Chapter 15
Tarantulas in Captivity: Raising and Breeding

Laura Montes de Oca and Jorge Mendoza

Abstract Tarantulas are animals that you either love or find disgusting. Some people are fascinated with them, whereas others fear them because of ignorance or aversion to what they consider dangerous on the basis of their appearance. Despite their reputation, many people study, maintain and use these spiders. The interest in keeping and propagating tarantulas has increased worldwide in recent decades. The aim of this chapter is to discuss the basic and ethical considerations involved in keeping these spiders in captivity (whether for research or as an enthusiast), as well as being aware of the origin and conservation status of the most common commercial species. As more has been learned about tarantula biology, there has been greater interest in how to breed them in captivity. However, few studies have addressed the reproductive biology of tarantulas. Despite this, many species are propagated successfully by enthusiasts, and the conditions for their reproduction are empirically known. We approach this chapter by dividing it into five sections: (1) natural history; (2) keeping and breeding tarantulas in captivity; (3) common ailments; (4) tarantulas' popularity as pets and their husbandry; and (5) traffic, endangered species and responsible breeding facilities.

L. Montes de Oca (✉)
Departamento de Ecología y Biología Evolutiva, Instituto de Investigaciones Biológicas Clemente Estable, Montevideo, Uruguay
e-mail: lmontesdeoca@iibce.edu.uy

J. Mendoza
Colección Nacional de Arácnidos, Módulo D Planta Baja, Departamento de Zoología, Instituto de Biología, Universidad Nacional Autónoma de México, Coyoacán, Mexico City, DF, Mexico

F. Pérez-Miles (ed.), *New World Tarantulas*, Zoological Monographs 6,
https://doi.org/10.1007/978-3-030-48644-0_15

15.1 Natural History

15.1.1 Common Names and History

Tarantulas are mygalomorph spiders belonging to the family Theraphosidae. Currently, 985 species belonging to this family are recognized, and more than half are from the New World (World Spider Catalog 2020). Theraphosid spiders are known for being hairy, large and long lived in comparison with other spiders. Although many people consider them dangerous and nasty, mostly because of lack of information, they have become very popular within others. Because of their popularity, these spiders are known by several common names. Theraphosids are known as baboon spiders in Africa, earth tigers in Asia, whistling or barking spiders in Australia and bird-eater spiders or tarantulas in the rest of the world. Indeed, the Committee on Common Names of Arachnids of the American Arachnid Society has developed a list of common names principally for those arachnids that are very common in houses, museum or zoo exhibitions, or the pet trade, in accordance with the following criteria: medical or agricultural importance (for their venom, as pests, or as predators of arthropod pests), endangered or threatened status, and abundance or conspicuousness. According to these criteria spiders from the family Theraphosidae can be named tarantulas (in lowercase) and common species will have an associated common name; for example, the (Goliath) bird-eater tarantula is the common name of *Theraphosa blondi* (Latreille, 1804) (Breene 1998). However, the common names are not universal and can vary between different countries and different communities. Hence, the words "tarantula" and "mygalomorph" are technically wrong (Psaila 2005; Pizzi 2012) and their use can provoke confusion. When people consult arachnologists about "big tarantulas" in their gardens, they often turn out to be wolf spiders. This is because the common name "tarantula" originates from the Araneomorphae spider *Lycosa tarantula* (Linnaeus, 1758), a wolf spider distributed in southeastern Europe, the Mediterranean and the Near East (World Spider Catalog 2020). History tells us that in the seventeenth and eighteenth centuries in Italy, the bites of these spiders (and other insects) were combatted with a frenzied dance for a couple of days to remove the "tarantism," accompanied by music known nowadays as tarantella. Also, there is a whip spider (Amblypygi) genus known as *Tarantula* Fabricius, 1793. Another name is *Mygale*, which means "field mouse," and was first used in the fourteenth and fifteenth centuries to name ermines (Mustelidae) (Sedinova 2015).

15.1.2 Natural History

Tarantulas can be found in tropical and subtropical regions, and are adapted to inhabit a wide range of habitats, from the rainforest canopy to desert soils. They are shy and typically solitary, spending most of the time inside their retreats. As ectotherms, tarantulas are sensitive to temperature. In nature, they construct their retreats in order to maintain constant humidity and temperature, avoiding exposure to high

Fig. 15.1 Burrows. (**a**) *Bistriopelma* sp. from Peru. (**b**) *Pamphobeteus insignis* from Peru. (**c**) *Aphonopelma seemanni*. (**d**) *Caribena* sp. from Puerto Rico. (Photos (**a**) and (**b**): L. Montes de Oca; photos (**c**) and (**d**): J. Richards)

or low temperature conditions (Punzo and Henderson 1999; Hardin and Sincage 2015). Burrow construction will vary depending on the habitat and the species. Terrestrial tarantulas use hollows or dig a vertical tunnel into the soil with or without chambers, or use sac-like chambers under rocks or logs; arboreal ones use holes or tree bark (Fig. 15.1). For example, the skeleton tarantula, *Ephebopus murinus* (Walckenaer, 1837), constructs two kinds of retreat: a silken tube mixed with leaves in standing vegetation, or a fossorial J-shaped vertical burrow (a tunnel) with a final chamber, whose entrance is ornamented with a wide funnel of silk and debris (Marshall and West 2008). The latter is similar to that of the white-collared *Eupalaestrus weijenberghi* (Thorell, 1894), but the entrance is smoothly surrounded by silk (Pérez-Miles et al. 2005, 2007). The Mexican redrump, *Tliltocatl vagans* (Ausserer, 1875), constructs a vertical and then a horizontal tunnel (20 cm long) leading from the entrance, with one to four chambers, using the last ones for leaving prey remains and molts (Locht et al. 1999; M'rabet et al. 2007). The female's burrow entrance is covered with more silk during the reproductive season (Locht et al. 1999). Species of the genus *Grammostola* Simon, 1892 can construct vertical tunnels in an open field or live under rocks in sac-like chambers (Ferretti et al. 2012; Costa and Pérez-Miles 2002). The arboreal pinktoe, *Avicularia avicularia* (Linnaeus, 1758), constructs its retreat in a hole, behind tree bark or on a tree branch (Cloudsley-Thompson and Constantinou 1985; Stradling 1994). Some tarantulas build only one burrow and enlarge it as they grow (Dippenaar-Schoeman 2002), whereas others present ontogenic habitat shifts. For example, some terrestrial juveniles construct retreats off the ground, avoiding the burrows of bigger juveniles or adult females (Marshall and West 2008), or look for retreats to occupy

instead of digging. Arboreal juveniles construct retreats within the leaves of climbing plants on trees and, as they grow, exchange those retreats for higher ones behind loose bark or in hollow branches without using leaves (Stradling 1994; Marshall and West 2008). Besides providing a suitable microhabitat, retreats are essential for protection while spiders are molting, for safety during the cold season, while spiders are taking care of egg sacs and also for protection against parasites and predators. For example, tarantulas have to beware of their biggest enemy, the tarantula hawk, *Pepsis* (Pompilidae) (Punzo 1994; Costa et al. 2004; Punzo 2005; Rego et al. 2004; Kurczewski 2010; Kurczewski and Edwards 2012). Indeed, some species such as the white-collared tarantula (*Eupalaestrus weijenberghi*) construct an extra small chamber at the end of their burrow, annexed to the main chamber, in order to prevent the wasp reaching them.

Most of the tarantulas in America have a special kind of hairs for their defense, called urticating hairs (setae), located in the dorsal part of the abdomen. These setae cause irritation on contact with skin. When a tarantula is disturbed, it throws the stinging hairs at the aggressor, which is why some tarantulas remain "bald" on the abdomen. If this is not enough, it raises its front legs, showing its fangs (Gallon 2000).

Tarantulas have two remarkable characteristics, the first being their low vagility. They spent most of their lives inside their retreats, emerging only to catch prey or when attracted by the courtship of a male. As they cannot balloon (as some other spiders do) to disperse, their big moment for dispersal is when they leave their mother's burrow as spiderlings. Reichling (2000) published the first description of the juvenile dispersion of *Tliltocatl vagans*. He found three groups of 72, 76 and 135 spiderlings walking at night, forming a line, and every 7–10 cm, the leader changed position, allowing the following spiderling to take the leader position. On this occasion, the nearest female burrow found was approximately 50 m away. In addition, Shillington and McEwen (2006), observing the same species, reported a maximum spiderling dispersal distance of 9 m from the mother's burrow. This behavior could explain why these spiders are found in local aggregations, while in adjacent areas with similar vegetation, they are absent (Reichling 2000).

Their second remarkable characteristic is their great longevity. Tarantulas from temperate zones, which are inactive during droughts or in the winter season (with exceptions), have a slower metabolism and live even longer. For example, *Aphonopelma hentzi* (Girard, 1852) mature at 10–12 years (Baerg 1958) and *Grammostola* species at 7–13 years (Costa and Pérez-Miles 2002). In the tropics, tarantulas mature faster; for example, *Avicularia avicularia* reaches adulthood in 3–4 years (Stradling 1978). Females become mature much later than males (Stradling 1978; Pizzi 2012). This has been suggested to be a temporal barrier to prevent breeding between siblings in nature (Pizzi 2012). After reaching adulthood, females tarantulas can live for 10–20 more years; moreover, in captivity, a female's lifespan can reach 20–34 years (Baerg 1928; Costa and Pérez-Miles 2002; Foelix 2011; Montes de Oca, personal observation 2010–2020). On the other hand, males have a shorter lifespan, and after they reach adulthood (sexual maturity), they can live on for between 4 months and 6 years, depending on the species—some probably only until the end of the mating season (Baerg 1928; Millot 1943; Stradling

1978; Locht et al. 1999; Costa and Pérez-Miles 2002; Pérez-Miles et al. 2005, 2007; Schultz and Schultz 2009). Some males can become more long lived and very occasionally can present a change after their sexual maturity but lose their reproductive capacity (Verdez and Cléton 2004). Even though in captivity they can live longer, they are unable to keep growing. Males that have molted after becoming sexually mature present anomalies in their pedipalps (their bulbs cannot be regenerated) and sometimes die during the molting process.

Spider growth depends on environmental factors; for example, food can affect the size (Baerg 1928; Turnbull 1962, 1965), as can the photoperiod and temperature (Peck and Whitcomb 1970; Li and Jackson 1996). If we have to rear one, we must bear that in mind. As arthropods, tarantulas have an exoskeleton and must change it in order to become bigger, in a process called molting or ecdysis. Days before molting, the tarantula will start fasting (Pizzi 2012) (and after ward too). Then it will create a soft sheet of silk on the ground and lie down dorsally (upside down) (Fig. 15.2). This is a critical moment; you must leave it in peace and alone, without prey in the terrarium, until the whole process has ended. The process starts a week before molting, when the body starts to prepare. Epidermal cells secrete chitinases and protease enzymes into the exuvial space (the gap between the epithelium and cuticle), which start dissolving the endocuticle, and the cuticle separates from the epidermis. Hypodermal cells secrete the cuticulin (the first new layer), which is protected from digestion. All dissolved substances are reabsorbed. Once the endocuticle has been largely digested, the prosoma starts to tear in the pleural areas. Ecdysis starts with lifting of the carapace, followed by liberation of the abdomen and, lastly,

Fig. 15.2 *Chilobrachys dyscolus* molting sequence. (Photos: J. Mendoza)

extraction of the extremities. Finally, the exocuticle starts to harden. During the subsequent weeks, the exoskeleton will increase its thickness by endocuticle deposition during the weeks following the molt (Foelix 2011). Furthermore, in the molting process, the spider regenerates lost extremities and also recovers the urticating hairs and all of the setae and spines that were present originally. It is common for spiders to lose some of their extremities. Legs can be autotomized from the coxa–trochanter junction if the spider gets hurt somewhere on the appendages below the coxae or if a predator takes an extremity. Regeneration will occur slowly; first, the spider will grow a shorter leg because the new one, after autotomy, will be developed inside the coxa. After the spider's molt, the new leg will be shorter and thin at first, but then, after consecutive molts, it will resemble the original one (Baerg 1926, 1938; Foelix 2011). Molting periodicity will vary depending on the stage. Spiderlings molt weekly, young spiders will molt less frequently (up to once a month) and juveniles each 2–6 months until they become adults. After that only females will keep molting every year or two (Baerg 1938, 1958; Costa and Pérez-Miles 2002).

Spiders are mostly carnivorous "sit-and-wait" predators. This strategy requires little energy because they can use their anerobic capacity to catch prey and their venom to paralyze it (Prestwich 1983a, b). But they do not have jaws, so they have to start the digestion outside their body by regurgitating digestive fluids into the prey in order to dissolve it and produce a liquefied meal. Then, activating the pharynx and stomach muscles, the spider sucks the juice through the mouth opening and transports it to the midgut to absorb the nutrients (Foelix 2011). Tarantulas prey on invertebrates, principally arthropods, and the big ones can even feed on small vertebrates such as lizards, frogs, snakes, mice and birds (Yánez 1998 in Locht et al. 1999; Punzo and Henderson 1999; M'Rabet et al. 2007; Foelix 2011). The majority are active at night or early in the morning. They remain in the entrance of their safe retreat (Cloudsley-Thompson and Constantinou 1985; Yáñez and Floater 2000) until some prey comes within a short distance. The spider must first touch the prey to sense its size and, if it is appropriate, it will catch the prey with its front legs and bite it. This hunting technique can result in long fasting periods; fortunately, spiders are adapted to survive these conditions for several months by reducing their metabolism (Baerg 1928; Punzo 1989; Anderson 1970, 1974). Indeed, in temperate zones, spiders do not eat (much) during the cold season, and nor do females when they are taking care of their egg sacs, during which time they remain inside their warm and closed burrows (Cloudsley-Thompson and Constantinou 1985; Locht et al. 1999; Pérez-Miles et al. 2005).

15.2 Keeping and Breeding Tarantulas in Captivity

Husbandry of a tarantula is not trivial, but it is very intuitive. The most important thing is to use common sense and observe the spider's behavior. The first thing you should know is where the species lives in its natural habitat, such as its natural climate and refuge construction. You should try to reproduce the natural conditions in order to keep your spider in optimal conditions. Bengston et al. (2014) found behavioral differences in *Brachypelma smithi* (F. O. Pickard-Cambridge, 1897) between

individuals housed in enrichment and nonenrichment conditions. Those who were raised in conditions similar to their natural conditions (enrichment conditions) showed fewer threat displays and more prey attacks and exploratory behavior. Sects. 15.2.1–15.2.10 give details of general care that must be borne in mind. For information about special care, see Sect. 15.4.

15.2.1 The Terrarium

Tarantulas are principally solitary, so they must be placed in separate containers. Although some exceptions exist, it is recommended to keep individuals separately. For better observation, the containers can be made of glass, acrylic or other transparent plastic. Although they are used to living in small burrows, they need space to prepare their retreat, feed, and have room while they are molting. Marshall (1996) suggests a minimum container size of 15 times the spider's leg span. For terrestrial tarantulas, you must consider a container length and height not more than twice the spider's length (e.g., 30 × 30 cm) in order to avoid injures from falling (Pizzi 2010; a top door is recommended. In contrast to terrestrial tarantulas, for arboreal tarantulas the vertical dimension is more important than the horizontal dimension, so you should consider a taller container (e.g., 30 × 50 cm), and both front and top doors are recommended (Psaila 2005; Bennie et al. 2011). Lids and doors should always be secure, do not underestimate the tarantula strength and perseverance to move them, they will try to get out from the container (Pizzi 2012; Montes de Oca, personal observation 2010–2020). Make sure the container has ventilation; small holes can be made in the lid or at the top of the walls. When thinking about the container location, the things you must avoid are (1) noise: remember that spiders are very sensitive to vibration; (2) direct sun: when it hits the container, it increases the temperature; and (3) draught: this also causes a temperature disruption. It is recommended to keep them away from chemical substances and at a height where it is warmer than near the floor.

