Please Note: Image quality will be much better if you download this file and view as a PDF rather than viewing within the browser window.

We thank the Of Pools and People team for contributing the science, photography, and figures for this presentation

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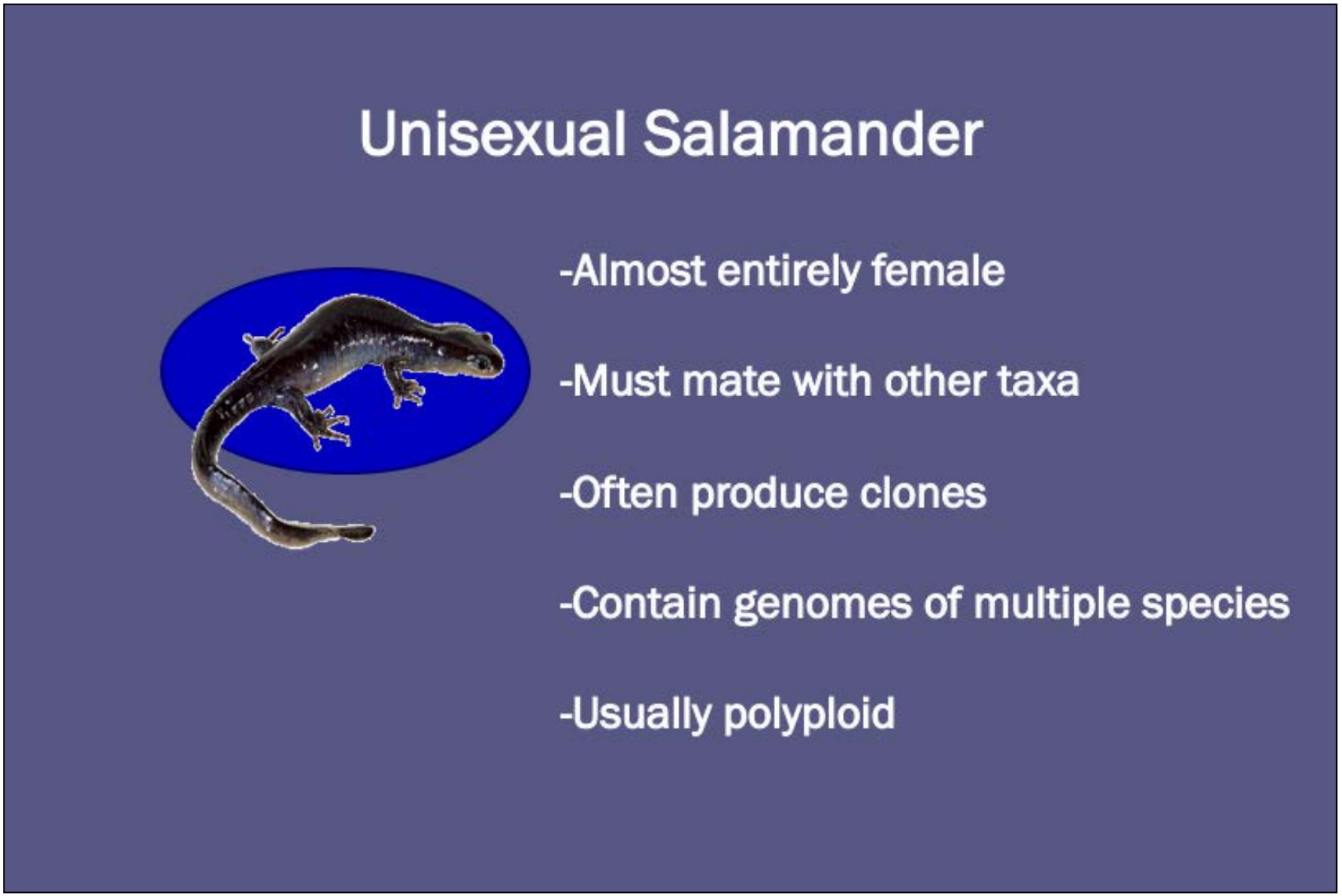


Unisexuals are the results of an ancient hybridization event where two now-exticnt species cross breed. The hybrid offspring were not able to undergo normal meiosis, the cell dividision that creates eggs and sperm with half the parents DNA. Instead the females pass all their DNA to their offspring, including their sex chromosomes, so all the offspring are female. But amphibian eggs will not divide if they are not stimulated by sperm, so they needed to "steal sperm" from the parent species. Overtime those species went extinc and our modern salamanders replaced them, and eventually replaced their nuclear DNA. In Maine, the only sperm donor available is the BSS, and our animals now are 2 part BSS and one part Jefferson salamander. Because they have so much BSS DNA, they are visually similar to Blue-spotted salamander.

