Isopods

BASICS OF CARE

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***T. tomentosa* eating a leaf**

Isopoda is an order of crustaceans describing oval shaped invertebrates found all over the world, commonly referred to as “isopods”. They inhabit terrestrial, aquatic, marine, and even arboreal environments. A variety of common names refer to isopods; “pill bug” and “roly-poly” are the varieties that roll into a ball, while “woodlouse” “sow bug” and “potato bug” do not roll.

Isopods have been growing in popularity both for their practical uses as cleaners and as pets. They have been described as “an animal hoarder’s dream” due to both their low maintenance requirements and the small space they requite to thrive. This care sheet will describe specific care for terrestrial isopods (over 3,600 species belonging to the Suborder *Oniscidea*).

Enclosure

A fresh isopod enclosure. photo credit: James Bolden

Most isopods found in America are in cool, damp environments. They prefer to hide underneath things near decaying organic matter. Isopods need access to a wet area to keep their lungs moist and breathe. Another important part of the setup is having a layer of dirt to maintain humidity, burrow, and hide.

Plastic shoe box size containers work great for a starter culture. The box should be large enough to accommodate a wet and a dry side, but small enough to monitor the culture and encourage breeding. The box does not need to seal or be airtight, because isopods cannot climb smooth surfaces. Holes for ventilation should be added along the sides, it is not necessary to add additional ventilation on the top of the lid with adequate amounts on the sides. A good method to add holes into a plastic tub is to use a soldering iron found in most craft stores. Please be sure to do this outside, as breathing in the fumes of burning plastic can be harmful. Ventilation is an important part of enclosure setup to discourage bacteria and mold growth. When the culture is so large that isopods crowd each other, or the entire layer of leaf litter from the last feeding has been eaten, it should be moved into a larger tub or isopods should be removed to prevent crowding.

Substrate used for isopods can be as complex or as simple as a keeper chooses to make it. The important points to meet are that it retains moisture, provides nutrition, and isopods can burrow in it. For example, a substrate high in clay would be a poor choice because it will be too dense to burrow. Previously, topsoil was recommended as the go-to, but this is not an efficient method as topsoil compacts easily and makes it difficult to burrow. The current recommended

cheapest method for effective substrate is to use organic potting soil and then to mix leaf litter in. That's all! To get more complex and effective, sphagnum moss is popular to add to keep up humidity. Peat moss, coco fiber, and mulch can be added to expand the soil for burrowing. Decayed wood, manure, and earthworm castings add a nutritional element to the substrate for the isopods to eat. Organic potting soil has elements such as peat to prevent impaction to the soil and make it more optimal for invertebrate burrowing. Leftover frass from other invertebrate cultures can add another level of nutrition to the substrate of an isopod culture. Adding a calcium source is very beneficial to establishing a thriving, stable culture. Viable calcium sources used by keepers include cuttlebone, eggshells, limestone, and oyster shell. A word of caution when working with limestone is lime can negatively affect indoor plumping and decay concrete. Eggshells are much denser than cuttlebone so they will be noticeable in the enclosure for months; cuttlebone is more preferred for this reason as it is easier to monitor consumption. Charcoal, cholla chips, seedpods, moss, invert and vertebrate molts and sheds, and flake soil are additional additives to the soil that add an extra dimension for nutrition.

P. expansus hiding in a magnolia seed pod. Photo credit: Hannah Arber

Hides are an excellent addition to a setup to give isopods an increased sense of security and encourage breeding behavior. Cork bark is a favorite, because isopods can eat, hide under, and burrow into it. Egg flats are also a favorite to use. Isopods enjoy crawling up underneath and congregating together. Egg flats are convenient because they make it easier to harvest and gage the population of isopods. Egg flats is also a good indicator of humidity- if the crate is soggy, the substrate is too wet. Unfortunately, this means that the crate is prone to mold, but this can be easily kept under control with the addition of springtails.