In the case of a spiderling, it can be kept in a small plastic container at least three to four times bigger than its leg span. This container must be changed as the tarantula grows to a size at which it can live in its final terrarium. It will be fine as long as you ensure that there is some moisture in the substrate. In cold places, heat can be provided by placing it on an electrical heating pad. It is preferable to place the pad on one side of the container or put a small piece of cardboard on the heating pad and place the tarantula's container on the cardboard so that it does not receive too much heat (Hardin and Sincage 2015; Mendoza, personal observation (2008–2020)).

15.2.2 Substrates

There are a variety of options for the substrate. It is most important to select one with the ability to retain water (e.g., turf or coir) and also permit it to drain. Here, we summarize a couple of mixtures. Mix I contains three parts of sterilized peat and one part

of sand, which are then mixed with water. The mixture must be moist but not soaked, and it must be able to hold the shape of a burrow. (Psaila 2005). Mix II contains two parts of coir, one part of fine coarse sand and one part of topsoil (Hardin and Sincage 2015). You can place 5–10 cm of substrate for terrestrial spiders and 3–4 cm for arboreal ones, softly compressing the surface to make it firm underfoot (Saul-Gershenz 1996; Psaila 2005; Hardin and Sincage 2015). Whatever substrate ingredients you select, ensure that they are sterile and do not contain chemicals or parasites (Marnell 2016). Avoid gravel and anything with sharp edges that could injure the spider if it falls (Hardin and Sincage 2015). A new technique is the use of "living soil," involving addition to the terrarium of topsoil, which will include microarthropods such as isopods, collembola, and microorganisms such as bacteria and fungi. These will help to decompose organic matter, such as prey remains, and feed on unwanted acarids, for example, keeping the substrate "clean." Moreover, their movement within the soil will aerate it, improving its drainage and structure.

15.2.3 Hides

Burrowing species will be fine with a deep substrate. For other species, you can use natural hides (such as logs, coconut shells or rocks) or artificial ones (such as pots, PVC pipe or plastic containers). For arboreal species, you can add a bark layer (Baxter 1995). Always leave half of the floor area clear, providing space for eating, molting and reproduction (Hardin and Sincage 2015). Remember to provide an enrichment environment to improve healthy development (Bennie et al. 2011; Bengston et al. 2014). It is recommended not to decorate it too much, in order to make it easy to clean it periodically.

15.2.4 Light

Tarantulas do not need too much light; a room where daylight comes in through a window is sufficient. Avoid direct sunlight on the terrarium. Spiders need to be able to distinguish the day from the night, so if they are in a dark room, it is recommended to use dim lights (not bright ones). During the day, you can turn on a low-wattage light, and during the night, if illumination is necessary, use low-wattage colored bulbs or black light (Psaila 2005; Bennie et al. 2011).

15.2.5 Food

As tarantulas are ambush predators and use their hairs to feel the vibrations of prey when they are nearby, they need to be fed with live food. In captivity, tarantulas can be fed with crickets (*Acheta domesticus*), mealworms (*Tenebrio molitor*) and

cockroaches (*Blaberus discoidalis*, *Blaptica dubia, Gromphardorhina protentosa*). Mealworms should preferably be offered carefully with forceps until the tarantula takes them, so they do not fall into the substrate and become buried. Mice or other small vertebrates are not recommended, because the remains start to rot, attracting parasites. Spiderlings can be fed with fruit flies (*Drosophila melanogaster*) and worker termites. You can also try moths, grasshoppers, earthworms, waxworms or cicadas. Always be vigilant for the presence of pesticide in areas where you find the prey, as the spider can become intoxicated if it is fed prey contaminated with pesticide. The size of the prey will depend on the size of the spider; you can start with the length of the spider's cephalothorax as a reference point. As you raise the spider and take care of it, you will get to know the spider's preferences (and personality). Adult spiders can be fed every 4–7 days manually ad libitum, waiting until they capture the first prey with their fangs before you offer the next one. For example, a medium tarantula can eat up to 3–4 mealworms at a time (Montes de Oca, personal observation 2010–2020). Small vertebrates should be offered up to twice a year; more could cause obesity (Hardin and Sincage 2015). If the spider rejects the food it is recommended to remove it. The prey could stress the spider, eat or damage its egg-sac, even attack the spider during molting. Another reason is if the prey dies, it will start to decompose, attracting parasites (e.g. it is common for some prey to drown in the spider's water bowl) (Psaila 2005; Saul-Gershenz 1996; Montes de Oca, personal observation 2010–2020). Remember that a spider starts a fasting period 30–60 days before ecdysis (Philip 2006; Philip and Shillington 2010; Foelix 2011). Other factors that can influence fasting are seasonal temperature changes, the light cycle and reproductive activities. In nature, mature males are known to stop eating in order to look for females to copulate with, consequently dying by starvation after the reproductive season (Pérez-Miles et al. 2005). In captivity, they will become more active and can survive for a few years (depending on the species) if we provide water and try to feed them (De Voe 2009). Studies in araneomorph spiders have found that food limitation in juveniles reduces egg production at the adult stage, and food limitation in adults reduces the clutch size. In both cases (though the impact of food limitation at the juvenile stage is greater), food limitation reduces the life span (Kleinteich et al. 2015). Other studies have found that spiderlings with a restricted diet have reduced growth but are able to gain mass once food is more plentiful again (Jespersen and Toft 2003).

15.2.6 Heating and Temperature

Species from temperate zones can tolerate a temperature range from 21 °C to 27 °C (Baxter 1995), but tropical species need a constant temperature, which may be around 27–30 °C (Psaila 2005). High temperatures may cause terrestrial species to start climbing inside the container, increasing the risk of falls, and tarantulas can become more aggressive and increase their water consumption. More importantly, a reduction in humidity can cause dehydration (Psaila 2005). Low temperatures will slow down the spider's metabolism, making it lethargic and reducing its appetite

(Psaila 2005). If you have to provide external heat and use a heat pad or lights, they should be placed only on one side of the container in order to not overheat it and to create a temperature gradient so that the spider can move to where it is most comfortable and thermoregulate as needed (Baxter 1995; Hardin and Sincage 2015).

15.2.7 Water and Humidity

Tarantulas have two pair of book lungs, giving them a greater propensity to lose water by evaporation (Davies and Edney 1952; Figueroa et al. 2010). Subtropical species should be kept in a humidity range of 40–60% (Shultz 1998 in Psaila 2005), whereas tropical species need higher humidity of 65–90% (de Vosjoli 1991; Baxter 1995). For terrestrial spiders, always keep a shallow bowl of water on the soil without any kind of cotton or sponge, which could cause infections (Marshall 2001; De Voe 2009; Riley and Barron 2016; Cléton et al. 2015; Mendoza, personal observation 2008–2020). As small spiders or prey can fall into it and drown, it is suggested to put small stones inside it to help them escape (Hardin and Sincage 2015), or maintain a damp area of substrate in the cage for the spider to drink from. Arboreal spiders will prefer to drink water drops on their web or in their surroundings, provided with a spray bottle (Frye 1992; De Voe 2009). To maintain the humidity, you can also cover the vents with a silk screen, plastic food wrap or laminated paper; this will depend on the kind of container you have selected and the mesh or hole size you use to provide ventilation (Psaila 2005; Saul-Gershenz 1996). Another way is spraying water every day (Bennie et al. 2011; Saul-Gershenz 1996). A dry environment can cause problems during molting, making the new skin stick to the old skin, which can cause loosening of extremities and respiratory difficulties (including asphyxia) if it gets stuck in the book lungs.

15.2.8 Cleaning

Containers must be maintained and cleaned periodically. The temperature and humidity conditions can cause feces, food remains or dead bugs to become infested by fungi and parasites. To prevent disease, containers should be kept under hygienic control. The inside surfaces can be cleaned with a 3400 ppm (part-per-million) sodium hypochlorite solution (SHS). Use different forceps for feeding and removing food and for removing or replacing items. This will avoid contamination of clean items. When you have finished using them, all forceps can be autoclaved or washed with SHS for use the next time. Some spiders leave their feces on the wall; they can be removed using cotton soaked in water (Psaila 2005; Saul-Gershenz 1996). Soil sterilization can be achieved by baking it at 200–250 °C for 2 hours in a conventional oven (Saul-Gershenz 1996) or even in a microwave oven (at 625 watts and 2450 MHz); leave it for at least 30 seconds until you see steam, and then it is ready. The time needed will depend on the amount of soil used and can be between

1 and 3 minutes (e.g., 1 kg of soil for 150 seconds; see Trevors (1996) for more methods). Let it cool before removing it from the oven.

15.2.9 Handling and Transport

Tarantulas are not animals that should be manipulated; they are fragile creatures that can easily be hurt accidentally, so it is always advisable to handle them only if it is strictly necessary. Although most tarantula species are docile, they all have venom glands and, if they feel stressed or threatened, they can bite you with their big fangs. Although it is not lethal, their bite can produce pain, local or extensive swelling, fever, dysesthesia, cramps, myalgia, or shivers (Haro and Jouglard 1998). Moreover, the urticating hairs present on New World tarantulas can cause chronic conjunctivitis (Haro and Jouglard 1998). To avoid the urticating hairs, it is recommended to use latex gloves and a facial mask when moving the tarantula or cleaning the terrarium (Saul-Gershenz 1996). To catch a spider, you can use a container (such as a glass) or a goldfish net and a small stick to tap on the burrow entrance. The use of cotton or gardening gloves is also recommended. If the tarantula is inside the burrow, you can dig (very gently) with a spoon. In the case of arboreal tarantulas, if all you need to do is change the substrate, remove the spider with its whole retreat (the log) or, if possible, you can start pressing on the silk tube from the back in order to persuade the spider to go outside, and then capture it with a container. The best time to manipulate a tarantula is during the day, as they are more active during the night (Psaila 2005).

15.2.10 Breeding

By examining the molts, sexes can be determined while tarantulas are still juveniles. Females can be recognized by the presence of spermathecae on the inner side of the epigastric furrow, between the anterior book lungs (Fig. 15.3). Juvenile females will have spermathecae that are sclerotized. If such a structure is not seen, you must have

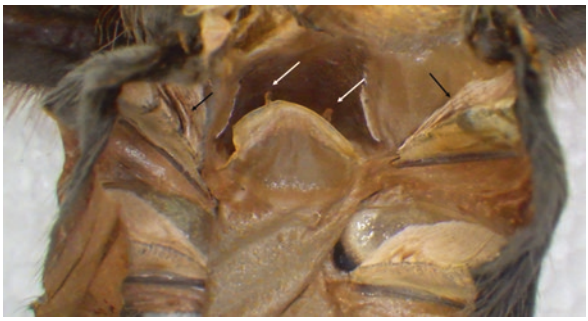

Fig. 15.3 *Grammostola anthracina* spermathecae (*white arrows*) between anterior booklungs (*black arrows*). (Photo: L. Montes de Oca)

a juvenile male. For example, in *Brachypelma* Simon, 1891, the spermatheca can be seen from the fifth instar (Hardin and Sincage 2015). Also, adult females can show an epigastric furrow that is swollen (raised) (Pizzi 2012). Males become sexually mature in their last molt, in which they develop a tibial apophysis (or spur) on legs I—a structure they use to hold onto females by their chelicera during copulation (except for the common species *Theraphosa stirmi* Rudloff & Weinmann, 2010 and Old World *Poecilotheria* spp.). Also, the tarsus on the palp is modified and appears as a bulb—a sclerotized structure that transfers sperm into the female spermathecae. As their testicles are in their abdomen, males have to transfer the sperm into their bulbs, in a process called sperm induction (Costa and Pérez-Miles 2002; Foelix 2011) (see Chap. 14). This process occurs during a 2-week period after the last molt, and then the males are ready for copulation. You can see the remains of the dense sheet of silk as a thick white string.

Preparation for mating Each species has its own reproduction period (see Sect. 15.4) and, depending on the species, females may copulate twice a year or every second year (Petrunkevitch 1911; Prentice 1997; Shillington and Verrell 1997; Costa and Pérez-Miles 2002). Females of some species may copulate several times (Petrunkevitch 1911), whereas others become reluctant after their first copulation (Pérez-Miles et al. 2007). In nature, the female remains in her retreat until a male approaches, detects her pheromones and starts his courtship. In captivity, copulation should occur in the female's container. Mature females should be well fed and within 2–3 months of their last molt. Before introducing the male, clear the terrarium, removing all objects from it to create space and avoid obstructions in case you need to separate the couple in the event that something goes wrong. Once the male is inside the terrarium and perceives the female's presence, he will start his courtship with vibration of his posterior legs and palp drumming. If the female is receptive, she will answer the male drumming with her pedipalps and approach him. Once they are close, the male will hook up his spurs on the female's chelicera in order to lift her and get access to the ventral part of her abdomen, and reach the epigastric furrow with his pedipalps to introduce the bulb and transfer the sperm into the spermathecae (Fig. 15.4). Copulation will end with the couple separating, at which point the female will return to her burrow or remain quiet for a while, and the male will move away. You can also help the male to get out in order to avoid an attack from the female. It also can happen that a male starts his courtship but the female does not respond, because she is still immature, is close to molting or is already gravid. In those cases, the male may intensify his courtship or move away. Be alert in case the female becomes upset or tries to attack the male. Depending on the species, courtship and copulation can take up to an hour. More details of the process are given in Chap. 14. If the female molts after copulating, the stored sperm will be lost; this can occur if the female is overfed (Clarke 1987).

A few weeks after copulating, the female will construct an egg sac, starting with a dense horizontal silk disk and a cylindrical wall, then she will lay her eggs and proceed with the fertilization, which takes a few minutes. After that, she will close the egg sac with a cover plate and finally wrap it with a mesh of threads (Foelix 2011). Most terrestrial tarantulas roll and silk the egg sac until it is spherical, and if they perceive that it is misshapen, they may eat it (Marshall 2001). The egg sac will

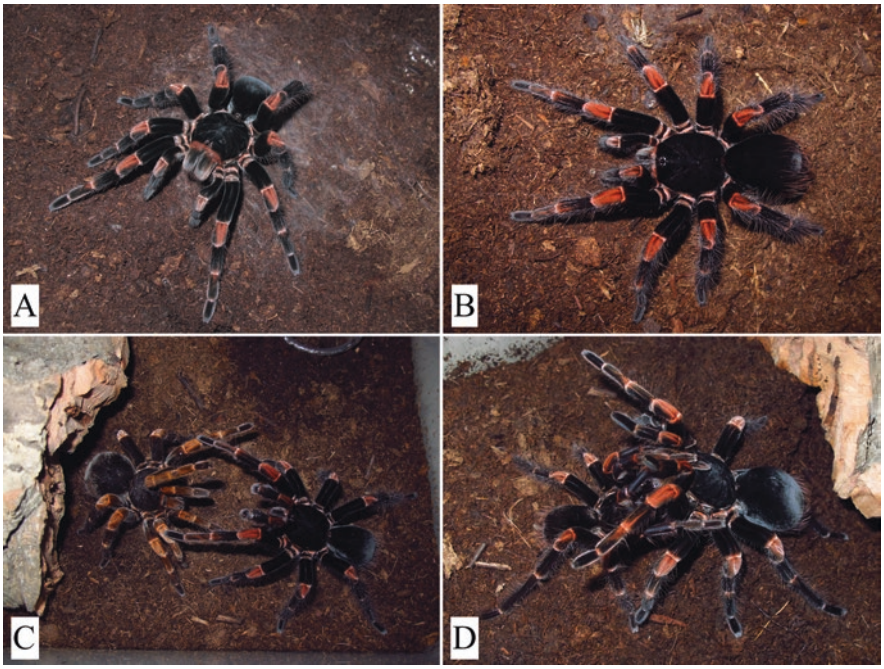

Fig. 15.4 *Megaphobema mesomelas*. (**a**) Female. (**b**) Male. (**c**) First contact. (**d**) Male hooking up the female. (Photos: J. Mendoza)

maintain its humidity and temperature, as well as providing mechanical defense. It is common for females to remain hidden in their retreats until the spiderlings emerge (Dias and Brescovit 2003; Foelix 2011) (Fig. 15.5). The developmental stages are (1) the embryonic stage, from the time of egg fertilization until the body shape of the spider is established; (2) the larval stage, which includes the prelarva and the larva, feeding on yolk; and (3) the nympho-imaginal stage, once all of the organ systems are present (nymph = juvenile, imago = adult). All stages beyond the larval stage are separated by ecdysis (Foelix 2011).