The Unisexual Salamander can “steal” the sperm of five different species of salamander. Together, the Unisexual and the sperm-hosts make up the Blue-Spotted Salamander Complex.

Pure blue-spotted salamanders tend to be smaller and darker in color with more abundant and well defined light blue spots.

Hybrids display characteristics of individuals more closely related to Jefferson salamanders and tend to be larger and more brownish-grey in color with light flecks of blue spots. Hybrids and pure individuals may breed in the same pool and in some cases, may be hard to tell apart.

Unlike the spotted salamander egg mass with its firm outer jelly membrane, blue-spotted egg masses are very drippy in appearance and may in fact “drip” off a twig suspended above the water. If you gently poke at each type of egg mass, the spotted salamander eggs will meet your finger with resistance, while a blue-

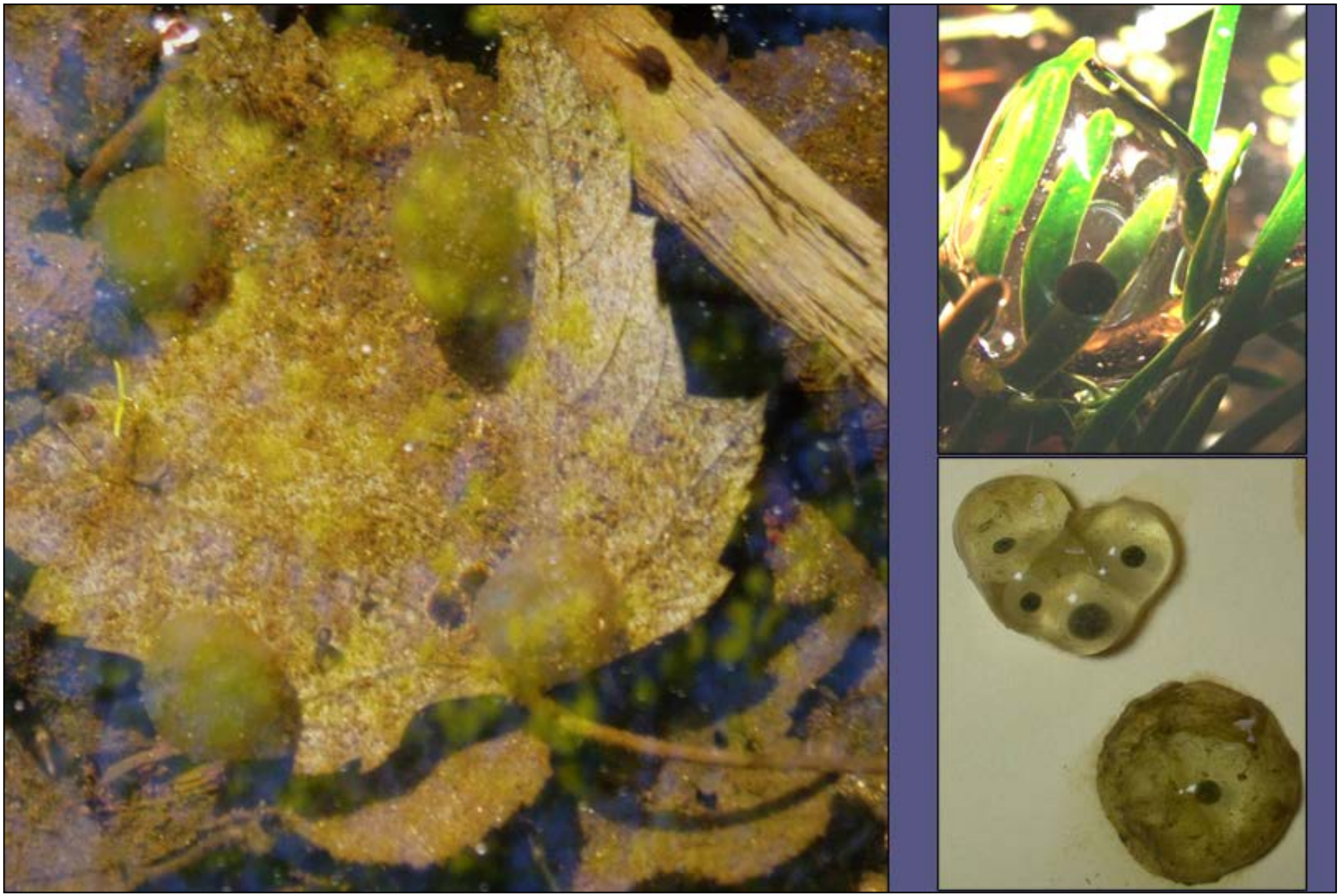
spotted egg mass will feel loose and yield to the slightest pressure, like loose jello.