Temperature, lighting and Humidity

P. scaber **"orange" in substrate.**

Most isopods don't need a heat source. They are comfortable at a wide range of 65-75F (`0-24C). Adding a heat source (such as a heating pad) can boost growth and breeding (especially if the ambient room temp is in the low 60s). However, heat sources should be used with caution because they can cause a culture crash if the temp becomes too high or the isopods do not have a cooler area to escape to. Cooler temps do result in a longer gestation period for isopods.

Some articles suggest that a light cycle may increase breeding activity in isopods. While a direct light source is not necessary, some filtered light to suggest a photoperiod encourages breeding. A clear tote left in a room with a window is enough light to meet this need.

While some species of isopod may prefer to be more wet or dry, it's best to set the tub up so that they can choose either a wet or a dry side. The wet side, when sprayed weekly, will be kept adequately moist. The addition of sphagnum moss will further ensure that moisture is retained and prevent a culture crash from becoming too dry. Adjust how wet or dry the setup is based on the behavior of the isopods and what side they prefer to be. Some isopods are more tolerant of dry conditions, but all isopods need constant access to some amount of moisture. Without moisture, they will suffocate and die because their lungs cannot function. However, if water drips when the soil is squeezed, it is too wet. This can be amended by allowing the substrate to air dry or mixing in dry materials. Substrate that is too wet is a breeding ground for bacteria and will become waterlogged. Mancae (isopod babies) may drown in small pools of water.

Diet

O. asellus mancae eating a dandelion blossom. Photo credit: Peihan Orestes

Isopods are detrivores, the cleaners of the world. A detrivore is an animal that eats any decaying organic matter. They are opportunistic and thrive best on a wide and varied diet. The primary portion of their diet should be made up of hardwood leaf litter and softened wood. Examples of these kinds of trees are elm, maple, oak, cottonwood, palm, and fruit trees. Leaves from potentially poisonous trees to mammals should be avoided for the safety of the keeper. Seed pods serve a dual functionality when offered to isopods; the animals will eat the pods as they decay and also hide inside of them. Moss is also a diet favorite of isopods. Dead, live, or rehydrated, isopods will consume them all. It can be quite entertaining watching small isopods lumber about grazing in their moss meadows.

***A. nasatum* and *P. scaber* eating a Ram's Horn seed pod. Photo credit: Megan Zupi**

Some keepers choose to sterilize leaf litter- this is not recommended from isopods. However, people that keep multiple invertebrates such as roaches, find this a necessary evil as pests that may pose no risk to isopods can be deadly to other animals. It is up to the keeper's discretion to choose the best course of action. Isopods eat microfauna and gain nutrition from

microbial animals in leaf litter. Baby isopods may gain some of these microorganisms from the droppings of the adult members of the colony. However, microorganisms are an important part of the diet of isopods the entirety of their life cycle. Desiccation (allowing leaf litter to dry out) is the preferred method to remove any hitch hikers. Wood is another item that should be treated at the discretion of the keeper depending on their residence. Some areas have little to no risk in harvesting wood locally; while other areas may have termites or predatory beetles burrowed deep in the wood. Baking at 200F for 1 hour should kill any unwanted invertebrates- wood treated at any higher temperature runs the risk of igniting.

Leaves stripped by a large *O. asellus* culture.

A protein source is an important item to offer isopods, especially those classified in the genus *Porcellio*. The most convenient method is to offer commercial fish flakes, but other items are excellent sources of protein as well such as dried shrimp, dog and cat food. Readily available protein encourages colony stability and breeding behavior. Just about any protein source will do, isopods have been observed to voraciously devour mouse pinkies, dead geckos, reptile sheds, and even roaches. A large, healthy colony will make short work of just about any food item offered.

***P. pruinosus* consuming a mouse carcass. Photo credit: Elise Silvas**

T. tomentosa eating snake shed. Photo credit: Ruthie Roo

Commercial diets available for isopods are from the company Repashy called “Morning Wood” and “Bug Burger”. It can be a very fun diet item to offer, it is sold as a powder but once mixed with water it becomes gelatinous and hardens. It can be poured into molds or given as cubes, and isopods quickly eat it. However, offering other listed protein sources are just as effective and it is not clear if these premade diets have a strong effect on a colony’s reproductive rate.