In captivity, some people remove the egg sac from the female and incubate it artificially in order to prevent cannibalism, which can occur if the female is disturbed. An interesting finding is that when eggs are incubated at 27 °C and then the juveniles are subsequently well fed, the males will be bigger (in terms of both mass and size) when they mature (Reichling and Gutzke 1998).

15.3 Common Ailments

Health problems can be avoid through control of humidity, temperature, ventilation and hygiene. Sects. 15.3.1–15.3.3 discuss the most common health problems observed in tarantulas.

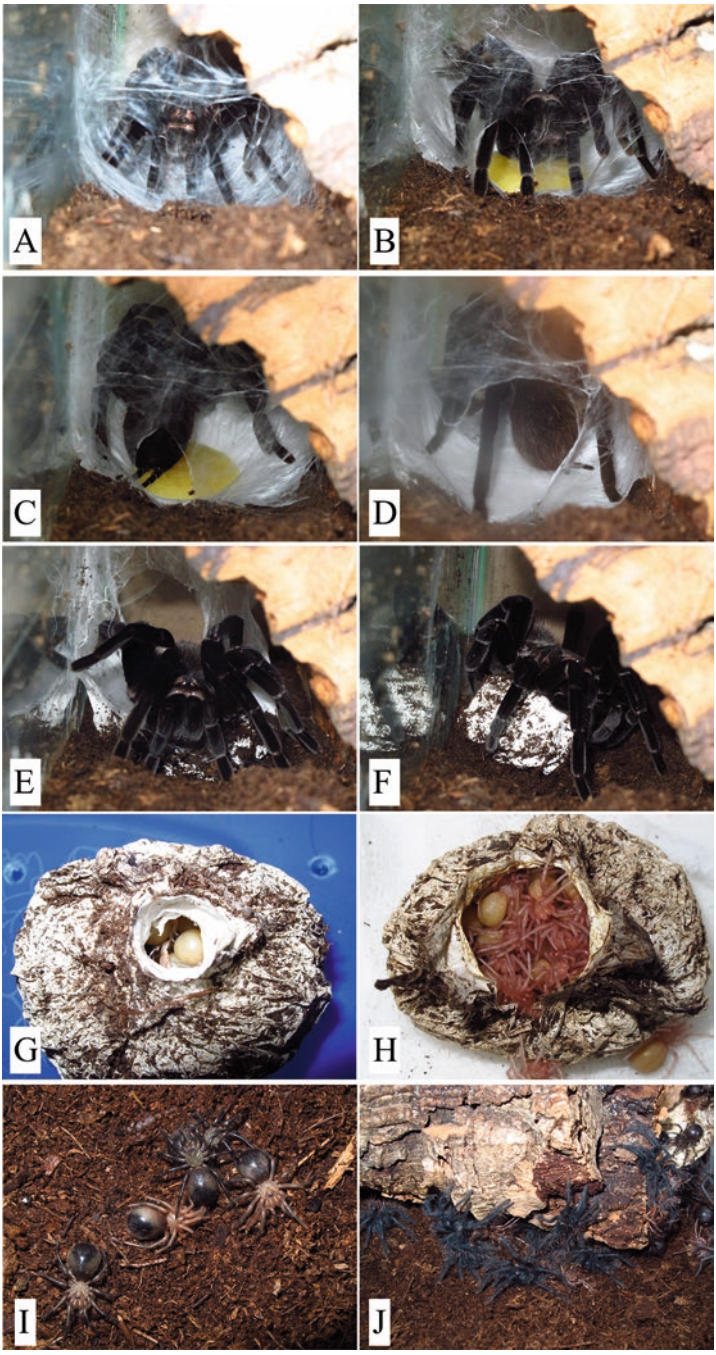

Fig. 15.5 *Xenesthis immanis* egg sac construction. (**a**) Horizontal disk silk and cylindrical wall. (**b**) Egg laying. (**c**) Fertilization. (**d–e**) Egg sac closing with a cover plate. (**f**) Wrapping and rolling with a mesh of threads. (**g**) Egg sac open at the larval stage. (**h**) Spiderling emergence. (**i**) Larval stage. (**j**) Juveniles. (Photos: J. Mendoza)

15.3.1 Dehydration

Dehydration can cause ataxia (loss of control of body movements) because, like all spiders, tarantulas use blood pressure instead of muscles to extend their legs, and lack of water lowers the blood pressure. Severe cases also can be distinguished by a shrunken abdomen (Draper and Trim 2018). Be alert to the possibility of dehydation if the spider drinks too much water, the water container is always empty or the spider sits in it. The recommended treatment is to check the water bowl and mist the terrarium. Place the spider's cephalothorax over the water container, allowing the chelicera to be in contact with the water for at least 1 hour. This should be supervised to ensure that the book lungs in the abdomen do not touch the, which could drown the spider. If the spider is still weak, repeat the procedure in a couple of days. Also, try to increase the relative humidity by closing some of the ventilation holes and adding water to the substrate (Psaila 2005).

15.3.2 Tissue Damage

Tissue damage can be caused if the spider falls from or inside the terrarium, if molting goes wrong or if the spider suffers a cut from a sharp object used for decoration. These kinds of injuries are risky because the spider can lose too much hemolymph, causing dehydration. In small injuries, loss of hemolymph can be stopped with use of wax (e.g., paraffin wax or beeswax) or cyanoacrylate adhesive. Infections can be avoided by use of antibiotic ointment (e.g., neomycinum). Never use iodine, alcohol or hydrogen peroxide, since they could poison the tarantula. It is better to avoid injuries, because most tarantulas do not survive them. Depending on the volume of hemolymph that is lost, the spider may require treatment for dehydration (Hardin and Sincage 2015; Pellett et al. 2015).

15.3.3 Parasites

One of the more lethal parasite infections found in captive tarantulas is caused by Panagrolaimidae nematodes, which have also been found in wild specimens. An infected spider will manifest anorexia, will become less mobile, and may adopt a huddled posture or appear to be "standing on the tips of its toes." You can inspect the mouth, washing the oral region between the chelicera with a saline solution, using a low-powered microscope or an endoscopic camera to try to see any mobile nematodes (which are less than 2 mm long). If the infection advances, a thick, white oral discharge can be observed, which may be mistaken for a bacterial infection. No treatment has been found, and the spider will die within weeks after the infection is first noticed. Precautions should be taken when handling specimens, because related nematodes have also been reported to infect humans, so a tarantula bite can be

aggravated by nematode infection of the wound, which is difficult to treat. It is strongly recommended to euthanize the spider in order to stop dispersal of the nematode infection (Pizzi 2009).

Saprophytic mites can appear as a result of moisture or dampness, so, again, it is important to control the humidity of the tarantula's environment. When they occur in large numbers, they may settle on the tarantula, and the resulting stress may make it stop eating and become weak. The main problem is if they infest the book lungs, interfering with the spider's breathing (Breene 1998). If you notice mites, place the tarantula in a new, empty container and remove the mites with a fine paintbrush. Disinfect (or autoclave) all of the terrarium objects or replace them. In North America, you can buy the predatory mite *Hypoaspis miles* (Laelapidae) (West 1995), and the recommended dose is half a teaspoon in the terrarium (Breene 1998). Also, in the substrate, you can include woodlice, which are isopods and help to dispose of prey remains, thereby helping to avoid the appearance of saprophytic mites (Schultz and Schultz 2009). Other alternative treatments have been described by Pizzi (2009).

Scuttle flies (genus *Megaselia*) are attracted by rotting flesh or food remains. Maggots can get inside the spider through its mouth or book lungs and eat it from the inside out. The symptoms are anorexia and immobility, followed by swelling of the abdomen and eventually death (Machkour-M'Rabet et al. 2015). This parasite has been reported in natural populations of *Megaphobema robustum* (Ausserer, 1875) and *Pamphobeteus* Pocock, 1901 in Colombia (Weinmann and Disney 1997), *Theraphosa* Thorell, 1870 in French Guyana (Marshall and Uetz 1990) and *Tliltocatl vagans* (Ausserer, 1875) in Mexico (Machkour-M'Rabet et al. 2015).

Acrocerid spider fly are cosmopolitan endoparasites. The last larval stage is fatal to the spider, as the larvae burst out of the host's abdomen to pupate (Cady et al. 1993; Larrivée and Borkent 2009; Pizzi 2009; Barneche et al. 2013).

Spiders can be also be infected by bacteria, causing lethargy, fasting, weight loss and open wounds. Indeed, bacterial co-infections are very common in spiders infected with nematodes. Diagnosis can be difficult because little is known about the relevant microflora. For confirmation of the diagnosis, a hemolymph culture should be made (Mitchell and Tully 2008).

15.4 Tarantulas' Popularity as Pets and Their Husbandry

Spiders vary in size, color and specific characteristics within each group, according to their lifestyle, but a very particular group of spiders that, throughout history, have created great fear while also fascinating people are tarantulas. These great giants among spiders have impressive strength, a perception of their environment that can seem other-worldly, and ways of eating, breathing and even reproducing that may seem very strange. The large size of these spiders suggests that they are very poisonous, but tarantulas pose no danger to humans; contrary to popular belief, no tarantula has a poison capable of killing people (Mendoza 2009).

As mentioned previously, tarantulas are very long-lived animals, with a life expectancy of more than 10 years and even up to 30 years in captivity for the females of some species. It is because of this longevity that there is greater demand for females. Tarantulas come in a wide color range, which varies from black to brown, red, orange, blue and even violet. These characteristics have made them popular animals as pets. Like other types of exotic animals, they are increasingly in demand among hobbyists. More and more species are being commercialized, described and kept in captivity (Reichling 2003; Rojo 2004; West 2005).

15.4.1 Popular Pet Species

Some species of tarantula commonly kept as pets include the Mexican red-legged tarantula (*Brachypelma smithi*), the burgundy Goliath tarantula (*Theraphosa stirmi*), the Costa Rican zebra tarantula (*Aphonopelma seemanni*) (F. O. Pickard-Cambridge, 1897), the Pinktoe tarantula (*Avicularia avicularia*) and the Old World Togo starburst tarantula (*Heteroscodra maculata* Pocock, 1900). These are just some of those considered the most popular and common species among hobbyists worldwide. These species are relatively easy to get for those interested in acquiring a tarantula as a hobby. These species are preferred mainly by those who are taking up the hobby, on the basis of their docility (except for *H. maculata*), coloration, longevity or size. It should be noted that most of these species are from the New World. This could be due to the fact that the majority of American species are large, are generally docile (as opposed to Asian or African species), come in a great variety of colors and, in most cases, are easy to maintain and breed in captivity. However, there are also other tarantulas from different parts of the world that are popular as pets and are regularly bred and offered for sale as pets (Table 15.1). Not all species are suitable for people who are new to the hobby; some tarantulas require more specific maintenance and management conditions. So, it is very important to learn and read about the species that we want to keep, in order to provide them with the most appropriate conditions in captivity. In the following sections, we will describe the basic requirements and care of some tarantulas that are kept in captivity in many parts of the world.

15.4.2 Acanthoscurria geniculata (C. L. Koch, 1841)

Historical names *Mygale geniculata* C. L. Koch, 1841
Scurria geniculata C. L. Koch, 1850

Synonyms *Acanthoscurria transamazonica* Piza, 1972

Common names Brazilian whiteknee tarantula, Giant whiteknee tarantula

Geographic distribution Brazil (states of Rondônia, Roraima, Pará and Mato Grosso)

Table 15.1 Popular tarantulas in the pet trade

Acanthoscurria geniculata
Aphonopelma seemanni
Avicularia spp.
Brachypelma spp.
Caribena versicolor
Ceratogyrus spp.
Chilobrachys spp.
Cyriopagopus spp. (*Omothymus*)
Ephebopus cyanognathus
Ephebopus murinus
Grammostola spp.
Haplopelma spp. (*Cyriopagopus*)
Heteroscodra maculata
Lampropelma spp.
Pamphobeteus spp.
Phormictopus spp.
Poecilotheria spp.
Psalmopoeus spp.
Pterinochilus murinus
Stromatopelma calceatum
Tapinauchenius spp.
Theraphosa spp.
Xenesthis spp.

Physical description The carapace is black, typically bordered by white. The legs are black with a white ring at the joints of each segment. Typically, there are two white stripes over the patellae and tibiae, and there may also be two narrow white vertical stripes on the patellae. A small cream-white vertical stripe is visible on one third of the metatarsi. The abdomen is black with scattered long red hairs. Adult males have a black carapace and legs. The adult female has a body length of up to 8 cm, with a leg span of 20 cm. The adult male has a body length of up to 7 cm, with a leg span of 18 cm (Fig. 15.6).

Habitat Brazilian tropical forest with a warm and humid climate and marked rainy and dry seasons. As an exclusively terrestrial species, it lives in burrows located under rocks, inside fallen logs, inside living trees and in ravines on the ground (Paula et al. 2014).

Longevity In captivity, the female matures in a period of 3–4 years, while the male matures at 2 years; females can live for up to 20 years, while males can live for up to 4–5 years.

Terrarium The substrate must be at least 10 cm deep because this species is a digger and tends to make a burrow if the substrate is to its liking.

Fig. 15.6 Female *Acanthoscurria geniculata*. *(Photo: J. Mendoza)*

Temperature 25–28 °C during the day and 21–24 °C at night

Humidity The recommended humidity is 70–80%. After the female has mated, the humidity can be dropped gradually to 60%; then, after 3–4 months, it can be increased again to 80% to simulate a wet season and let the female lay an egg sac. Adults tolerate lower humidity better; for spiderlings, the humidity can be up to 90% (in a well-ventilated container). The humidity can be maintained by sprinkling water on half the substrate at least once a week (Marshall 2001; Cléton et al. 2015; Mendoza, personal observation 2008–2020).

Feeding You can offer crickets, cockroaches, mealworms (adult specimens are well received), large roaches or grasshoppers. Young spiders can feed on fruit flies (occasionally) and pinhead crickets, preferably every third day. It is a very voracious tarantula and will grow quickly, changing its skin at a frequency of around 30–40 days (Mendoza, personal observation 2008–2020).

Reproduction This is an easy species to breed. The mating season is from June to September. The female may or may not be slightly aggressive toward the male. If the male is introduced very quickly into the terrarium of the female, she will attack it most of the time. If the female is not ready for mating, she will try to escape in the first instance, but if the male is persistent, she may attack him to defend herself. After copulation, the male will try to run away quickly. During the subsequent 2 months, the female should be fed regularly; during the third month, the feeding should be more sporadic. The latency of oviposition after mating can range from 3 to 6 months. Once the egg sac is formed, the female will take care of it for approximately 3 months before the hatchlings emerge. During this period, the average temperature of the terrarium should be around 28 °C. If desired, the egg sac can be incubated artificially; in that case, it should be removed between 4 and 6 weeks after it is laid. The number of offspring can range from 800 to 2000 (Paula et al. 2014; Cléton et al. 2015; Mendoza, personal observation 2008–2020).

Handling and behavior This species has a generally docile but very unpredictable character and can bite if you put your hand inside its terrarium, but the most likely reason is that this species is very voracious and may mistake your hand for some kind of food. If you disturb it, it is most likely to throw urticating hairs. The urticating hairs of this species are particularly effective against humans and can cause a severe reaction (in some people) of burning of the skin, eyes and nose, so be careful (Cléton et al. 2015; Mendoza, personal observation 2008–2020). Its venom is not dangerous to humans, and its bite, although painful, does not cause major effects. The pain and swelling can disappear in a few hours or a couple of days (Mendoza, personal observation 2008–2020).

Conservation status There is not enough information available on this species, but it is not considered threatened.

