TIPS, TRICKS & TECHNIQUES

A Captive Breeding Program for the Giant Amazonian Whip Spider: Making Educational Connections to a Charismatic Arachnid and the Ongoing Sixth Mass Extinction

NABT BioClub RECOMMENDATION

RON WAGLER

Abstract

Heterophrynus batesii *(the Giant Amazonian Whip Spider) are often referred to as "whip scorpions" or "whip spiders" because of their very long antenniform legs (i.e., whips), but they are neither scorpions nor spiders. They are amblypygids, a type of harmless charismatic arachnid with an alien-like appearance that students are drawn to. I have developed care and breeding techniques that are effective at getting* H. batesii *to live and reproduce in captivity. I developed these techniques with other science teachers in mind. These techniques are simple, time efficient, utilize the least expensive materials, and require minimal space—important characteristics since most high school biology teachers are limited by time, money, and space. This article instructs high school biology students (under the guidance of their teacher) how to properly care for and develop a captive breeding program for* H. batesii *in their high school biology classroom. Topics, resources, and activities are also suggested that allow teachers to make educational connections between the* H. batesii *captive breeding program, the ongoing sixth mass extinction, and the destruction of the Amazon rainforest.*

Key Words: *amblypygid; anthropocene mass extinction; arachnid; arthropod; captive breeding; curriculum;* Damon diadema*;* Heterophrynus batesii*; science education; sixth mass extinction.*

Introduction

Heterophrynus batesii (the Giant Amazonian Whip Spider) (Figure 1) are often referred to as "whip scorpions" or "whip spiders" because of their very long antenniform legs (i.e., whips), but they are neither scorpions nor spiders. They are amblypygids, a type of harmless and nonvenomous arachnid. With a 50-cm span between their extended antenniform legs, *H. batesii* displays one of the largest arachnid widths in the world. I have developed care and breeding techniques that are effective at getting *H. batesii* to live and reproduce in captivity. I developed these techniques with other science teachers in mind. These techniques are simple, time efficient, utilize the least expensive materials, and require minimal space—important characteristics since most high school biology teachers are limited by time, money, and space. In my experience with keeping and breeding these arachnids in educational settings, I believe these are the overall best techniques for teachers with minimal space, small budgets, and time constraints who would like to keep this amazing animal in their classrooms.

Heterophrynus batesii *(the Giant Amazonian Whip Spider) are often referred to as "whip scorpions" or "whip spiders" because of their very long antenniform legs.*

I have found that allowing students to care for and set up captive breeding programs is a beneficial activity that can be a meaningful part of a biology course. *H. batesii* are very charismatic animals. They are arguable one of the most unique looking animals on Earth. My students are often drawn to their bizarre alien-like appearance and, because of this, get very excited about learning and caring for them. When they realize they are harmless, they are even more motivated to work with them, breed them in captivity, and learn about their interesting biology. This article instructs high school biology students (under the guidance of their teacher) how to properly care for and develop a captive breeding program for *H. batesii* in their high school biology classroom. Topics, resources and activities are also suggested that allow teachers to make educational connections between the *H. batesii* captive breeding program, the ongoing sixth mass extinction, and the destruction of the Amazon rainforest. I believe these simple but effective care and captive breeding techniques will provide you and your students with years of enjoyment while keeping these amazing animals in your classroom.

The American Biology Teacher, Vol. 80, No 1, pages. 47–49, ISSN 0002-7685, electronic ISSN 1938-4211. DOI: https://doi.org/10.1525/abt.2018.80.1.47.

Figure 1. A mature adult male *Heterophrynus batesii*. Photograph by Ron Wagler.

○ Acquiring, Caring for, and Breeding Captive Bred *H. batesii* in the Classroom

H. batesii juveniles can be purchased online (see the Resources section). *Damon diadema* (the Tanzanian Whip Spider), another more common amblypygid species, can also be purchased online (see the Resources section). Verify from the seller that the amblypygids are captive bred and not wild caught so that further numbers of these species are not removed from their already fragile natural ecosystems. The care and captive breeding techniques presented here are effective for either species. It is recommended that you purchase eight to ten juveniles for your breeding project, but a single amblypygid can also be purchased if you do not want to breed them. If this is your first time caring for an amblypygid, purchase a single juvenile *D. diadema*. This is a good way to develop your care skills before you take on the responsibility of caring for *H. batesii*. If you decide to breed your amblypigids, breed *D. diadema* before you take on the more challenging species *H. batesii*. In all cases purchase juveniles that have molted at least four times.