P. ornatus eating Bug Burger and Morning wood. Photo Credit: Brittany E. Wendtland

Calcium is a key element to incorporate into any culture’s diet. This can be done a variety of ways; the easiest and cheapest method is to save up leftover egg shells. The shells do not need to be rinsed, baked or otherwise cleaned; only air dried as the sticky yolk can trap and kill isopods. Cuttlebone is a risk-free option that is easy for isopods to consume since it is very soft. A third option is pelletized/powdered gardening lime. Limestone can be mixed directly into the substrate for isopods to use as a long-term source of calcium.

A. maculatum eating a cuttlebone. Photo credit: Kelly Corder

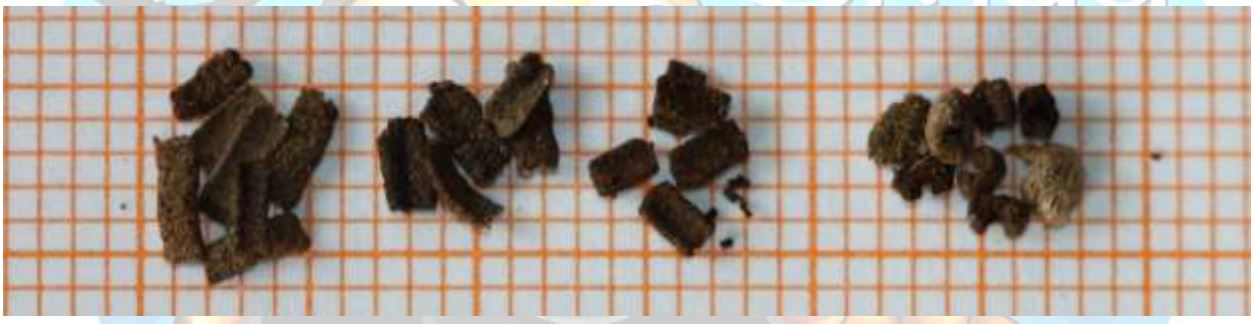
As far as other items to add to a culture diet, isopods will eat nearly anything. Fruit should be offered sparingly (or not at all) because it attracts pests and rots quickly due to high water and sugar content. Potatoes should be used with caution in small tubs as sprouts emit a noxious gas that will kill the animals in an enclosure with inadequate ventilation. Vegetables of any variety are an excellent choice; greens, carrots, zucchini, squash, cucumbers, etc. are all accepted. The firmer the vegetable, the longer the isopods will take to eat it all. Isopods even readily eat grains like oatmeal and wheat bran. Isopods also readily consume fecal material and castaway sheds from larger animals, which is why they are so popular as use as clean up crews. They will thrive with the addition of rodent or reptile stools to their tub and destroy any reptile sheds that are offered. They even eat the frass of other invertebrates, like roaches, beetles, millipedes and crickets!

C. convexus eating a carrot. Photo Credit: Valerie O'Neil

Isopods do well when offered food weekly. To avoid molding food and pests, only offer enough food to be consumed in between weekly checks. If food is leftover, remove rotten food or do not offer any fresh food; the isopods will still eat rotten food. Adjust weekly offerings accordingly with the rate of consumption of the colony.

***P. scaber* eating a powdered diet mix of flours, calcium, fish flakes, and spirulina. Photo credit: Valerie O'Neal**

As isopods eat leaves and other food sources, they of course have to poop. Their waste is called “frass” and is essentially dirt. The frass will build up over time, and the tub becomes more and more full and heavy. Eventually, the substrate/frass will have to be removed. This is a great fertilizer to add to any garden, it should just be frozen first to avoid adding any alien species to the environment. A simple sand sifter or fine litter scoop is a good method to remove frass and save isopods.