15.4.3 Aphonopelma seemanni (F. O. Pickard-Cambridge, 1897)

Historical names *Eurypelma seemanni* F. O. Pickard-Cambridge, 1897
Rechostica seemanni Smith, 1986

Synonyms None

Common names Costa Rican zebra tarantula, Costa Rican stripe knee tarantula

Geographic distribution Costa Rica (province of Guanacaste), Nicaragua (departments of Rivas and Carazo)

Physical description The female carapace is black or dark brown, typically bordered by light brown. The male carapace is black with dark purple around the eyes, bordered by light brown. The legs are black with scattered long brownish hairs. Typically, there are two white stripes over the patellae and tibiae, but the stripes on the tibiae are less visible in adult males. A small cream-white vertical stripe is visible on one third of the metatarsi and palp tarsi. The abdomen is black with scattered long brown hairs. From the ventral view, the prosoma and opisthosoma are brown. The adult female has a body length of up to 7 cm, with a leg span of 14 cm. The adult male has a body length of up to 6 cm, with a leg span of 13 cm (Teyssié 2015; Mendoza, personal observation 2008–2020) (Fig. 15.7).

Habitat Costa Rican dry forest and grassland. It is an adaptable species and can be found frequently around rich green embankments on the front lawns of local homeowners (Smith 2013; Mendoza, personal observation 2008–2020). As an exclusively terrestrial species, it lives in burrows located in open grasslands, on hillsides or on slopes (Herrero and Valerio 1986; Mendoza, personal observation 2008–2020).

Fig. 15.7 *Aphonopelma seemanii*. (**a**) Burrow. (**b**) Female. (**c**) Male. (**d**) Mating. (Photos: J. Mendoza)

Longevity In captivity, the female matures in a period of 4–5 years, while the male matures at 3 years; females can live for up to 15 years, while males can live for up to 2–3 years.

Terrarium The substrate must be at least 10 cm deep because this species is a digger and tends to make a burrow if the substrate is to its liking.

Temperature 24–27 °C during the day and 21–23 °C at night

Humidity The recommended humidity is 70–80%. After the female has mated, the humidity can be dropped gradually to 50%; then, after 3–4 months, this can be increased to 80% to simulate a wet season and let the female lay an egg sac. Adults are more tolerant of minimum humidity. The humidity can be maintained by sprinkling water on half the substrate at least once a week.

Feeding You can offer crickets, cockroaches and mealworms. Young spiders can feed on fruit flies (occasionally) and pinhead crickets, preferably every third day. Juveniles can be fed with medium-sized crickets or *Tenebrio molitor*. Females grow more slowly than males, changing their skin at a frequency of around 40 days as juveniles (Mendoza, personal observation 2008–2020).

Reproduction This species rarely breeds in captivity. The mating season is from August to January. The female in general is not aggressive toward the male. If the female is not ready for mating, she will try to escape in the first instance, but if the male is persistent, she may attack him to defend herself. After copulation, the male will try to run away. During the subsequent months, the female should be fed regularly. The latency of oviposition after mating can range from 4 to 6 months; however, an Arachnida breeding facility keeps a female which laid an egg sac 14 months after mating (Mendoza, personal observation). Once the egg sac is formed, the female will take care of it for approximately 3 months before the hatchlings emerge. During this period, the average temperature of the terrarium should be around 26 °C. It is recommended to artificially incubate the egg sac in an incubator to avoid the risk of cannibalism. The egg sac can be removed after 4 weeks. The number of offspring can range from 200 to 500 (Cléton et al. 2015; Mendoza, personal observation 2008–2020).

Handling and behavior Many individuals are very skittish and can run very fast, so you must be careful when opening the terrarium. It is rare for this species to throw urticating hairs. (Marshall 2001; Mendoza, personal observation 2008–2020). Its venom is not dangerous to humans, and the bite does not cause a major effect. Not much is known about the effect of its venom.

Conservation status There is not enough information available on this species, but it is not considered threatened.

15.4.4 Avicularia avicularia (Linnaeus, 1758)

Historical names *Aranea avicularia* Linnaeus, 1758
Mygale avicularia Latreille, 1804
Mygale scoparia C. L. Koch, 1841
Eurypelma avicularia C. L. Koch, 1850
Avicularia avicularia Simon, 1892

Synonyms *Avicularia ancylochira* ***Mello-Leitão, 1923***
Avicularia velutina Simon, 1889
Avicularia exilis Strand, 1907
Avicularia cuminami Mello-Leitão, 1930
Avicularia nigrotaeniata Mello-Leitão, 1940

Common names Pinktoe tarantula, Common pinktoe tarantula, Guyana pinktoe tarantula

Geographic distribution Venezuela, Guyana, Suriname, French Guyana, Trinidad and Tobago, Brazil, Peru and Bolivia

Physical description Females have a brown carapace with short brown body setae with a green sheen. The carapace is bordered with long reddish brown setae with a

pink sheen. The ventral region is dark brown. The legs and palps have short brown body setae with a green sheen and reddish brown guard setae with homogeneous dark coloration on the anterior legs and guard setae with a darker base and a contrasting whitish apex on the posterior legs. There are leg rings on the distal femora and tibiae, and the metatarsi are whitish. The abdomen has scattered long reddish brown hairs with a pink sheen grouped on the lateral, dorsal and anterior areas, with short black body setae. The ventral abdomen is brown. Males have a brown carapace with short brown body setae with a green and golden sheen. The carapace is bordered with long setae the same color as the short body setae on the dorsal carapace. The ventral region is dark brown. The legs and palps have short brown body hairs with a green sheen and reddish brown guard setae with homogeneous dark coloration on the anterior legs and guard setae with a darker base and a contrasting whitish apex on the posterior legs. There are leg rings on the distal femora and tibiae, and the metatarsi are whitish. The dorsal abdomen has scattered long reddish brown hairs with a pink sheen and dark short body setae. The ventral abdomen is brown (Fukushima and Bertani 2017). The adult female has a body length of up to 7 cm, with a leg span of 13 cm, and the adult male has a body length of up to 6 cm, with a leg span of 12 cm (Fig. 15.8).

Color pattern ontogeny Juveniles are brownish without a metallic sheen, and with black tarsi contrasting with other lighter parts, and a reddish dorsal abdomen, with a dorsal central longitudinal black stripe disconnected from transversal black stripes. When mature, both males and females lose this pattern (Fukushima and Bertani 2017).

Habitat Tropical forests in South America. Their retreats are found in different settings in vegetation and in human constructions. Younger juveniles are found between the leaves of low-growing plants (especially *Heliconia*), holding the edges of leaves together with silk to create a retreat. After this life stage, these spiders tend to build their retreats in more elevated structures without incorporating leaves into their retreat. The locations of their retreats include hollow stumps of the acai palm, folded leaves of bananas, the hollow center of pineapple plants and the palm leaf thatch of native houses (Fukushima and Bertani 2017).

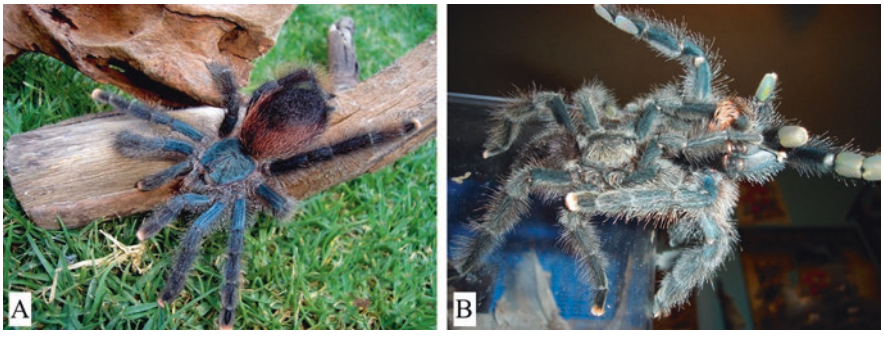

Fig. 15.8 *Avicularia avicularia*. (**a**) Female. (**b**) Mating. (Photos: J. Mendoza)

Longevity In captivity, the female matures in a period of 2–3 years, while the male matures at 1–2 years; females can live for up to 12 years, while males can live for up to 2–3 years.

Terrarium This should have a vertical orientation, and the substrate must be at least 5 cm deep to retain moisture. It is recommended to put in a piece of cork bark or a hollow log to let the tarantula build its silk tube web there.

Temperature 26–28 °C during the day and 22–25 °C at night

Humidity The recommended humidity is 80–90%. The humidity can be maintained by sprinkling water on half the substrate at least once a week or even around the silk nest of the spider.

Feeding You can offer crickets, cockroaches and mealworms. Young spiders can feed on fruit flies (occasionally) and a small cricket twice per week. This is a voracious tarantula and will grow quickly, changing its skin at a frequency of around 30 days (Mendoza, personal observation 2008–2020).

Reproduction This is an easy species to breed. The mating season is from July to October. The female does not exhibit aggression toward the male, and they can live together for a few days. The female will lay an egg sac 2–4 months after mating. After 1–2 months of incubation, between 100 and 200 spiderlings will emerge from the egg sac. There is no problem if the egg sac is left with the female, but, if desired, the egg sac can be incubated artificially; in that case, it should be removed 4 weeks after it is laid. During incubation, the average temperature of the terrarium should be around 28 °C (Schultz and Schultz 2009; Fukushima and Bertani 2017; Mendoza, personal observation 2008–2020).

Handling and behavior This species is generally docile but can leap toward the ground if it feels in danger. It can also shed its excreta as a defense mechanism. This species possesses urticating hairs. These are not thrown into the air but placed by direct contact with the attacker (Fukushima and Bertani 2017; Mendoza, personal observation 2008–2020). Its venom is not dangerous to humans, and its bite does not cause a major effect (Mendoza, personal observation 2008–2020).

Conservation status There is not enough information available on this species, but it is not considered threatened.

15.4.5 Brachypelma auratum Schmidt, 1992

Historical names None

Synonyms None

Common names Mexican flame knee tarantula

Geographic distribution Mexico (states of Jalisco, Michoacán, Guerrero and Estado de México)

Physical description This is a very robust tarantula with a black background color throughout the body, with both dark and whitish hairs on the legs. It presents red coloration in the area of the knee (patella) of each of the legs and palps that resembles the shape of a flame, hence its common name. Also, at the end of each segment of the legs, it has a small ring that is slightly orange. It has a few reddish hairs on its abdomen, while the carapace is typically black with a light yellow border. Its ventral region is totally black (Mendoza, personal observation 2008–2020). The adult females have a body length of up to 7 cm, with a leg span of 15 cm. Males usually tend to be a bit smaller than females, with a body length of 5–6 cm and a leg span of up to 14 cm, although there are some specimens that are even larger than many females and of a similar build, reaching a leg span of almost 16 cm (Cooper et al. 2019) (Fig. 15.9).

Habitat Regions of subwarm and subhumid temperate climate with mixed forest vegetation of deciduous plants and thorn. As an exclusively terrestrial species, it lives in burrows and prefers mainly clay-type soils, where it digs its tunnels under rocks, in tree roots, in cracks and (because of proximity to several urban centers) under the walls of houses. Some specimens can occupy the setting of a grassland

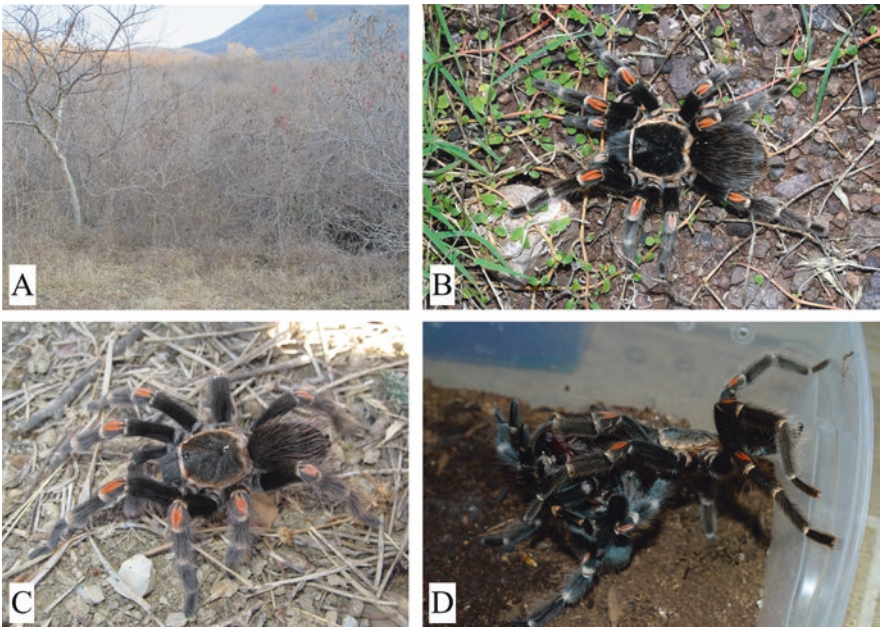

Fig. 15.9 *Brachypelma auratum*. (**a**) Habitat. (**b**) Female. (**c**) Male. (**d**) Mating. (Photos: J. Mendoza)

field or farmland because, as a result of the destruction and fragmentation of their habitat, they have been forced to adapt to these sites at which they can find the prey they feed on (West 2005; Cooper et al. 2019).

Longevity Females live for up to 25 years in captivity, and males live for 6–10 years.

Terrarium The substrate must be at least 12 cm deep because this species is a digger and will tend to make a burrow. It is also recommended to put a slightly curved piece of cork bark over the substrate to simulate a burrow. The terrarium can be decorated but should be kept minimally ornamented to facilitate cleaning, feeding and location of the specimen inside the terrarium.

Temperature 25–29 °C during the day and 20–24 °C at night

Humidity It has been believed that because of the kind of habitat in which this species lives, it is better to keep it very dry, but we must remember that inside its burrow, the humidity is higher than in the environment, so although they can be maintained in terrariums with humidity of 50%, humidity of 70–80% is recommended. The maximum percentage is especially recommended to avoid dehydration of the eggs during the incubation period. The humidity can be maintained by sprinkling water on half the substrate at least once a week or even around the silk nest of the spider.

Feeding You can offer crickets, cockroaches and mealworms (occasionally). Young spiders can feed on small crickets or cockroaches twice per week. This species is considered a slow-growing tarantula, so it molts every 40–50 days, on average, as a spiderling; juveniles molt twice a year and adults once a year (Mendoza, personal observation 2008–2020).

Reproduction The main challenge in breeding this species is to obtain an adult male, as they are not commonly available. The mating season runs from October to January. The adult males age very fast, so it is recommended that the male should mate with the female during the first 3 months after the male matures. The female can exhibit some aggression toward the male. Sometimes the female will approach the male with her chelicerae spread. If mating goes well, the female will bend quite far backward when the male introduces the male palpal bulb; after this, the male can run away. The female will lay an egg sac 4–8 months after mating. After 3 months of incubation, between 400 and 800 spiderlings will emerge from the egg sac. The egg sac can be incubated artificially; in that case, it should be removed 4–5 weeks after it is laid. During the incubation time, the average temperature of the terrarium should be around 28 °C (Mendoza, personal observation 2008–2020).

Handling and behavior This species is generally docile but has a nervous character. It can be manipulated manually but is very likely to throw urticating hairs. It is rare to come across specimens that do not hesitate to bite in order to defend them-

selves, but it is always better to try to understand the kind of character that the animal we keep has in particular. This species has urticating hairs on its abdomen, which can cause a severe reaction (in some people) of burning of the skin, eyes and nose, so be careful. Its venom is not dangerous to humans, and its bite, although painful, does not cause more major effects than local pain and slight swelling, which disappear in a few hours.

Conservation status All species in the *Brachypelma* genus are listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II, so their international trade is strictly regulated. This species is very exploited in Mexico for its illegal trade as a pet, and there are already problems in its wild populations because of the extraction rate and the fragmentation that its habitat is suffering. Because of the lack of population studies, we cannot know exactly where a relatively abundant population lives (Fukushima et al. 2018; Cooper et al. 2019).

15.4.6 Brachypelma hamorii Tesmoingt, Cléton & Verdez, 1997

Historical names None

Synonyms None

Common names Mexican orange knee tarantula

Geographic distribution Mexico (states of Jalisco, Colima and Michoacán)

Note This species was misidentified for years as *Brachypelma smithi*. Most of the specimens the pet trade has erroneously sold as *B. smithi* have, in fact, been specimens of *B. hamorii*.