The enclosure for your amblypygid will be a 5-gallon plastic bucket with a secure lid, which can be purchased at a home improvement store. Drill ten to fifteen 2-mm holes (5/64 drill bit) equally spaced around the top rim of the bucket directly below where the lid snaps into place. Next, buy polystyrene foam board (19–25 mm thick), which can be purchased at a home improvement or arts and crafts store. Note that furniture stores will often give you the discarded polystyrene foam board from their furniture packing material. Cut the foam board into a rectangle so you can slide it vertically into the middle of the bucket. You will need to measure the inside of your bucket to know what size to cut the foam board. The foam board should be long enough so the bottom edge touches the bottom of the bucket but does not extend all the way up to the lid, and wide enough so the sides fit snuggly against the sides of the bucket. When the lid is closed there should be a 2.5-cm space between the top of the foam board and the bottom of the lid. This will allow enough space so the amblypygid can move to either side of the vertical foam board when the lid is closed.

Then add 2 cm of moist coconut fiber (i.e., coir) to the bottom of the bucket. Coconut fiber can be purchased at a pet store. I use Zoo Med Eco Earth coconut fiber, but other brands can be used. Next, place a starter colony (10–20 individuals) of dwarf isopods in the bucket. Springtails can also be added. Dwarf isopods and springtails can be purchased online at many locations. The dwarf isopods and springtails will keep the enclosure free of any organisms (e.g., fungi) that will harm your amblypygid. Last, place one juvenile amblypygid in each bucket, lightly mist the entire enclosure and close the lid. These inexpensive plastic bucket enclosures can be stacked in columns of up to five tall, but be careful to not knock them over. This provides a very space efficient captive breeding set up. I have a very large "wall" of amblypygid bucket enclosures in my science classroom.

If you want to have an enclosure for viewing your amblypygid without opening the lid, you will need to replicate these same conditions in a transparent enclosure. If you would like a larger enclosure for your mature adult amblypygid, duplicate these same conditions in a larger plastic container such as a 10-gallon or 18-gallon tote. Instead of using the inexpensive polystyrene foam board, a slab of more expensive cork bark, which can be purchased online, can also be used. If you use a slab of cork bark, purchase the maximum size that will fit in the bucket enclosure, and place the slab diagonally so that the bottom rests on one side of the bottom of the bucket and the top rests on the other side of the top of the bucket.

Note that some people have reported problems with large, older *H. batesii* not successfully molting on the size of foam board that is in the 5-gallon bucket. I have not had this issue; the problem may be because the amblypygid has reached full maturity and is at the end of its life, and not because of the size of the foam board. If the *H. batesii* is large, it is best to err on the side of caution and move the amblypygid to a larger enclosure with a taller and wider piece of foam board to avoid molting problems.

Keep all of your enclosures at 24°C (75°F). You can allow the temperature to fluctuate from 21 to 27°C (70 to 80°F) for moderate periods of time, but try and keep all of the enclosures at 24°C (75°F). Once a week feed your amblypygid and mist the enclosure so the coconut fiber, internal walls of the bucket, and foam board are moist. Never over-mist the enclosure to the point where standing water accumulates on the coconut fiber. Feed your amblypygid one cricket that is half to two thirds its body length. You can buy crickets at your local pet store. If the amblypygid has not eaten the cricket after six hours, remove the cricket and try and re-feed the amblypygid in four days. When your amblypygid is molting, do not disturb it. Once it has molted and the amblypygid's exoskeleton has hardened (i.e., when the exoskeleton is no longer blue), you can attempt to feed it. When your amblypygid molts, it will increase in size.

Introduce your amblypygids for breeding only when they are mature, and never attempt to breed amblypygids of different species. You can identify the sex of your amblypygids when they are mature by looking at the pedipalps, the rake-like front appendages in Figure 1. If the pedipalps extend beyond the first set of walking legs (as in Figure 1), then you have a mature male. Female's pedipalps do not extend beyond the first set of walking legs. Once you have identified that you have a mature male, wait till you have a female of the same body length. Do not attempt to breed amblypygids that are not mature or are different sizes. Introduce the male into the female's enclosure. Allow the male to cohabitate with the female. Feed the male and female as frequently as they will eat. Check the pair daily and when you notice a spermatophore (search

Google images for amblypygi spermatophore) in the enclosure, the amblypygids have most likely mated, and you can move the male out of the female's enclosure. Note that observing one spermatophore is good, but observing two is even better.