Frass from assorted isopods. From left to right: Armadillo officinalis, Porcellio hoffmannseggi, Armadillidium gestroi, Helleria brevicornis Photo credit: Marco Rampinelli

A complete and varied diet not only encourages culture stability but reduces instances of cannibalism. When an individual isopod dies on its own, other isopods will still always consume it. However, when nutritional sources are lacking instances of cannibalism are higher, especially in protein hungry species like *P. scaber* or *P. laevis*. Sometimes the phenomenon of cannibalism is observed in even the most well-fed cultures.

An adult *P. laevis* preying on a juvenile

Pests

A variety of pests and unwanted quests may appear in isopods tubs. However, these pests rarely adversely effect isopods, and even in instances when this does occur, it is likely due to the pest population overwhelming the isopods. Culture crashes are usually caused by invader isopods overwhelming and outcompeting the existing isopod population.

Isopods as pests

Other isopods present problems for several reasons. Aggressive, large species such as *P. scaber* will outcompete and even eat smaller species such as dwarves or more docile species like *O. asellus* and *P. muscorum.* Small species such as dwarf white (*T. tomentosa)* present a challenge of their own because they breed quickly, crowd food sources and stress females out causing premature release of young from marsupium. While the adults may survive, the first stage of their life cycle is eliminated in this way and the culture will eventually die.

Some cultures are kept specifically for their coloration, so it is important that the pattern and coloration be consistent throughout the culture. *P. scaber* “Spanish orange” is the most widely used example of this. If a member of the same species, but a different coloration gets into the culture, it can compromise the entire culture. It will breed and produce offspring that is not the desired coloration, and with the fast reproduction and early breeding age of isopods, the entire culture will be quickly compromised. If the visitor is not caught early on, the entire culture will have to be scrapped and started over with the desired animals.

Ants

Ants are the endgame predator for an isopod culture. This is an animal that is worth panicking over if it is found in tubs. Ants can get just about anywhere and leave scent trails for other members of the colony to lead them back to any source of food they find- and unfortunately many ants love to feast on isopods. Ant invasions can be treated the same way that they would in a home, but it is best to wipe down the outside of the tub and relocated the isopod bins until the ants are eliminated. Any place that ants could be coming in from such as a window or door should be well cleaned to disrupt the scent trails. Ants lay down scent trails to tell other ants where to go, and with the trail destroyed ants will not find their way back.

Ants can be successfully eliminated using several steps, even if the ants themselves have taken up residence in a terrarium or tub. Surround the area the isopods are kept with diatomaceous earth. Diatomaceous earth has micro fragments that essentially shred small invertebrates- killing ants before they can enter an isopod culture. Do NOT use diatomaceous earth inside the enclosure, as it will kill the isopods as well. Double sided tape around the top of the tub will prevent any ants from entering as well. If the ants have colonized the tub, slowly flood the area with ant activity with water to cause the ants to vacate the enclosure- because of the water the ants will take their larvae and eggs with them.

Borax and Terro liquid traps are excellent methods to kill rogue ants in a household. If a tub is colonized with ants, a method to prevent the ants from re-entering should be used to prevent the ants from bringing poinson into the tub. These traps should NOT be used inside of an enclosure.

Mites

Many people come into isopod keeping from the reptile hobby, so the word “mite” strikes fear into their hearts. While many species of mite are parasitic, exactly 0 of the 50,000 described species have been observed preying on isopods. There are two types of mite that can be typically found in a culture: wood/grain mites (an agricultural pest) and predatory mites (often used in agriculture to control small pests). Predatory mites do not prey on isopods or their young. Their diet consists of soft bodied invertebrates, usually aphids and wood mites. Mites are relatively easy to remove and control their population because they go where their food goes. Predatory mites will disappear with their prey; since they eat pests it’s beneficial to allow them to run their course.