Physical description Adult females have two carapace patterns: (1) brownish pink around the border and black dorsomedially (juveniles and subadults have the same pattern); and (2) pale orange-yellow around the border and behind the fovea, with a starburst black pattern from the fovea to the caput. The dorsal chelicerae are light bluish gray with two brownish pink stripes (not all specimens have clearly visible stripes; they are more readily seen in recently molted specimens). The ventral prosoma is brownish black. The abdomen is black with light reddish brown setae dorsally and brownish black ventrally. The legs and palps have black femora, patellae with a proximal dorsomedian deep orange flame-shaped area, a pale orange-yellow distodorsal paramedian area (specimens of some populations only present pale orange-yellow on the distal half of the patella) and brownish pink setae laterally.

Fig. 15.10 *Brachypelma harmorii*. (**a**) Chelicera. (**b**) Female. (Photos: J. Mendoza)

The tibiae are proximally half black with brownish pink setae, and the distal half is light orange-yellow with brownish pink setae. The metatarsi are black with brownish pink setae and a yellowish white ring at the terminal end. The tarsi are black with a few dorsal brownish pink setae. The adult females have a body length of up to 7 cm, with a leg span of 14–15 cm. Males usually tend to be a bit smaller than females, with a body length of 5–6 cm and a leg span of up to 14 cm (Mendoza and Francke 2017) (Fig. 15.10).

Habitat Thorn and deciduous secondary forests. As an exclusively terrestrial species, its modified or self-excavated burrows can be found under fallen logs or large rocks, among large tree roots or thorny brush, or in tall grass thickets. The burrows do not have any silk around the entrance (West 2005; Mendoza and Francke 2017).

Longevity Females live for up to 25 years in captivity; males live for 6–10 years.

Terrarium This species can be maintained in a terrarium like the one used for *Brachypelma auratum*.

Temperature 25–29 °C during the day and 22–24 °C at night

Humidity This is the same as that used for *Brachypelma smithi*.

Feeding You can offer crickets, cockroaches and mealworms (occasionally), although some specimens do not like to eat cockroaches or mealworms (Mendoza, personal observation 2008–2020). Young spiders can feed on small crickets or newborn cockroaches twice per week. It is considered a slow- to medium-growing tarantula, depending on the maintenance conditions. Spiderlings will molt every 40–50 days on average; juveniles molt three times a year and adults once a year (Mendoza, personal observation 2008–2020).

Reproduction This is similar to that of *Brachypelma smithi*.

Handling and behavior These are the same as those specified for *Brachypelma auratum*.

Conservation status All species in the *Brachypelma* genus are listed in CITES Appendix II, so their international trade is strictly regulated. Not only is this species exploited in Mexico for its illegal trade as a pet, but also they live in a very fragmented area. Because of the lack of population studies, it is not possible to know exactly where a relatively abundant population lives and how threatened they are (Mendoza and Francke 2017). This species is listed in the International Union for Conservation of Nature (IUCN) Red List and considered vulnerable (Fukushima et al. 2018).

15.4.7 Brachypelma smithi (F. O. Pickard-Cambridge, 1897)

Historical names *Eurypelma smithi* F. O. Pickard-Cambridge, 1897
Brachypelma smithi Pocock, 1903

Synonyms *Brachypelma annitha* Tesmoingt, Cléton & Verdez, 1997

Common names Mexican redknee tarantula

Geographic distribution Mexico (state of Guerrero)

Physical description In live specimens, adult females have three carapace patterns: (1) grayish yellowish pink around the border and behind the fovea, with a bluish black starburst pattern from the fovea to the caput; (2) light brown around the border and bluish black dorsomedially; and (3) grayish yellowish pink on almost all of the carapace, except for two longitudinal black patches on the caput. juveniles and subadults have light brown coloration around the border, with brownish black coloration dorsomedially. The dorsal chelicerae are dark grayish blue. The ventral coxae, labium, maxillae and sternum are brownish black. The abdomen is black dorsally with light orange setae and brownish black ventrally. The legs and palps have bluish black femora, and the patellae have a dark reddish orange flame-shaped proximal dorsomedian area and a light yellowish pink distodorsal paramedian area, with light orange setae laterally. The tibiae have a bluish black proximal half with light orange setae and a pale yellowish pink distal half. The metatarsi are bluish black with light orange setae and a pinkish white ring at the terminal end. The tarsi are bluish black (Mendoza and Francke 2017). A females have a body length of up to 7 cm, with a leg span of 15–16 cm. Males usually are smaller than females, with a body length of 5–6 cm and a leg span of up to 14 cm, although there are some specimens that are even larger than many females and of a similar build, reaching a leg span of almost 17 cm (Mendoza, personal observation 2008–2020) (Fig. 15.11).

Habitat This species is known to inhabit the Pacific coast of Guerrero in dense thickets or vegetation of dry thorn forests and deciduous plants. Burrows are found under large rocks or tree roots; there are no traces of silk at the burrow entrance, and

Fig. 15.11 *Brachypelma smithi*. (**a**) Habitat. (**b**) Chelicera. (**c**) Female. (**d**) Male. (Photos: J. Mendoza)

the interior is often multitunneled. Some specimens can occupy the surroundings of grassland fields or farmland because the destruction and fragmentation of their habitat have forced them to adapt to these sites at which they can find the prey they feed on (West 2005; Mendoza and Francke 2017).

Longevity Females live for up to 25 years in captivity; males live for 5–10 years.

Terrarium This species can be maintained in a terrarium like the one used for *Brachypelma auratum*.

Temperature 26–30 °C during the day and 20–22 °C at night

Humidity The recommended humidity is 75–80%. During the incubation period, it is possible to raise it to 85%. The humidity can be maintained by sprinkling water on half the substrate at least once a week.

Feeding You can offer crickets, cockroaches and mealworms (occasionally), although there are some specimens who do not like to feed on cockroaches or mealworms (Mendoza, personal observation 2008–2020). Young spiders can feed on small crickets or newborn cockroaches twice per week. It is considered a slow- to

medium-growing tarantula, depending on the maintenance conditions. Spiderlings molt every 40–50 days on average; juveniles molt three times a year and adults once a year (Mendoza, personal observation 2008–2020).

Reproduction The main difficulty in breeding this species is obtaining an adult male; they are not so common among hobbyists. Also, because it looks similar to *B. hamorii*, one must be careful to not try and pair two specimens of these different species. The mating season is from November to January. The adult male ages very fast, so it is recommended to mate it with a female during the first 4 months after the male matures. The female can exhibit some aggression toward the male. Sometimes the female will approach the male with her chelicerae spread. If the mating goes well, the female will bend quite far backward when the male introduces the palpal bulb; after this, the male will go away. After the mating, it is recommended to drop the humidity to 60% and lower the temperature to 22–24 °C. Then, after 1 or 2 months under these conditions, the humidity can be increased to 85% and the temperature to 28–30 °C to trigger the female to elaborate the egg sac. It will be laid between 4 and 8 months after the mating, depending on the environmental conditions. After 3 months of incubation, between 450 and 1000 spiderlings will emerge from the egg sac. The egg sac can be incubated artificially; in that case, it should be removed 4 weeks after it is laid (Mendoza, personal observation 2008–2020).

Handling and behavior These are the same as those specified for *Brachypelma auratum*.

Conservation status All species in the *Brachypelma* genus are listed in CITES Appendix II, so their international trade is strictly regulated. This species is not only exploited in Mexico for its illegal trade as a pet but also killed by local people who think they are dangerous. Because of the lack of population studies, it is not possible to know exactly where a relatively abundant population lives and how threatened they are (Mendoza and Francke 2017). This species is listed in the IUCN Red List and considered near threatened (Fukushima et al. 2018). It is important to mentioned that this species is protected by Mexican law and listed as a threatened species.

15.4.8 Caribena versicolor (Walckenaer, 1837)

Historical names *Mygale versicolor* Walckenaer, 1837
Avicularia versicolor Simon, 1892
Caribena *versicolor* Fukushima & Bertani, 2017

Synonyms *Avicularia rutilans* Ausserer, 1875

Common names Martinique pinktoe tarantula, Antilles pinktoe tarantula, Martinique red tree spider

Geographic distribution Martinique

Physical description Females have a brown carapace with short golden body setae with a very intense green sheen. The carapace is bordered with long setae the same color as the carapace. The ventral region is light brown. The legs and palps have short gold body hairs with a green sheen and long brown guard setae with a very intense iridescent sheen. The leg rings on the distal femora, tibiae and metatarsi are the same color as the rest of the segment. The dorsal abdomen has scattered long red iridescent hairs and short black body setae. The ventral abdomen is brown. Urticating hairs form a very distinctive small bronze patch on the dorsoposteriad area of the abdomen. The male's carapace is brown with short golden body setae with a very intense green sheen. The carapace is bordered with long setae the same color as the dorsal carapace short body setae. The ventral region is light brown. The legs and palps have short gold body hairs with a green sheen and long brown guard setae with a very intense iridescent sheen. The leg rings on the distal femora, tibiae and metatarsi are the same color as the rest of the segment. The dorsal abdomen has scattered long vivid red hairs with a very intense iridescent sheen that is homogeneously distributed, and short dark body setae. The ventral abdomen is brown. Urticating hairs form a very distinctive small bronze patch on the dorsoposteriad area of the abdomen. Two color forms are known: one with specimens that have leg and palp hairs in bright red and the other with specimens that have darker hairs on the legs and palps (Fukushima and Bertani 2017). The adult female has a body length of up to 6 cm, with a leg span of 12 cm. The adult male has a body length of up to 5 cm, with a leg span of 10–11 cm (Fig. 15.12).

Color pattern ontogeny Spiderlings have a metallic blue sheen, and their abdomen has a dark fish-bone pattern on it. Juveniles have a metallic sheen; all parts are the same blackish color, and the dorsal abdomen has a central longitudinal black stripe connected to all transverse black stripes. When mature, they lose this pattern (Fukushima and Bertani 2017).

Habitat Cloud forests of Martinique; their retreats are found in bromeliad leaves, between tree branches, in bamboo, in tree hollows and also in people's houses (Marechal et al. 2009).

Longevity In captivity, the female matures in a period of 2 years, while the male matures at 1 year; females can live for up to 10 years, while males can live for up to 2–3 years.

Terrarium This should have a vertical orientation, and the substrate must be at least 5 cm deep to retain moisture. It is recommended to put in a piece of cork bark or a hollow log to let the tarantula build its silk burrow there.

Temperature 26–28 °C during the day and 22–24 °C at night

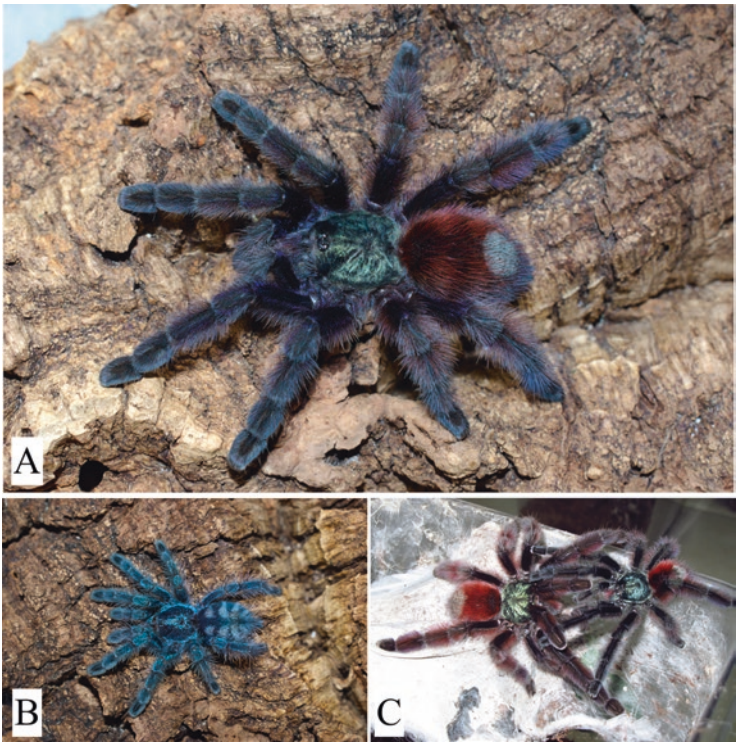

Fig. 15.12 *Caribena versicolor*. (**a**) Female. (**b**) Spiderling. (**c**) Mating. (Photos: J. Mendoza)

Humidity The recommended humidity is 80%. The humidity can be maintained by sprinkling water on half the substrate at least once a week or even around the silk nest of the spider.

Feeding You can offer crickets, cockroaches and mealworms. Young spiders can feed on fruit flies (occasionally) and a quarter-inch (6 mm) cricket twice per week. It is a voracious tarantula and will grow quickly, changing its skin at a frequency of around 30–40 days (Mendoza, personal observation 2008–2020).

Reproduction This is a relatively easy species to breed in captivity. The female can be a little aggressive toward the male sometimes. The female will lay an egg sac 2–4 months after mating. After 1–2 months of incubation, between 100 and 200 spiderlings will emerge from the egg sac. There is no problem if the egg sac is left with female, but, if desired, the egg sac can be incubated artificially; in that case, it should be removed 3 weeks after it is laid. During the incubation time, the average temperature of the terrarium should be around 27–28 °C. Spiderlings can be separated in individual containers about 4 cm high, but some authors also recommend separating them into small groups (e.g., groups of 10 individuals) and raising them that way, after noticing instances of cannibalism. It is necessary to provide a suitable small

surface on which the spiderlings can build their silk nests in the upper area of their container (Cléton et al. 2015; Mendoza, personal observation 2008–2020).

Handling and behavior This species is generally docile but can leap toward the ground if it feels in danger, and if you persist in disturbing it, it can use its urticating hairs. It can also shed its excreta as a defense mechanism. Its venom is not dangerous to humans, and its bite does not cause a major effect (Mendoza, personal observation 2008–2020).

Conservation status There is not enough information available on the wild populations of this species, but it is not considered threatened.

15.4.9 Psalmopoeus irminia Saager, 1994

Historical names None

Synonyms None

Common names Venezuelan suntiger tarantula

Geographic distribution Venezuela, Guyana and Brazil

Physical description The female has a greenish carapace with a metallic sheen, bordered with olive-green setae. The ventral region is dark brown. The legs are black with an orange stripe at the end of the tarsi and a larger longitudinal stripe on the metatarsi. The abdomen has a black background with eight orange oval marks in the dorsal region. The ventral abdomen is light brown. The male is smaller and less striking than the female; when mature, it is gray with a feathery appearance. The adult male also has orange stripes on its metatarsi and tarsi (Mendoza, personal observation 2008–2020) (Fig. 15.13).

Fig. 15.13 Female *Psalmopoeus irminia*. (Photo: J. Mendoza)

Color pattern ontogeny Spiderlings have an orange carapace. The abdomen is black with eight oval whitish spots on the dorsum. The legs are black, but all of the metatarsi are white. The juveniles have the same coloration as the adults but paler. The adult female has a body length of up to 7 cm, with a leg span of 15 cm. The adult male has a body length of up to 5 cm, with a leg span of 13 cm (Mendoza, personal observation 2008–2020).

Habitat This species inhabits rainforests. Their retreats are found between tree branches, inside tree hollows, under bark or even close to large tree roots (Mendoza, personal observation 2008–2020).

Longevity In captivity, the female matures in a period of 2 years, while the male matures at 1 year; females can live for up to 12 years, while males can live for up to 2–3 years.

Terrarium This should have a vertical orientation, and the substrate must be at least 8 cm deep to retain moisture, but also because in captivity, this species will use some of the substrate to build its retreat. It is recommended to put in a piece of cork bark or a hollow log to let the tarantula build its silk retreat there. If possible, try to locate the water plate up high, close to the retreat's entrance.

Temperature 26–28 °C during the day and 20–22 °C at night

Humidity The recommended humidity is 80%, but this can be lowered to 60% after mating. The humidity can be maintained by sprinkling water on half the substrate at least once a week or even around the silk nest of the spider.

