxonomy subject to change and revision.*

Experience Level Required
Novice/Beginner.

Legal and Regulatory Status (*Subject to Change)
Consult your nearest United States Department of Agriculture (USDA) branch for any further, current federal regulatory or legal status. Also consult with your local, municipal, and state ordinances and regulations for any ownership restrictions.

Size
Superworms are about ½ an inch to 2 ½ inches. Waxworms tend to be smaller, at 13 to 16 millimeters in size. Mealworms can range in size from ¼ of an inch to about 1 inch.

Housing and Enclosure
Housing, or enclosures for any of these larvae can be relatively simple and inexpensive to purchase and maintain. Many commercially available tubs (including those made by Rubbermaid, Sterilite, and Iris), aquariums/terrariums, Kritter Keepers, or other containers of sufficient height as to prevent escape often work well. The container or enclosure should be large enough for each larvae housed within it to be accommodated and not be in constant contact with any wastes inside the container. To prevent any possible escape or them climbing the sides of the container, a layer of Vaseline, plastic boxing tape, or other slippery surface can be used around the top 2 to 3 inches to one third of the container. A tight, securely fitting lid or top with adequate ventilation and smooth sided containers can also be used as well. If using a plastic container, the lid that comes with the container can be used and modified by punching or carving out a section and covering it with a secure wire mesh. Cleaning wise, containers should be spot cleaned and cleaned regularly every 1 to 2 weeks to remove and discard any soiled food, debris, dead or decaying worms, frass (shed exoskeletons), pupae, or adult beetles/insects. These larvae are can be sensitive to fumes and chemicals, and dead worms and other wastes in the container can produce toxins that can kill the living ones and create an overall fowl and unkempt environment.
Many different substrates can be used to house feeder larvae, but any substrate that is chosen should obviously be chemical and pesticide free. Quality, nutritional substrates that can be used

for them to burrow in can include 2 to 4 inches of wheat bran, grain cereal mixes, wheat germ, wheat flour, cornmeal, rolled oats, and oat bran. Do not allow excess moisture or humidity to buildup, as this causes molding and other unfavorable conditions. In addition, suitable hides, shelters, and other furnishings that can be provided can include egg crates/cartons, cork bark, rock slabs, and other similar materials. Providing adequate space, hides, and food is a must, as some species of larvae can be territorial and cannibalistic, and will kill and consume one another without adequate resources.

Temperature, Lighting, and Humidity

For temperatures, mealworms and waxworms can be refrigerated at around 50 to 60 degrees F, and will tend to be dormant and less active during these temperatures for up to several months. Do not refrigerate superworms, as these temperatures will kill them. Do not maintain larvae at temperatures substantially below 40 to 50 degrees F, as this will kill them as well. They can also be maintained at room temperature as well from 60 to 75 degrees F., but will tend to grow and develop at a quicker rate. If additional heating is needed, a low wattage ceramic heat emitter, incandescent bulb, or UTH (or under tank heating pad) can be used. More specific lighting, heating, and humidity product suggestions and recommendations that can best suit one's needs, as well as those of any feeder species can be given as well. If an UTH is used, create at least a ¼ of an inch gap to create adequate airflow. Also be sure to use a quality dimmer or thermostat as well. Additional lighting typically is not required for larvae. Also be sure to keep any of these feeders out of direct sunlight and do not overheat over 80 degrees F.

Feeding, Diet, and Nutrition

Mealworms, waxworms, and superworms are all extremely easy and inexpensive to feed. They can subsist from their substrate provided (mentioned above), or they can be provided some additional variety of fruits and vegetables including potatoes, carrots, lettuce, apples, pears, and other sliced fruits and vegetables. For water and hydration, these forms of larvae are also very easy to maintain in this regard. They are able to obtain their needed moisture from the above sliced fruits and vegetables, particularly potatoes since they are longer lasting. Water bowls or dishes should not be used, as the larvae can drown in them. More specific dietary and supplementary product suggestions and recommendations that can best suit one's needs, as well as those of one's animals can be given as well.

Handling

Most feeder larvae and other feeder insects can easily be handled, moved, or transferred from one container or enclosure to another if needed by gently shaking or tapping the egg carton, tube, or other hide that they are on or within, or scooping them up. It is recommended that they be dusted or supplemented with calcium and other vitamins prior to feeding to other animals as well. Individuals can also be gently grasped and offered using forceps or tweezers as well. **It is possible for some people to develop allergies to feeder insects and/or their frass (droppings and waste products) as a result of too frequent of handling or constant exposure to thereof. Handling your feeder insects in a well ventilated room or other area, and using gloves are some ways to prevent any potential human health related issues. Also remember to be sure to practice basic cleanliness and hygiene associated with proper husbandry after touching or handling any animals or animal enclosures to prevent the possibility of contracting salmonellosis or any other zoonotic pathogens**

Contact

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