Wood mites clinging to the underside of an adult P. hoffmanseggi. Photo credit: David Pavlik

Wood mites typically appear when a culture is being overfed. Wood mites can pose a slight risk when their population gets out of control due to stress from mites causing females to vacate marsupium and discourage breeding. Thankfully, it is relatively easy to control and reduce the population of mites. Wood mites also require a warm, moist environment to thrive, so allowing the culture to dry out and reducing feedings like fish flakes and moist vegetables for two weeks will typically cause the mites to leave the culture. The addition of springtails will expedite this process as well because they will out compete the mites for food and breeding spaces. Just remember: the worst sin of a mite is being really, really, creepy looking.

Fungus Gnats and Fruit Flies

Several different species of gnat. Photo credit: Valerie O'Neal

Gnats are another common complaint among isopod keepers. Gnats are completely harmless and can coexist with isopods without issues. However, most sane people find them really, really gross and annoying. Fruit flies are easy enough to get rid of with apple cider vinegar traps and removal of their food sources such as fruit and moist vegetables like cucumbers. Fungus gnats can be a bit more complicated to remove. Allowing the culture to dry will reduce the population since larvae need a moist environment to thrive. Yellow sticky tape traps is an effective method to trap and kill adults because the bright yellow coloration attracts them. UV fan machines are another method, the top of the machine has a UV light that attracts the flies, and a fan spins at the bottom to pull them down. If they aren't killed by the fan, they cannot escape the trap while the fan is going. This is a great alternative to fly machines that use electricity and are completely safe to use in a house with children and other pets. Springtails are the most effective method to control gnats. A healthy population of springtails will quickly outcompete gnat larvae causing the flies to dwindle and quickly disappear.

Fungus gnats caught in a tape trap. Photo credit: Cindy Gross

Springtails

Closeup of a pink springtail. Photo credit: Valerie O'Neal

Springtails have a habit of showing up in cultures whether they were introduced or not, which can be quite alarming. Springtails are harmless and will *not* harm isopod cultures and are very beneficial. Springtails serve an important part of the microbiome and contribute to a healthy culture. Springtails will break down isopod frass (poop) and, more importantly, mold. In any damp, cool environment, mold will have a hay day and rapidly grow. Springtails will eat most molds. A culture that houses a large, healthy population of springtails will have a practically nonexistent occurrence of mold. Springtails will also outcompete most unwanted microfauna and are frequently used to discourage mites and gnats. Springtails occur in a variety of shapes, sizes, and colors. They are most well known for the “giant white” species used in bioactive setups, but also are available in silver, blue, pink, brown, grey, and even black colors (these are all different species, not mutations). All are beneficial and may break down different kinds of mold and display slightly different behaviors.

Springtails (circled in red) next to *A. nasatum* mancae. Photo credit: Kelly Corder

Millipedes

Garden millipedes. Photo credit: Shawn Kramer

Native millipedes sometimes appear in cultures with isopods. They often hitch a ride while quite small on substrate, leaf litter, or wood. Millipedes are harmless to isopods and can live in harmony. They often will not breed in a very active isopod tub but post no risk to the animals.

Centipedes

Common centipede. Photo credit: Shawn Kramer

Centipedes make their way into a culture by the same method millipedes do. Unlike millipedes, centipedes may prey on isopods. They can harm adult isopods while molting and will hunt and consume mancae. They breed slowly and can be easily manually removed. Left to their own devices, centipedes can decimate an established culture.

Worms

Several different kinds of worms may present in an isopod culture. Earthworms are harmless and pose no risk to the isopods. Another worm, called grindel worms, is a long, white, thin worm that is bred as a feeder for small amphibians like frogs and is also harmless. Nematodes is another worm, and this is the only one that poses any sort of risk to isopods. Some species of nematode are parasitic, but for the most part nematodes are generally harmless as well as naked to the eye and are not visible without a magnifying lens or

microscope. What many people think are nematodes that they have found in their cultures are actually fungus gnat larvae.