Feeding You can offer crickets, cockroaches and mealworms (occasionally). Young spiders can feed on fruit flies (occasionally) and a quarter-inch (6 mm) cricket twice per week. This is a voracious tarantula and will grow quickly, changing its skin at a frequency of around 25–35 days (Mendoza, personal observation 2008–2020).

Reproduction This is an easy species to breed in captivity. The mating season is from July to October. The female can be a little aggressive toward the male sometimes. The female will lay an egg sac 2–4 months after mating. After 1–2 months of incubation, between 100 and 200 spiderlings will emerge from the egg sac. There is no problem if the egg sac is left with the female, but, if desired, the egg sac can be incubated artificially; in that case, it should be removed 3 weeks after it is laid. During the incubation time, the average temperature of the terrarium should be around 27–28° C. This species can lay a second egg sac 4–5 months after the first one (Cléton et al. 2015; Mendoza, personal observation 2008–2020).

Spiderlings can be kept in individual containers approximately 4 cm high. It is necessary to provide a suitable small surface on which the spiderling can build its silk nest in the upper area of its container.

Handling and behavior This is a very fast and fearful species when it is young; first, it will tend to flee before facing its aggressor. However, as it grows, it tends to be more defensive. If it feels threatened, it will adopt a defensive position, showing its fangs, and if you persist in bothering it, it may bite. This species possesses a stridulating organ, which it uses as a warning, and lacks urticating hairs. Its venom is not dangerous to humans but can cause some pain for hours, depending on the sensitivity of the person (Mendoza, personal observation 2008–2020).

Conservation status This species is widely bred in captivity. There is not enough information available on the wild populations of the species, but it is not considered threatened.

15.4.10 Pseudoclamoris gigas (Caporiacco, 1954)

Historical names *Tapinauchenius gigas* Caporiacco, 1954
Pseudoclamoris gigas Hüsser, 2018

Synonyms None

Common names Orange tree spider, orange chevron tarantula

Geographic distribution French Guyana

Physical description Females have a greenish carapace bordered with red-orange setae. The ventral region is dark. The abdomen and legs are a red-orange color, with a slightly marked spike pattern over the abdomen. The ventral abdomen is light orange. The male is smaller and less striking than the female; when mature, it is a grayish brown color with a feathery appearance and presents a light orange color on the metatarsi and tarsi (Mendoza, personal observation 2008–2020). The adult female has a body length of up to 6 cm, with a leg span of 13 cm. The adult male has a body length of up to 5 cm, with a leg span of 10–11 cm (Fig. 15.14).

Color pattern ontogeny Spiderlings have a black carapace. The abdomen is black with eight oval orange spots on the dorsum (four on each side). The legs are orange and the tarsi are all black. Juveniles have the same coloration as adult females but paler.

Habitat Tropical rainforest; their retreats are found between tree branches, inside tree hollows, under bark or even close to large tree roots (Mendoza, personal observation 2008–2020).

Longevity In captivity, the female matures in a period of 2 years, while the male matures at 1 year; females can live for up to 12 years, while males can live for up to 2–3 years.

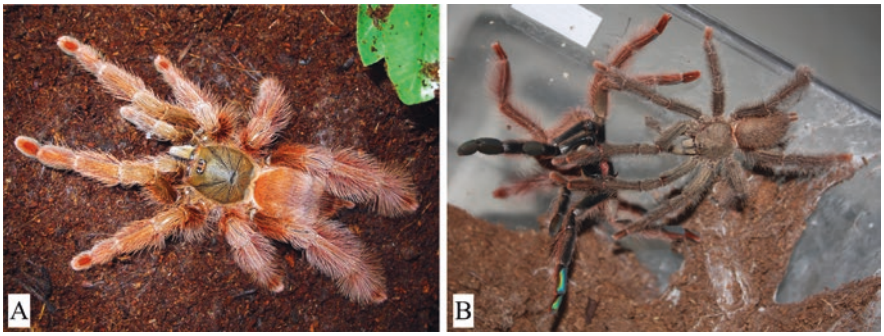

Fig. 15.14 *Pseudoclamoris gigas*. (**a**) Female. (**b**) Mating. (Photos: J. Mendoza)

Terrarium This species can be kept in the same conditions as *Psalmopoeus irminia*.

Temperature 27–30 °C during the day and 24–26 °C at night

Humidity The recommended humidity is 75%, but it can be lowered to 60% after mating. The humidity can be maintained by sprinkling water on half the substrate at least once a week or even around the silk nest of the spider.

Feeding This species can be fed in the same way as *Psalmopoeus irminia*.

Reproduction This is similar to that of *Psalmopoeus irminia*.

Handling and behavior This is a very fast and fearful species when it is young. First, it will tend to flee before facing its aggressor. However, as it grows, it tends to be more defensive and, if it feels threatened, it will adopt a defensive position by showing its fangs. If you persist in bothering it, it may bite. Its venom is not dangerous to humans but can cause some pain for hours, depending on the sensitivity of the person (Mendoza, personal observation 2008–2020).

Conservation status This species is widely bred in captivity. There is not enough information available on the wild populations of the species, but it is not considered threatened.

15.4.11 Theraphosa stirmi Rudloff & Weinmann, 2010

Historical names None

Synonyms None

Common names Burgundy Goliath bird-eater

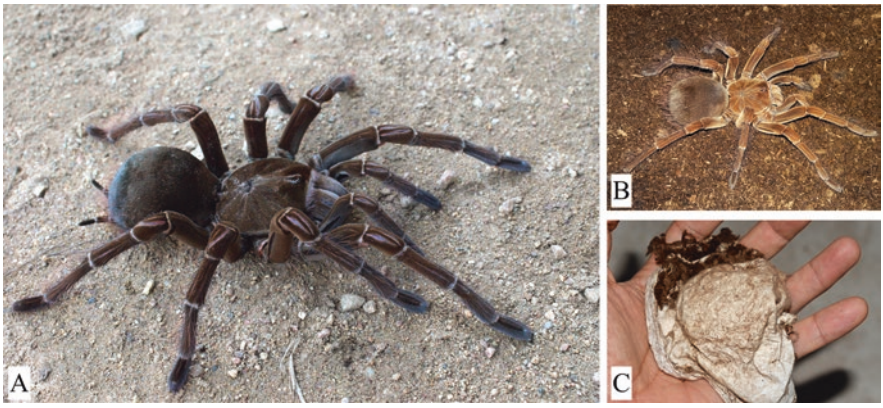

Fig. 15.15 *Theraphosa stirmi*. (**a**, **b**) Female. (**c**) Egg sac. (Photos: J. Mendoza)

Geographic distribution Guyana (Takutu)

Physical description Both males and females have a carapace and legs that are mud-brown in color. They typically have two stripes over the patellae. The abdomen is the same color as the carapace and legs, but darker, with scattered long pale brown hairs. The adult female has a body length of up to 10 cm, with a leg span of 27 cm. The adult male has a body length of up to 9 cm, with a leg span of 26–28 cm. The female is more robust than the male, but the male can have larger legs and therefore can have a greater leg span (Fig. 15.15).

Habitat Tropical forest with a warm and humid temperate climate and with marked rainy and dry seasons. As a species that is both terrestrial and fossorial, it lives in areas near water, where it digs burrows under the roots of large trees and even between the roots. It also takes over existing burrows of small mammals or reptiles (Mendoza, personal observation 2008–2020).

Longevity Females can live for up to 20 years, while males can live for up to 4–5 years.

Terrarium The substrate must be at least 15 cm deep because this species will tend to make a burrow. A deep substrate is particularly useful for breeding this species. The terrarium can be decorated but should be kept minimally ornamented to facilitate cleaning, feeding and location of the specimen inside the terrarium.

Temperature 20–22 °C during the day and 17–18 °C at night. This species is sensitive to high temperatures so must be kept in accordance with these recommendations.

Humidity The recommended humidity is 80–85%. After the female has mated, the humidity can be dropped gradually to 65%; then, after 2–3 months, it can be

increased again to 85% to trigger the female to lay an egg sac. This species is sensitive to fungal infections, so there must be excellent ventilation in the terrarium. The humidity can be maintained by sprinkling water on half the substrate at least once a week. After the substrate has been left to almost dry out after mating, it is better to sprinkle water in the terrarium once a day (Mendoza and Matias, personal observation 2008–2020).

Feeding You can offer crickets, cockroaches, mealworms (adult specimens are well received), large roaches or grasshoppers. Young spiders of a large size (e.g., those with a leg span of 3 cm) can be fed medium-sized crickets, preferably every third day. This is a very voracious tarantula and will grow quickly, changing its skin at a frequency of around 30–40 days (Mendoza, personal observation 2008–2020).

Reproduction Breeding in captivity is moderately difficult. The mating season is from June to September. The female may or may not be slightly aggressive toward the male, so you must be careful to separate them if necessary. If the male is introduced very quickly into the terrarium of the female, she can turn aggressive toward the male. If the female is not ready for mating, she will try to warn the male by tapping on the substrate with the first pair of her legs. After the mating is finished, the male will try to run away quickly. During the subsequent 1 or 2 months, the female should be fed regularly, but be careful not to overfeed her. The size of her abdomen should be slightly bigger than her carapace. The substrate should be allowed to dry out almost completely, and the temperature should be kept at 16–18 °C. During the second and third month, the feeding should be more sporadic as the abdomen of the female increases in size. Then the humidity must be raised again to 85% by spraying the terrarium (do not flood the substrate), and the temperature must be kept at 20–22 °C. Once the egg sac is formed, the female will take care of it for approximately 3 months before the hatchlings emerge. During this period, the average temperature of the terrarium should be around 20 °C. If desired, the egg sac can be incubated artificially; in that case, it should be removed between 4 and 6 weeks after it is laid. The number of offspring can range from 50 to 80.

The spiderlings are big (2–3 cm) and must be kept in individual containers according to their size (Mendoza, personal observation 2008–2020).

Handling and behavior This species is very nervous and will not hesitate to use its urticating hairs, which are particularly effective against mammals, including humans. Urticating hairs can cause a severe reaction (in some people) of burning of the skin, eyes and nose, so be careful (Cléton et al. 2015; Mendoza, personal observation 2008–2020). If the use of urticating hairs has not been enough to dissuade the attacker, then the spider will bite. The bite is particularly painful because of the size of the chelicera (approximately 2 cm). The venom is not dangerous to humans, and its bite, although painful, does not cause a major effect. The pain and swelling can disappear in a few hours or a couple of days (Mendoza, personal observation 2008–2020).

Conservation status There is not enough information available on this species, but it is not considered threatened. For years, this species was collected and sold as

Theraphosa blondi. However, some people suspected that it was a different species, which was confirmed after its description in 2010. Of the three known Goliath tarantulas, this is the one most commonly found in trade. Also, because there has been more success in breeding this species than in breeding *T. blondi* and *T. apophysis*, it is the least expensive and most common species of the three on the market.

15.4.12 Xenesthis immanis (Ausserer, 1875)

Historical names *Lasiodora immanis* Ausserer, 1875
Xenesthis colombiana Simon, 1891
Xenesthis immanis Pocock, 1901

Synonyms None

Common names Colombian lesserblack tarantula

Geographic distribution Panama, Colombia and Venezuela

Physical description The carapace is black with a bright pink radial pattern, which is more evident in the ocular area. The carapace is typically bordered by large brownish setae. The legs are black. The abdomen is black with scattered long reddish hairs. Adult males have a black carapace with an iridescent pinkish or bronze radial pattern, which, unlike that observed in females, extends throughout the carapace and its border. The legs are black and the femora are a wine-like color. The adult female has a body length of up to 8 cm, with a leg span of 21 cm. The adult male has a body length of up to 7 cm, with a leg span of 18–20 cm. Some males can be as long as females, but females are more robust (Fig. 15.16).

Habitat Tropical forests with a warm and humid temperate climate and with marked rainy and dry seasons. As an exclusively terrestrial species, it lives in bur-

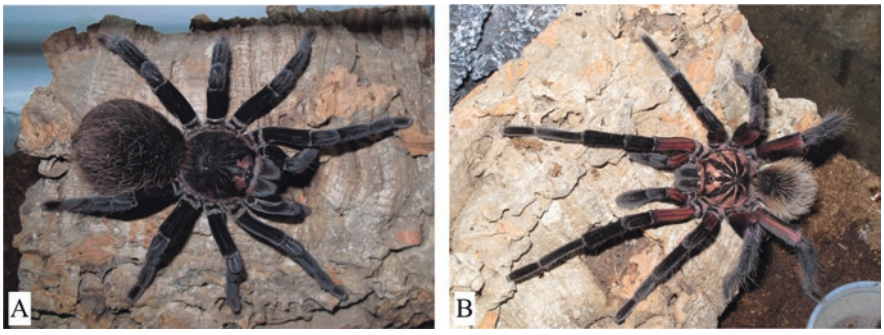

Fig. 15.16 *Xenesthis immanis*. (**a**) Female. (**b**) Male. (Photos: J. Mendoza)

rows located under fallen logs or among tree roots; some can make burrows on hillsides and at ground level (Mendoza, personal observation 2008–2020).

Longevity In captivity, the female matures in a period of 3–4 years, while the male matures at 2–3 years; females can live for up to 15 years, while males can live for up to 4–5 years.

Terrarium The substrate must be at least 10 cm deep because this species is a digger and tends to make a burrow. It is also possible to place a flat piece of cork bark between the rear wall of the terrarium and the substrate, creating a refuge that the tarantula can use as its burrow and a nice place for it to lay its egg sac.

Temperature 25–28 °C during the day and 20–22 °C at night

Humidity The recommended humidity is 80–85%. After the female has mated, the humidity can be dropped gradually to 65%; then, after 3–4 months, it can be increased again to 85% by wetting the substrate to simulate a wet season, which will trigger the female to lay an egg sac. Adults can better tolerate minimum humidity; for spiderlings, it should be at least 80% (in a well-ventilated container). The humidity can be maintained by sprinkling water on half the substrate at least once a week.

Feeding You can offer crickets, cockroaches, mealworms (adult specimens are well received), the largest cockroaches or grasshoppers. Young spiders can feed on *Tenebrio molitor* or medium-sized crickets, preferably every third day. This is a very voracious tarantula and will grow relatively quickly, changing its skin at a frequency of around 40 days (Mendoza, personal observation 2008–2020).

Reproduction This species is not so easy to breed and requires a dry and humid season for successful breeding. The mating season is from June to September. The female may or may not be slightly aggressive toward the male. If the male is introduced very quickly into the terrarium of the female, he will be attacked. If the female is not ready for mating, she will try to escape in the first instance, but if the male is persistent, she could attack him to defend herself and use her rear legs to prevent the male from inserting his palpal bulb. After copulation, the male will try to run away quickly. During the subsequent 3 months, the female should be fed regularly, but during the third month, the feeding should be more sporadic. The humidity and temperature should be lowered to the recommended minimum levels. After the third or fourth month, the humidity and temperature must be increased. The latency of oviposition after mating can last from 3 to 8 months. Once the egg sac is formed, the female will take care of it for approximately 3 months before the hatchlings emerge. During this period, the average temperature of the terrarium should be around 28 °C. If desired, the egg sac can be incubated artificially; in that case, it should be removed between 4 and 6 weeks after it is laid. The number of offspring can range from 60 to 100. Before molting into spiderlings, the larvae will climb the walls of the female's burrow, setting themselves as high as possible to

facilitate their molt. During artificial incubation, two pieces of gauze can be placed to allow the tarantulas to climb and be attached properly to molt (Cléton et al. 2015; Mendoza, personal observation 2008–2020).

Handling and behavior This species is very nervous; when disturbed, it is almost certain to throw urticating hairs. These urticating hairs are particularly effective against humans and can cause a severe reaction (in some people) of burning of the skin, eyes and nose, so be careful (Cléton et al. 2015; Mendoza, personal observation 2008–2020). Its venom is not dangerous to humans, and its bite, although painful, does not cause a major effect. The pain and swelling can disappear in a few hours or a couple of days (Mendoza, personal observation 2008–2020).

Conservation status There is not enough information available on this species, but it is not considered threatened.