If the amblypygids successfully mate, the female will develop an egg sac that she will carry under her abdomen. You can attempt to feed her while she has her egg sac, but keep all disturbances to a minimum. After carrying the egg sac, the eggs will hatch and the amblypygids will crawl onto her abdomen. They will then molt and move off of her abdomen. At this point you can introduce living prey of appropriate size for both the mother and the juveniles. If you are having trouble finding appropriately sized prey for your juveniles, note that they can eat crickets 1.5 times longer than their body length. Allow the juveniles to live with their mother, and after they have molted three more times, move them to their own enclosures. If any of the juveniles die for any reason, immediately move all of them to their own enclosures. Juveniles can also be housed in smaller enclosures, and then be moved to the 5-gallon bucket when they are larger.

It is not possible to cover all aspects of the care and captive breeding of these two species in this one article, but the essential aspects have been presented. I have found these care and captive breeding techniques to be successful, but you will find other techniques online. If you have further clarification questions about the care and captive breeding techniques, or if problems arise with either of these two species, please contact the author by email (rrwagler2@utep.edu).

○ Conclusion

Heterophrynus batesii are from the Amazon rainforest, so there is also the opportunity for the teacher to connect this amazing animal to the current mass extinction and the ongoing destruction of this species' ecosystem. Five mass extinctions have occurred, so the current mass extinction is often referred to as the sixth mass extinction. Also referred to as the Anthropocene mass extinction, the current mass extinction is defined as an ongoing current event during which a large number of living species are threatened with extinction or are going extinct because of the environmentally destructive activities of humans (Wagler, 2017). The sixth mass extinction provides, from an educational standpoint, the best way for students to *fully* understand the environmental impact we are having on Earth's ecosystems because it encompasses all of the *major* human activities causing this extinction. These large-scale global human activities are the spread of invasive species and genes; overexploitation of species; habitat modification, fragmentation, and destruction; pollution and climate change (Wagler, 2017). All of these human activities have and continue to negatively impact the Amazon rainforest where *H. batesii* lives.

As your students care for *H. batesii*, consider connecting this species to the topics, resources, and activities presented in *The American Biology Teacher* article "The Anthropocene Mass Extinction" (Wagler, 2011) and the *Science Scope* article "The Sixth Great Mass Extinction" (Wagler, 2012). These articles provide science educators with a large number of topics, resources, and activities that can be used to educate students about the major factors that are impacting global ecosystems and the arachnid species (and other species) that live in these ecosystems. Many of these topics, resources, and activities are aligned to the performance expectations, disciplinary core ideas, crosscutting concepts, and other aspects of the *Next Generation Science Standard* HS-LS2: Ecosystems: Interactions, Energy, and Dynamics (NGSS Lead States, 2013). For example, disciplinary core idea LS2.C states, "Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7)" And LS4.D states,

> Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (secondary to HS-LS2-7) (Note: This Disciplinary Core Idea is also addressed by HS-LS4-6.) (NGSS Lead States, 2013)

My hope is that by allowing your students to care for and develop a captive breeding program that connects this charismatic arachnid to the ongoing current mass extinction and the destruction of the Amazon rainforest, they will be motivated to become citizens and scientists who can participate in reducing the destruction of this essential life-giving rainforest. If the effects of the current human-induced sixth mass extinction are not reduced—and they show no signs of slowing—one day soon the vast majority of the Amazon rainforest will be gone, and this species will go extinct in the wild (EW). Captive breeding techniques may be the only thing that keeps this amazing animal from going extinct (EX).

○ Resources

To buy captive bred *Heterophrynus batesii* and *Damon diadema*, visit the following websites or other online locations:

- Arachnoboards (see For Sale section): http://arachnoboards.com
- Bugs In Cyberspace: www.bugsincyberspace.com

References

NGSS Lead States (2013). *Next Generation Science Standards: For states, by states*. Washington, DC: National Academies Press.

Wagler, R. (2011). The anthropocene mass extinction: An emerging curriculum theme for science educators. *American Biology Teacher*, *73*(2), 78–83.

Wagler, R. (2012). The sixth great mass extinction. *Science Scope*, *35*(7), 48–55.

Wagler, R. (2017). 6th mass extinction.* In D. DellaSala & M. Goldstein (Eds.), *Encyclopedia of the Anthropocene: Biodiversity volume*. Amsterdam, Elsevier.

DR. RON WAGLER is an Associate Professor of Science Education at the University of Texas at El Paso and the founder and Director of the Living Arthropod and Environmental Education Laboratory. Website: http://volt.utep.edu/ronwagler/ Email: rrwagler2@utep.edu