Fungus gnat larvae. Photo credit: Elise Silvas

Slugs and Snails

A common garden snail. Photo credit: Peihan Orestes

While slugs and snails happily live in harmony with isopods, they should be removed immediately when spotted. Gastropods are quick breeding animals and the population may explode if left unchecked. Slugs and snails will not feed or predate on isopods, their population can just get out of control if left on checked. Slugs and snails, due to their soft skin, are also vulnerable to being predated on by isopods so are not much of a worry. Many *Porcellio* species have been observed eating an unfortunate slug while still alive in their enclosure.

Garden slug. Photo credit: Kevin Nasser

Spiders

House spider. Photo Credit: Shawn Kramer

Spiders are not a huge concern due to their slow breeding behavior. Large spiders, like wolf spiders, can predate on isopods and should be removed immediately. Smaller spiders are not as much of a concern and can actually be beneficial in keeping unwanted pests such as gnats in check. Many keepers find the idea of spiders living in their house uncomfortable, so there is no harm in removing them as they appear. Eventually, the population will disappear.

Fungus and mold

The spores of common yellow house fungus. Photo credit: Cindy Gross

Unfortunately, the environment for isopods to thrive in is also ideal for mold and fungal growth. Fungus and mold can be deadly to insects (especially cockroaches) but isopods can go about their day relative` ely unaffected. Isopods will consume mold, but large, fuzzy mold growth poses a risk to babies because they can become caught in it. When a culture first starts out, mold is unavoidable until a healthy microbiome is established. Springtails are the best method to control mold growth, microorganisms invisible to the naked eye will further assist with mold control. Isopods enjoy mushrooms and will eat most that sprout in the enclosure, but one that is left untouched is yellow house fungus. Yellow house fungus at first glance is alarming due to the bright coloring and aggressive growth rate but is harmless and common. Yellow fungus is often found in potting soil and thriving alongside common house plants. The fungus will run its course over a period of a few months but may cause the soil to become compact where it grows. Areas with yellow fungus growth can be manually removed.

White mold in an isopod enclosure. Photo credit: Rebecca Hales

Diseases and Infections

One well documented virus that affects isopods is iridovirus. Iridovirus causes the exoskeleton to turn a brilliant blue in the affected organism. While beautiful, this is a death sentence and the isopod will die soon after displaying the blue color. How contagious iridovirus actually is to isopods is debatable. While the affected individual will die, the virus will not be transferred by healthy individuals consuming the affected one. The virus is transferred through abrasions (injuries) to isopods, so decreasing crowding in a colony, increasing humidity, and using a nonabrasive substrate is typically enough. Affected individuals should be removed immediately to discourage infection.

On the right, a *P. scaber* infected with iridovirus next to healthy *O. asellus*. Photo Credit: Hope Hartmann

Sometimes when isopods die, they turn a bright red-orange color in death. This has been noticed recently in collections, and at this time the exact cause is not sure. It always appears to occur when the isopods are living in excessively damp substrate, so the moisture level plays a part. It will occur when the isopods have a “dry” side to escape to, as well. One theory is that the high moisture level encourages bacterial growth, and that the bacteria causes the red-orange coloring in dead isopods. All ages seem to be affected, ranging from very young to old. If several dead isopods are noticed matching this description, all dead and the area of soil around the dead should be removed to treat the affected area.

A bright red *P. scaber* "orange" in death. This was due to decomposition in an excessively moist setup. Photo credit: Danielle Kalwa