15.5 Traffic, Endangered Species and Responsible Breeding Facilities

Over the years, in many countries tarantulas have been offered in markets, pet stores, reptile shows or even tarantula shows. A lot of large specimens from distant places are offered, and it seems that no one cares about the origin of these spiders. No one asks where they come from, if they are wild-caught and, if so, whether they were collected with appropriate permission from the country of origin—or these issues are simply ignored. It is uncertain how many tarantula hobbyists ask or care about the condition of the natural habitat of the tarantulas they keep. There are arguments for and against collection of wild-caught tarantulas. At first, all specimens of the species kept by hobbyists were wild-caught, and this was necessary in order to start a breeding process. However, the lack of regulation of spider collection can have consequences, as was shown with the Mexican redknee tarantula (*Brachypelma smithi*) in the 1980s. This species was collected in its thousands for the pet trade and sent mainly to the USA and Europe. Because of this, large colonies of *B. smithi* declined, population sizes became affected and the species was declared threatened. In September 1985, *B. smithi* was officially listed in Appendix II of the Convention on International Trade in Endangered Species (CITES) (Smith 1994; Schultz and Schultz 2009).

CITES is the most important international convention for regulation of the wildlife trade. Its fundamental purpose is to protect and control the international trade of organisms that may be threatened or endangered by any of the signatory countries (Schultz and Schultz 2009). However, despite the increased recognition of this issue, these regulatory measures do not necessarily benefit wild species. While there have been numerous revisions to the listing criteria, they still focus almost exclusively on the biological and trade status of the species and scarcely touch on whether

the listing will benefit the conservation status of the species (Dickinson 2002). Unfortunately, the conservation status of the vast majority of tarantulas is unknown. The Red List of the International Union for Conservation of Nature (IUCN) includes only some species of the genera *Brachypelma* Simon, 1891, *Chilobrachys* Karsch, 1892, *Grammostola* Simon, 1892, *Haploclastus* Simon, 1892, *Poecilotheria* Simon, 1885 and *Thrigmopoeus* Pocock, 1899 (Molur et al. 2008; Ferretti and Popozzi 2012; Fukushima et al. 2018), and in CITES, only the genus *Brachypelma* is listed.

According to Reichling (2003), one negative result of the *Brachypelma* CITES listing has been a decrease in the supply of some species, leading to increased desirability and thus demand. This has encouraged the development of a black market, which smuggles protected species both locally and internationally. On the other hand, lack of supply and availability of some species lead hobbyists and local dealers to breed their own specimens. Captive breeding allows production and sale (trade) of spiderlings between breeders and hobbyists. However, there are some inherent issues with this activity. For example, the genetic diversity of a captive population is finite, and without control, inbreeding will occur (CEC 2017). That is one reason why tarantulas well established in captivity are continuously smuggled. It is common to see, at least once a year in the news, that a person or some luggage has been intercepted at an airport, with smuggled tarantulas (Phillips 2009; Cooper 2011; Agencia EFE 2016; Carranza 2018).

Some of the most commonly smuggled tarantulas include *Brachypelma* spp., *Poecilotheria* spp., *Grammostola* spp., *Avicularia* spp., *Haplopelma* spp., *Pamphobeteus* spp., *Xenesthis* spp., *Theraphosa* spp., and many undescribed species from different subfamilies. Unfortunately, not all countries have records or policies on the tarantula trade and its implications for their conservation status. The most extensively documented cases of this involve *Brachypelma* in Mexico and *Poecilotheria* in India and Sri Lanka (Smith 1994; Rojo 2004; Molur et al. 2008; Benjamin et al. 2012; Mendoza and Francke 2017; CEC 2017). Moreover, it has been documented that different species are smuggled from Ecuador, Brazil and Uruguay. In the case of Mexico, traffickers pay the local people who collect them around US$2–3 per tarantula, which can then be sold for up to US$200 on the international market (Inecc 2012). Large tracts of land are pitted from excavation of burrows. Further habitat loss also occurs during the rainy season, as a result of landslides. The principal method of illegal exportation known within the international tarantula trade community is the “brown box”. Large numbers of live tarantulas are individually sealed in padded containers and put together in a brown box. This box is airmailed out of the country of origin with documentation declaring that its contents are a gift, a costume, or some other nonliving content that will avoid suspicion from postal service employees or regulatory authorities. The principal destinations are the European Union and Asia, and sometimes the USA (CEC 2017). In some cases, spiders are hidden in photographic film containers, small plastic tubes or plastic bags inside toys, electronic devices or handicrafts (BWPM 2014). The result of that kind of packing is that animals are crammed in with each other, and many dies as a result of dehydration, insufficient space during molting or suffocation in their own exuviae (Rojo 2004). In Mexico, some of these packages are

intercepted and reviewed by the authorities, and the live specimens are turned over to legal breeders or zoos rather than being destroyed. Confiscated adult specimens are then used as additional breeding stock for renewed genetic diversity in breeding facilities (Mendoza, personal observation 2008–2020).

With the increase in illegal trade (not only of tarantulas but also of other organisms), several countries have closed their borders to trade of their wildlife, prohibiting its export and increasing fines for its illicit trade. Brazil, Costa Rica, Venezuela, Australia and Sri Lanka are some of the countries that do not allow export of their tarantulas in any way. This, in the first instance, could be observed as something favorable for these and other organisms. However, illegal trade is only one part of the risks faced by all wildlife. Habitat loss poses the greatest threat to species. Without a strong plan to create protected terrestrial and marine areas, important ecological habitats will continue to be lost (Laurance 2010). At sustainable levels of consumption, both wildlife and people benefit from trade. Granting people an economic stake in wildlife provides the best incentive for careful stewardship of species and habitats (Carey 1999). It is certainly not the removal of a few tarantulas, with the intention of breeding them, that will lead to the extinction of a species (Cléton et al. 2015); the greater damage is the removal of large numbers of spiders for illegal export, only a few of which are expected to reach their final destination alive. On the other hand, the collection of tarantulas with purely commercial intentions is usually very harmful because it is done by extracting as many specimens as possible from some areas of the natural distribution of tarantulas. This practice can damage the habitat even more because the collection techniques are destructive, removing large numbers of stones, digging up soil and plants, and even using substances such as gasoline to force the tarantulas to leave their burrows more quickly (Verdez and Cléton 2004; West 2005).

As a group, spiders are one of the most proficient colonizers, but tarantulas are an exception in that they lack any ability to travel farther than their legs will carry them. The tendency of tarantulas to keep their populations together and to be common only in small areas throughout their distribution makes them vulnerable to both natural and anthropogenic factors that directly affect their habitat, such as drought or transformation of native vegetation in areas of cultivation (Reichling 2003). Some arachnids such as tarantulas have low mobility, limited mechanisms, of dispersion and sedentary habits. Depending on each group of arachnids, these characteristics can greatly influence their dispersal capacity (Ferretti et al. 2014). That is why many species of tarantula are vulnerable to destruction of their natural habitats. Despite this, laws that prohibit sustainable use of natural resources have some contradictory issues. On the one hand, there is extreme protection of wildlife against being traded or even bred in captivity; on the other hand, there is the fact that their habitat continues to disappear because of a lack of interest in direct actions that can benefit the tarantulas and the people who live together at their distribution sites. Hectares of land continue to be devastated, and loss of biodiversity continues unabated. We must understand that we can take advantage of resources sustainably and contribute to their care and conservation. For this, there are some models that can be implemented for legal rearing and trade of native tarantulas from each region,

allowing collection of a certain number of individuals in order to breed them in captivity and release part of the progeny with a planned reintegration strategy, thereby competing legally with the illegal trafficking of them.

One example of this is the case of Mexico, where there is a permanent program that integrates all people interested in sustainable use of wildlife in the country in a system called the UMA (Unidad de Manejo para la Conservación de la Vida Silvestre) (DOF 2000). UMAs can be properties or property owners who voluntarily participate in sustainable use of the wild species that live there. They also respond to the need to conserve biodiversity and boost production and socioeconomic development of the country (Robles de Benito 2009). The general wildlife law (Ley General de Vida Silvestre (LGVS)) and its respective UMA regulate sustainable use, conservation and management of native tarantulas in Mexico. The UMA program allows qualified persons to collect a limited number of wild tarantulas in order to keep and breed them in captivity, and only the resulting offspring can be sold domestically or exported (CEC 2017). It should be noted that these breeding facilities can sell only those specimens that have been bred in captivity and not the wild-caught specimens they have been allowed to collect, since their only permitted use is as initial breeding stock for captive breeding (Mendoza, personal observation 2008–2020). This is a substantial difference in the use of tarantulas, since although their use is allowed, this has limitations, and only a few specimens are allowed to be collected in order to breed them in captivity to supply the existing demand for some protected species or even other species within the country. These actions are intended to remove pressure on native populations of tarantulas, giving people the opportunity to legally buy specimens bred in captivity that can be maintained or exhibited without legal problems, rather than those that have been illegally removed from their natural habitat (Zuñiga, personal communication 2019). As these specimens bred in captivity can also be exported to other countries, their illegal collection for international trafficking can be reduced. In addition, when the authorities confiscate tarantulas whose origin can not be determined and for any reason they cannot be returned to their country of origin (or, in the case of Mexican tarantulas, reintegrated into their habitat), they are given to any of these legal breeding facilities in order that they can be kept in the best possible living conditions. In this way, if it is possible, tarantula-breeding facilities can reproduce these species and trade the offspring. Legal importation of tarantulas into Mexico is also allowed, so any person with requirements for legal importation of animals can introduce exotic species into the country, on the condition that they are kept exclusively in captivity (DOF 2000).

Mexico is among the countries considered megadiverse and is considered the country with the second-largest number of known species of tarantula, after Brazil (Locht 2008; Candia-Ramírez and Francke 2017). Therefore, we consider that the way Mexico has implemented its legislation to be able to regulate and enable sustainable use of and trade in tarantulas is a good example of how other countries could allow responsible captive breeding of and trade in tarantulas. While it is true that around the world, there are a large number of people and breeding sites that reproduce tarantulas as part of a hobby, many of them are located in areas where

there is little or no diversity of native tarantulas. So, it is important to recognize that large breeding facilities in Europe, Canada and the USA contribute to an important part of the indirect conservation of tarantulas by offering thousands of captive-bred individuals to supply the growing market demand. However, it should be noted that many of these tarantulas bred in captivity today were once illegally harvested from their places of origin. Thus, if there could be a legal alternative allowing trading and supply of tarantulas to the international market by the countries where these organisms are distributed naturally, it could reach a point where breeding facilities similar to those found in Mexico could be opened. Local breeders could not only benefit from this activity but also promote the importance and conservation of tarantulas in their native habitat, thereby managing to curb an important part of the illegal trafficking and collection of these organisms. On the other hand, importers of tarantulas in places such as Europe, Canada, and the USA could access specimens bred in captivity and exported legally, with the assurance that they were the product of sustainable use. In such a way, with the passage of time, they would preferentially acquire tarantulas legally from breeders in different countries and bring more income to families dedicated to the breeding of tarantulas in captivity.

References

Agencia EFE (2016) Un envío fallido de tarántulas de Uruguay a Dominicana destapa el tráfico ilegal de esta especie, 23 January. https://www.efe.com/efe/america/cono-sur/un-envio-fallido-de-tarantulas-uruguay-a-dominicana-destapa-el-trafico-ilegal-esta-especie/50000553-2818821. Accessed 5 Nov 2018

Anderson JF (1970) Metabolic rates of spiders. Comp Biochem Physiol 33(1):51–72

Anderson JF (1974) Responses to starvation in the spiders *Lycosa lenta* Hentz and *Filistata hibernalis* (Hentz). Ecology 55(3):576–585

Baerg WJ (1926) Regeneration of appendages in the tarantula *Eurypelma californica* Ausserer. Ann Entomol Soc Am 19(4):512–513

Baerg WJ (1928) The life cycle and mating habits of the male tarantula. Q Rev Biol 3(1):109–116

Baerg WJ (1938) Tarantula studies. J N Y Entomol Soc 46(1):31–43

Baerg WJ (1958) The tarantula. University of Kansas Press, Lawrence

Barneche JA, Gillung JP, Gonzalez A (2013) Description and host interactions of a new species of *Exetasis* Walker (Diptera: Acroceridae), with a key to species of the genus. Zootaxa 3664(4):525–536

Baxter RN (1995) Keeping and breeding tarantulas, 2nd edn. Chudleigh, Ilford

Bengston SE, Pruitt JN, Riechert SE (2014) Differences in environmental enrichment generate contrasting behavioural syndromes in a basal spider lineage. Anim Behav 93:105–110

Benjamin SP, Nanayakkara RP, Dayananda SK (2012) The taxonomy and conservation status of the spiders (Arachnida: Araneae) in Sri Lanka. In: Weerakoon DK, Wijesundara S (eds) The national red list 2012 of Sri Lanka; conservation status of the fauna and flora. Ministry of Environment, Colombo, pp 42–45

Bennie M, Loaring C, Trim S (2011) Laboratory husbandry of arboreal tarantulas (Theraphosidae) and evaluation of environmental enrichment. Anim Technol Welfare 10(3):163

Breene RG (1998) The ATS arthropod medical manual: diagnoses and treatment. American Tarantula Society, Carlsbad, NM, p 32

BWPM (2014) Códigos de barras de la vida silvestre México. http://bwp-mex.blogspot.mx/. Accessed 11 Aug 2018

Cady A, Leech R, Sorkin L, Stratton G, Caldwell M (1993) Acrocerid (Insecta: Diptera) life histories, behaviors, host spiders (Arachnida: Araneida), and distribution records. Caad Entomol 125(5):931–944
Candia-Ramírez DT, Francke OF (2017) Taxonomic revision of the genus *Crassicrus* Reichling & West, 1996 (Araneae: Theraphosidae: Theraphosinae), with the description of additional keels on the embolus. J Arachnol 45(1):67–98
Carey JE (1999) Improving the efficacy of CITES by providing the proper incentives to protect endangered species. Wash U L Rev 77:1291–1322
Carranza D (2018) Incautan en Colombia 23 tarántulas que iban al comercio ilegal en Seúl. Anandolu Agency. https://www.aa.com.tr/es/mundo/incautan-en-colombia-23-tarántulas-que-iban-al-comercio-ilegal-en-seúl/1271224. Accessed 2 Nov 2018
CEC (2017) Sustainable trade in tarantulas: action plan for North America. Commission for Environmental Cooperation, Montreal
Clarke D (1987) The captive breeding of arachnids. In: Proceedings of a Symposium on Spiders and Their Allies, London, pp 71–76
Cléton F, Sigwalt Y, Verdez JM (2015) Tarantulas, breeding experience & wildlife. Edition Chimaira, Frankfurt
Cloudsley-Thompson JL, Constantinou C (1985) Diurnal rhythm of activity in the arboreal tarantula *Avicularia avicularia* (L.) (Mygalomorphae: Theraphosidae). Biol Rhythm Res 16(2):113–116
Cooper R (2011) Smuggler caught at airport with 261 Mexican tarantulas shoved into his luggage. Daily Mail. https://www.dailymail.co.uk/news/article-2051210/Smuggler-caught-airport-261-Mexican-tarantulas-shoved-luggage.html. Accessed 5 Nov 2018
Cooper EWT, West R, Mendoza J (2019) Identification of CITES-listed tarantulas: *Aphonopelma*, *Brachypelma* and *Sericopelma* species. Commission for Environmental Cooperation, Montreal
Costa FG, Pérez-Miles F (2002) Reproductive biology of uruguayan theraphosids (Araneae, Mygalomorphae). J Arachnol 30(3):571–588
Costa FG, Pérez-Miles F, Mignone A (2004) Pompilid wasp interactions with burrowing tarantulas: *Pepsis cupripennis* versus *Eupalaestrus weijenberghi* and *Acanthoscurria suina* (Araneae, Theraphosidae). Stud Neotrop Fauna E 39(1):37–43
Davies ME, Edney EB (1952) The evaporation of water from spiders. J Exp Biol 29(4):571–582
De Voe RS (2009) Captive invertebrate nutrition. Vet Clin North Am Exot Anim Pract 12(2):349–360
de Vosjoli P (1991) Arachnomania: general care and maintenance of tarantulas and scorpions. Advanced Vivarium Systems, Lakeside
Dias SC, Brescovit AD (2003) Notes on the behavior of *Pachistopelma rufonigrum* Pocock (Araneae, Theraphosidae, Aviculariinae). Rev Bras Zool 20(1):13–17
Dickinson B (2002) International conservation treaties, poverty and development: the case of CITES. Nat Resour Perspect 74:1–4
Dippenaar-Schoeman AS (2002) Baboon and trapdoor spiders of southern Africa: an identification manual. Plant Protection Research Institute handbook no. 13. Agric Res Council, Pretoria
DOF (Diario Oficial de la Federación) (2000) Ley general de vida silvestre. Diario Oficial de la Federación. http://www.diputados.gob.mx/LeyesBiblio/ref/lgvs/LGVS_orig_03jul00.pdf. Accessed 3 July 2018
Draper E, Trim SA (2018) Dyskinetic syndrome in tarantula spiders (Theraphosidae). Vet Nurs J 33(8):230–232
Ferretti NE, Pompozzi G (2012) *Grammostola vachoni*. The IUCN red list of threatened species 2012: e.T18217620A18217711. https://doi.org/10.2305/IUCN.UK.2012.RLTS.T18217620A18217711.en. Accessed 5 Nov 2018
Ferretti N, Pompozzi G, Copperi S (2012) Notes on egg-sacs and spiderlings of two species of *Grammostola* (Araneae: Theraphosidae) from Central Argentina. J Br Tarantula Soc 27(2):53–61
Ferretti N, Gonzalez A, Pérez-Miles F (2014) Identification of priority areas for conservation in Argentina: quantitative biogeography insights from mygalomorph spider (Araneae: Mygalomorphae). J Insect Conserv 18(6):1087–1096

Figueroa DP, Sabat P, Torres-Contreras H, Veloso C, Canals M (2010) Participation of book lungs in evaporative water loss in *Paraphysa parvula*, a migalomorph spider from Chilean Andes. J Insect Physiol 56(7):731–735

Foelix R (2011) Biology of spiders. Oxford University Press, New York

Frye FL (1992) "Tarantulas" and other spiders. In: Captive invertebrates a guide to their biology and husbandry. Krieger, Malabar, pp 7–17

Fukushima CS, Bertani R (2017) Taxonomic revision and cladistic analysis of *Avicularia* Lamarck, 1818 (Araneae, Theraphosidae, Aviculariinae) with description of three new Aviculariinae genera. ZooKeys 659:1–185

Fukushima C, Mendoza J, West R, Longhorn S, Rivera-Téllez E, Henriques S, Cardoso P (2018) *Brachypelma*. The IUCN red list of threatened species 2018: e.T8152A21416539. https://doi.org/10.2305/IUCN.UK.2018-2.RLTS.T8152A21416539.en. Accessed 5 Nov 2018

Gallon RC (2000) The natural history of tarantula spiders. J Br Tarantula Soc. http://www.bts.ndirect.co.uk/natural.htm. Accessed 5 Oct 2018

Hardin T, Sincage J (2015) AZA Mexican red kneed tarantula (*Brachypelma smithi*) species survival plan. Mexican red kneed tarantula care manual. Association of Zoos and Aquariums, Silver Spring. http://digitalcommons.unl.edu/entodistmasters/1. Accessed 27 Oct 2018

Haro L, Jouglard J (1998) The dangers of pet tarantulas: experiences of the Marseilles Poison Centre. J Toxicol Clin Toxicol 36(1&2):51–53

Herrero MV, Valerio CE (1986) Análisis de 1ª actividad diaria de *Aphonopelma seemanni* (Araneae, Theraphosidae) en Costa Rica. J Arachnol 14:79–82

Inecc (2012) Tráfico ilegal de especies silvestres y sus impactos. http://www.inecc.gob.mx/descargas/dgioece/2012_sem_trafico_pon01_alow.pdf. Accessed 21 Nov 2018

Jespersen LB, Toft S (2003) Compensatory growth following early nutritional stress in the wolf spider *Pardosa prativaga*. Funct Ecol 17:737–746

Kleinteich A, Wilder SM, Schneider JM (2015) Contributions of juvenile and adult diet to the lifetime reproductive success and lifespan of a spider. Oikos 124(2):130–138

Kurczewski FE (2010) Prey and nesting behavior of some North American spider wasps (Hymenoptera: Pompilidae). Northeast Nat 1:115–124

Kurczewski FE, Edwards GB (2012) Hosts, nesting behavior, and ecology of some North American spider wasps (Hymenoptera: Pompilidae). Southeast Nat 11(m4):1–72

Larrivée M, Borkent CJ (2009) New spider host associations for three acrocerid fly species (Diptera, Acroceridae). J Arachnol 37(2):241–242

Laurance WF (2010) Habitat destruction: death by a thousand cuts. In: Sodhi NS, Ehrlich PR (eds) Conservation biology for all. Oxford University Press, Oxford, pp 73–87

Li D, Jackson RR (1996) How temperature affects development and reproduction in spiders: a review. J Therm Biol 21(4):245–274

Locht A (2008) Estudio sobre la sistemática y distribución de la familia Theraphosidae (Arachnida, Araneae) en México. Dissertation, Facultad de Ciencias, Universidad Nacional Autónoma de México

Locht A, Yáñez M, Vázquez I (1999) Distribution and natural history of Mexican species of *Brachypelma* and *Brachypelmides* (Theraphosidae, Theraphosinae) with morphological evidence for their synonymy. J Arachnol 1:196–200

M'Rabet SM, Hénaut Y, Sepúlveda A, Rojo R, Calmé S, Geissen V (2007) Soil preference and burrow structure of an endangered tarantula, *Brachypelma vagans* (Mygalomorphae: Theraphosidae). J Nat Hist 41(17-20):1025–1033

Machkour-M'Rabet S, Ariane D, Hénaut Y (2015) *Megaselia scalaris* (Diptera: Phoridae): an opportunistic endoparasitoid of the endangered Mexican redrump tarantula, Brachypelma vagans (Araneae: Theraphosidae). J Arachnol 43(1):115–119

Marechal P, Rolland C, Leguin EA, Monpiou L (2009) Etude sur l'etat des populations de *Avicularia versicolor*, mygale endemique de la Martinique, rapport de synthese, missions 2007–2008. Museum national d'Histoire naturelle, Paris. http://www.side.developpement-durable.gouv.fr/EXPLOITATION/DEFAULT/Infodoc/ged/viewportalpublished.ashx?eid=IFD_FICJOINT_0006180&search=. Accessed 10 Oct 2019

Marnell C (2016) Tarantula and hermit crab emergency care. Vet Clin North Am Exot Anim Pract 19(2):627–646
Marshall SD (1996) Tarantulas and other arachnids: a complete pet owner's manual. Barron's, New York
Marshall SD (2001) Tarantulas and other arachnids. Barron's Educational Series, Hauppauge
Marshall SD, Uetz GW (1990) Incorporation of urticating hairs into silk: a novel defense mechanism in two Neotropical tarantulas (Araneae, Theraphosidae). J Arachnol 18(2):143–149
Marshall SD, West R (2008) An ontogenetic shift in habitat use by the Neotropical tarantula *Ephebopus murinus* (Araneae, Theraphosidae, Avicullariinae). Arachnology 14(6):280–285
Mendoza J (2009) La ciencia de las tarántulas: anatomía y fisiología. In: Memorias del 2° Curso de Manejo de Tarántulas y Escorpiones en Cautiverio. Universidad Nacional Autonóma de México, Facultad de Medicina Veterinaria y Zootecnía
Mendoza JI, Francke OF (2017) Systematic revision of *Brachypelma* red-kneed tarantulas (Araneae: Theraphosidae), and the use of DNA barcodes to assist in the identification and conservation of CITES-listed species. Invertebr Syst 31(2):157–179
Millot J (1943) Une mygale vivante de l'Uruguay. Bull Soc de Pathol Exotique 36:130–133
Mitchell M, Tully TN (2008) Manual of exotic pet practice. Saunders-Elsevier, St. Louis
Molur S, Daniel BA, Siliwal M (2008) *Poecilotheria*. The IUCN red list of threatened species. e.T63563A12681959. https://doi.org/10.2305/IUCN.UK.2008.RLTS.T63562A12681695.en. Accessed 4 Nov 2018
Paula FS, Gabriel R, Indicatti RP, Brescovit AD, Lucas SM (2014) On the Brazilian Amazonian species of *Acanthoscurria* (Araneae: Theraphosidae). Zoologia (Curitiba) 31(1):63–80
Peck WB, Whitcomb WH (1970) Studies on the biology of a spider, *Chiracanthium inclusum* (Hentz). Bull Ark Exp Stn 753:1–76
Pellett S, Bushell M, Trim SA (2015) Tarantula husbandry and critical care. Companion Anim 20(2):54–60
Pérez-Miles F, Costa FG, Toscano-Gadea C, Mignone A (2005) Ecology and behaviour of the 'road tarantulas' *Eupalaestrus weijenberghi* and *Acanthoscurria suina* (Araneae, Theraphosidae) from Uruguay. J Nat Hist 39(6):483–498
Pérez-Miles F, Postiglioni R, Montes de Oca L, Baruffaldi L, Costa FG (2007) Mating system in the tarantula spider *Eupalaestrus weijenberghi* (Thorell, 1894): evidences of monandry and polygyny. Zoology 110:253–260
Petrunkevitch A (1911) Sense of sight, courtship and mating in *Dugesiella hentzi* (Girard), a theraphosid spider from Texas. Zoologische Jahrbücher (Systematik) 31:355–376
Philip BN (2006) The effect of prey availability on metabolism and activity in the tarantula *Phormictopus cancerides* (Araneae: Theraphosidae). Dissertation, Eastern Michigan University. http://commons.emich.edu/theses/82
Philip BN, Shillington C (2010) The effect of prey availability on metabolism and activity in the tarantula *Phormictopus cancerides*. Can J Zool 88(1):90–98
Phillips T (2009) London petshop owner try to smuggle 1000 spiders. The Guardian. https://www.theguardian.com/world/2009/nov/12/pet-shop-owner-spider-smuggling. Accessed 27 Oct 2018
Pizzi R (2009) Parasites of tarantulas (Theraphosidae). J Exot Pet Med 18(4):283–288
Pizzi R (2010) Invertebrates. In: Meredith A, Johnson-Delaney CA (eds) BSAVA manual of exotic pets, 5th edn. BSAVA, Gloucester, pp 373–385
Pizzi R (2012) Spiders. In: Lewbart G (ed) Invertebrate medicine, 2nd edn. Blackwell, Chichester pp 187–221
Prentice TR (1997) Theraphosidae of the Mojave Desert west and north of the Colorado River (Araneae, Mygalomorphae, Theraphosidae). J Arachnol:137–176
Prestwich KN (1983a) Anaerobic metabolism in spiders. Physiol Zool 56:112–121
Prestwich KN (1983b) The roles of aerobic and anaerobic metabolism in active spiders. Physiol Zool 56:122–132
Psaila N (2005) Husbandry manual for exotic tarantulas. http://nswfmpa.org/Husbandry%20Manuals/Published%20Manuals/Invertebrata/Exotic%20Tarantulas.pdf. Accessed 2 July 2018

Punzo F (1989) Effects of hunger on prey capture and ingestion in *Dugesiella echina* Chamberlin (Orthognatha, Theraphosidae). Bull Br Arachnol Soc 8(3):72–79
Punzo F (1994) The biology of the spider wasp, *Pepsis thisbe* (Hymenoptera: Pompilidae) from Trans Pecos, Texas. II. Temporal patterns of activity and hunting behavior with special reference to the effects of experience. Psyche 101(3–4):243–256
Punzo F (2005) Experience affects hunting behavior of the wasp, *Pepsis mildei* Stål (Hymenoptera: Pompilidae). J N Y Entomol Soc 113(3):222–229
Punzo F, Henderson L (1999) Aspects of the natural history and behavioral ecology of the tarantula spider *Aphonopelma hentzi* (Girard, 1854) (Orthognatha, Theraphosidae). Bull Br Arachol Soc 11(4):121–128
Rego FN, Rheims CA, Venticinque EM (2004) Notes on the predation of an *Avicylariine* spider (Araneae: Theraphosidae, *Avicularia* sp.) by *Pepsis frivaldszkyi* (Hymenoptera: Pompilidae) in Brazilian Amazonia. J Br Tarantula Soc 20(1):18–25
Reichling SB (2000) Group dispersal in juvenile *Brachypelma vagans* (Araneae, Theraphosidae). J Arachnol 28(2):248–251
Reichling SB (2003) Tarantulas of Belize. Krieger, Malabar
Reichling SB, Gutzke WH (1998) Phenotypic consequences of incubation temperature and feeding regimen in captive-bred tarantulas. Zoo Biol 17(5):405–414
Riley J, Barron H (2016) Wildlife emergency and critical care. Vet Clin North Am Exot Anim Pract 19(2):613–626
Robles de Benito R (2009) Las unidades de manejo para la conservación de la vida silvestre y el corredor biológico Mesoamericano México. CONABIO, Mexico City
Rojo R (2004) Las tarántulas de México: pequeños gigantes incomprendidos. Biodiversitas 56:7–11
Saul-Gershenz L (1996) Laboratory culture techniques for the Goliath tarantula *Theraphosa blondi* (Latreille, 1804) and the Mexican red knee tarantula, *Brachypelma smithi* (Araneae: Theraphosidae). In: American Association of Zoological Parks and Aquariums (AAZPA) Regional Conference Proceedings, pp 773–777
Schultz SA, Schultz MJ (2009) The Tarantula Keeper's guide: comprehensive information on care, housing, and feeding. Baron's Educational series, Hauppauge, NY, p 384
Sedinova H (2015) The shrew or ermine? New meaning of Aristotele's term mygale in the middle ages. Liaty Filologicke 138(1-2):119–146
Shillington C, McEwen B (2006) Activity of juvenile tarantulas in and around the maternal burrow. J Arachnol 34(1):261–266
Shillington C, Verrell P (1997) Sexual strategies of a North American 'tarantula' (Araneae: Theraphosidae). Ethology 103(7):588–598
Smith AM (1994) Tarantula spiders: tarantulas of the USA and Mexico. Fitzgerald, London
Smith A (2013) The story of the Costa Rican zebra tarantula, *Aphonopelma seemanni*. http://www.lovetarantulas.com/costaricanzebratarantula.pdf. Accessed 14 Aug 2018
Stradling DJ (1978) The growth and maturation of the "tarantula" *Avicularia avicularia* L. Zool J Linn Soc 62:291–303
Stradling DJ (1994) Distribution and behavioral ecology of an arboreal tarantula spider in Trinidad. Biotropica 1:84–97
Teyssié F (2015) Tarantulas of the world. NAP Editions, Verrières-le-Buisson
Trevors JT (1996) Sterilization and inhibition of microbial activity in soil. J Microbiol Methods 26(1–2):53–59
Turnbull AL (1962) Quantitative studies of the food of *Linyphia triangularis* Clerck (Araneae; Linyphiidae). Can Entomol 94:1233–1245
Turnbull AL (1965) Effects of prey abundance on the development of the spider *Agelenopsis potteri* (Blackwell) (Araneae: Agelenidae). Can Entomol 97(2):141–147
Verdez JM, Cléton F (2004) Tarántulas. Introducción, guía y reproducción. Reptilia Ediciones, Barcelona
Weinmann D, Disney RH (1997) Two new species of Phoridae (Diptera) whose larvae associate with large spiders (Araneae: Theraphosidae). J Zool 243(2):319–328

West RC (1995) Mighty mites. J Br Tarantula Soc 10(3):86–88
West RC (2005) The *Brachypelma* of Mexico. J Br Tarantula Soc 20:108–119
World Spider Catalog (2020) World Spider Catalog. Version 21.5. Natural History Museum Bern. http://wsc.nmbe.ch. Accessed 11 Sept 2020. https://doi.org/10.24436/2
Yáñez M, Floater G (2000) Spatial distribution and habitat preference of the endangered tarantula, *Brachypelma klaasi* (Araneae: Theraphosidae) in Mexico. Biodivers Conserv 9(6):795–810