Breeding, Offspring, and Life Cycle

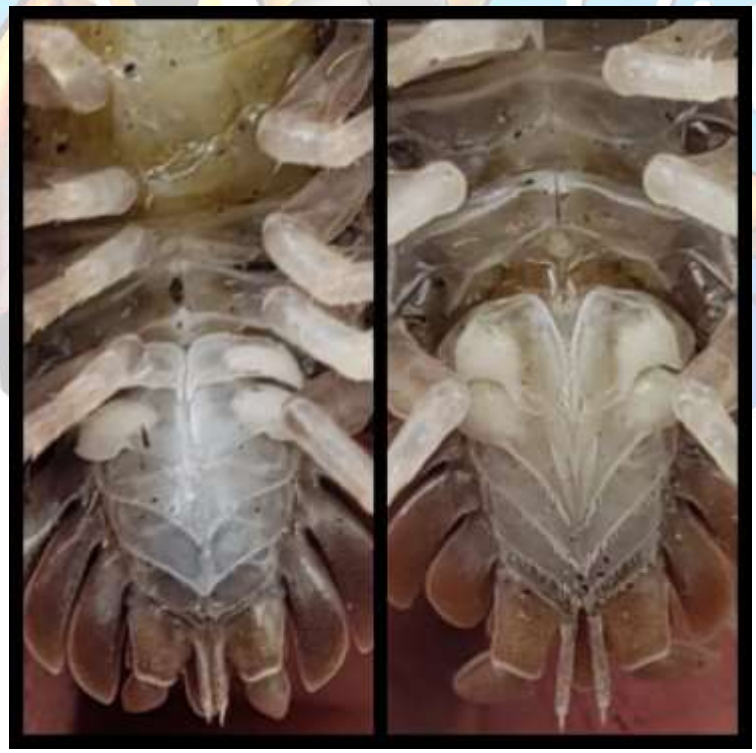
Encouraging isopods to breed is a relatively simple task, just keep them well fed and happy. If temps are too low, breeding will slow or may stop altogether. If too high, the culture may crash, so it is important to have a balance. A good diet is equally important. With plenty of resources available, isopods will multiply quickly with large litters. If there is an element lacking in the diet, isopods may resort to cannibalism, be short lived, have weak bodies, or the culture may slowly die out.

A gravid female *P. dilatatus*

Isopod cultures can start from a population of as few as two, assuming it is a male and female pair. However, the more individuals a culture begins with, the stronger it will be. Most keepers start out with at least 6 but 10 or more is ideal. If possible, adding fresh blood from a separate collection will strengthen the culture.

Male, right and female, left in P. dilatatus. Notice the difference in uropods.

When starting a fresh culture, it is important to be sure there are both male and females present. Isopods wild collected from the US are generally not sexually dimorphic; sometimes a male will be considerably larger than females in old age, and some large Spanish species display a subtle sexual dimorphism with noticeably larger uropods. Uropods are the appendages extending from the posterior end of the isopod. The most direct (and accurate) sexing method is to look at the ventral side of the isopod's posterior end. An isopod is sexed by looking for the presence of the male sexual organ. The actual male reproductive organs are not visible, but the hard sheath used to deliver the spermatophores is- this is called an "appendices masculinae" and is distinctly absent in females.



Left: female right: male in *P. dilatatus*

Isopods typically will not be “caught in the act” of breeding; most will hide away when exposed to light as they are a prey animal. There is always an exception to the rule, and the species A. maculatum readily will breed without fear or shame. While breeding, a male will be seen mounting a female, and the female arches up her hind end to assist. Isopods breed once sexually mature, and for some species this is quite young and small. An isopod will complete 5 molts to reach adulthood, but some species are observed gravid in as little as 2 molts. Young females will mate with large males, and large females will allow small males to mate with them as well. They are not picky animals. An interesting behavior observed in some larger Spanish species is a large mature male can be observed guarding a single female to prevent fertilization from other males.

***A. klugii* breeding. Photo credit: Cindy Gross**

When a female is fertilized, the eggs are laid in a pouch on her abdomen called a “marsupium” (it is also sometimes referred to as a “brood pouch”). The young hatch and develop for some time in this pouch prior to finally emerging. Towards the end of gestation, the young, called manca (mancae for plural), are visible in this pouch- their dark eyes are even observable. The female may release her young early when stressed, for example if she is caught by a predator. This way, the mancae may live on. After a female gives birth, she will guard her young under her body for some time as they acclimate, ensuring they are protected and eat. The manca are soft when born and take some time to harden their exoskeleton. By protecting them, their rate of survival drastically increases. A single group on mancae born together are called a brood. A female will give birth to a fresh brood every 4-6 weeks; this time window is affected by several factors including species, temperature, and diet. Isopods also retain sperm from breeding encounters, a female can produce about 3 broods from one male. Each brood contains 15-30 mancae, this again may vary by species and diet.

A female *P. dilatatus* birthing her brood due to stress from being handled.

A female *P. magnificus* gaurding her brood. she was witnessed chasing off other isopods several times. Photo credit: Brittany E. Wendtland

When isopods molt, they do so one half at a time. The animal doesn't change color, but immediately prior to molting may appear cloudy as the molt is preparing to be removed. After a successful molt, the isopod will appear substantially brighter. It is important not to stress an isopod while it is molting, as a fault molt will result in death of the animal.

***P. laevis* "dairy cow" molting. Photo credit: Peihan Orestes**

Morphs and Mutations

The isopod hobby is rapidly growing, and a big part of this is the huge array of different colors and species that isopods are available. Isopods are found naturally occurring in varying colors and patterns, but occasionally something completely different appears. When an isopod visually looks significantly different, it is called a mutation. Once a mutation is proven, it is called a morph. A morph is not considered proven until is produces offspring identical to itself for multiple generations. Sometimes, due to genetic drift (the cause of the initial mutation) something else may appear in the culture – but this should only happen one in thousands in a proven culture and be relatively infrequent.

P. scaber is the species that has the single most morphs available on the market. This is largely due to how rapidly *scaber* breed and reproduce, but also from a wide natural variation in the species. *Scaber* is commercially found in solid color, calico, pied, and dalmatian patterning, while also available in grey, brown, yellow, orange, white, and red coloring. *Scaber* has demonstrated the effective method of line breeding to encourage pattern and color development. If the *scaber* species is any indication, the world of isopod genetics presents boundless opportunity.

Top row from left to right: "orange dalmatian", "red calico", and "wild type"
Bottom row from left to right: "white out", "Spanish orange", and "Orin's calico"

Mutations can be expressed one of several ways: line breeding for certain traits, Co-dominant, and recessive. Recessive is what most people are familiar with. Recessive traits are when an animal needs two copies of the same gene to express the trait. Albinism is probably the most well-known example of this. To produce offspring with this characteristic, both parents need to be heterozygous or “het”. Het individuals carry the gene but do not express it. When two het individuals reproduce, 25% of offspring will express the trait (2 copies of the gene), 50% will be het (1 copy, carriers, and 25% will not carry the gene at all. For anyone interested in recessive genetic expression, the monk Gregory Mendel did many experiments on pea plants while researching recessive genetic expression.

Co-dom is similar, except an individual only needs one copy of the gene to express the trait. So far, the only confirmed co-dom mutation is “lava” in scaber. With co-dom, when an individual breeds with a non-carrier at least half of offspring will receive and express the gene.

Line breeding is a very interesting method because it does not require specific genes to pursue a new morph. With this method, a breeder picks stock they believe best visually expresses what they want to produce, then remove the offspring that do not meet the goal. This method can be extremely time consuming since there is not a clear genetic cause to color and pattern expression, and it could be years before the desired offspring is consistently produced.

When beginning to isolate a mutation, the process is relatively simple: sex the initial animals and select suitable mates. If female, any males will do. If male, it is best to isolate multiple your females as a male can fertilize several. If the females are not gravid or do not produce any young within 6 weeks, they are considered unfertilized and may be place with the male, and all offspring may be considered descended from him. The isopods should be allowed to breed for a period of time. The non-expressing adults are to be removed once the first generation (called F1) near sexual maturity. After this point, the F1s can reproduce and be watched carefully for offspring of their own that visually represent the desired traits. Any macae that express these traits are to be isolated to their own tub as soon as they are noticed. This way, they are removed prior to being fertilized by non-carriers for the gene which contributes to quicker isolation of the mutation. This method is continued until desired results are achieved or the project abandoned.

Variation in A. nasatum "peach"