Blue-spotted eggs may be deposited individually, in small clusters, or as strands beaded along sticks. The nature of the eggs depends on the genetic make-up of the animal. Pure blue-spotted salamanders may lay individual eggs on the pool bottom or as small strings of eggs (2-10) along a stick. The hybrid mix (blue-spot and Jefferson) have egg masses with more eggs and lots of white, infertile eggs contained within the mass.

Frequently attached to submerged sticks, blue-spotted eggs can be very difficult to see below the surface of the water. Without gently lifting this stick, you would not be able to tell that below the surface, eggs are attached the full length of each of these branches.

Upon lifting the stick, the egg mass abundance becomes apparent.

It is important to be very cautious when lifting submerged branches above the surface of the water. Blue-spotted eggs are so loose and drippy that when they are not supported by the buoyancy of water, they have the tendency to drip right off the stick.



It can be very difficult to find and count individual eggs which are either attached to submerged vegetation or deposited on the leaf litter at the bottom of the pool. However, if you do find individual eggs, where there is one, there are usually scores.

At the other extreme of difficulty, counting long strings of eggs beaded along a submerged stick can also provide a challenge. If trying to determine Significance in Maine, remember that a minimum of 10 blue spotted salamander egg masses (no matter the genetic make up) meets the criteria for vernal pool Significance. The low threshold of 10 masses was used because if you can find ten egg masses, then it is very likely that the pool contains hundreds of blue spotted eggs. (For the pure diploid, one single egg is counted as a mass for state regulation in Maine).

Hybrid blue-spotted salamanders (with Jefferson salamander genes) often produce infertile eggs with cloudy white embryos.

Egg mass characteristics

- Very loose jelly - can poke finger through it
- Single eggs on leaf litter or up to 10 eggs in mass
- Often attached to submerged sticks
- Hybrid eggs have a high percentage of infertile eggs that are white
- Hard to see in water; may have to lift sticks gently and use polarized sunglasses

Metamorphs of recently emerged blue-spotted salamanders. Note that you will not be likely to tell the difference between young spotted and blue-spotted salamander larvae or metamorphs.

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Postbreeding Habitat Use of the Rare, Pure-Diploid Blue-spotted Salamander (*Ambystoma laterale*)

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ABSTRACT.—**The pure-diploid Blue-spotted Salamander (*Ambystoma laterale*) is among the rarest amphibians in northeastern North America, and data on its ecology are sparse. We assessed the movement ecology and terrestrial habitat use of *A. laterale* using radio- and passive integrated transponder (PIT) tag- telemetry. We radio-tracked 22 *A. laterale* for a median of 54 days (range 6–126 days) in the spring and summer of 2009 and 2010. Using a modified PIT tag reader, we conducted 34 in situ surveys during the spring and summer of 2009 through 2011, resulting in 42 relocations. We detected salamanders at a median straight-line distance of 67 m (range 7–281 m) from their breeding wetland. The life zone (i.e., critical terrestrial habitat), encompassing 95% of observed salamander movements, extended 152 m from the edge of the breeding wetland. Eighteen radio-track Salamanders used u 10-m and 1-m-diam percent cover of slas salamander locatio recommendations fo**

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Post-Breeding Migration and Habitat of Unisexual Salamanders in Maine, USA

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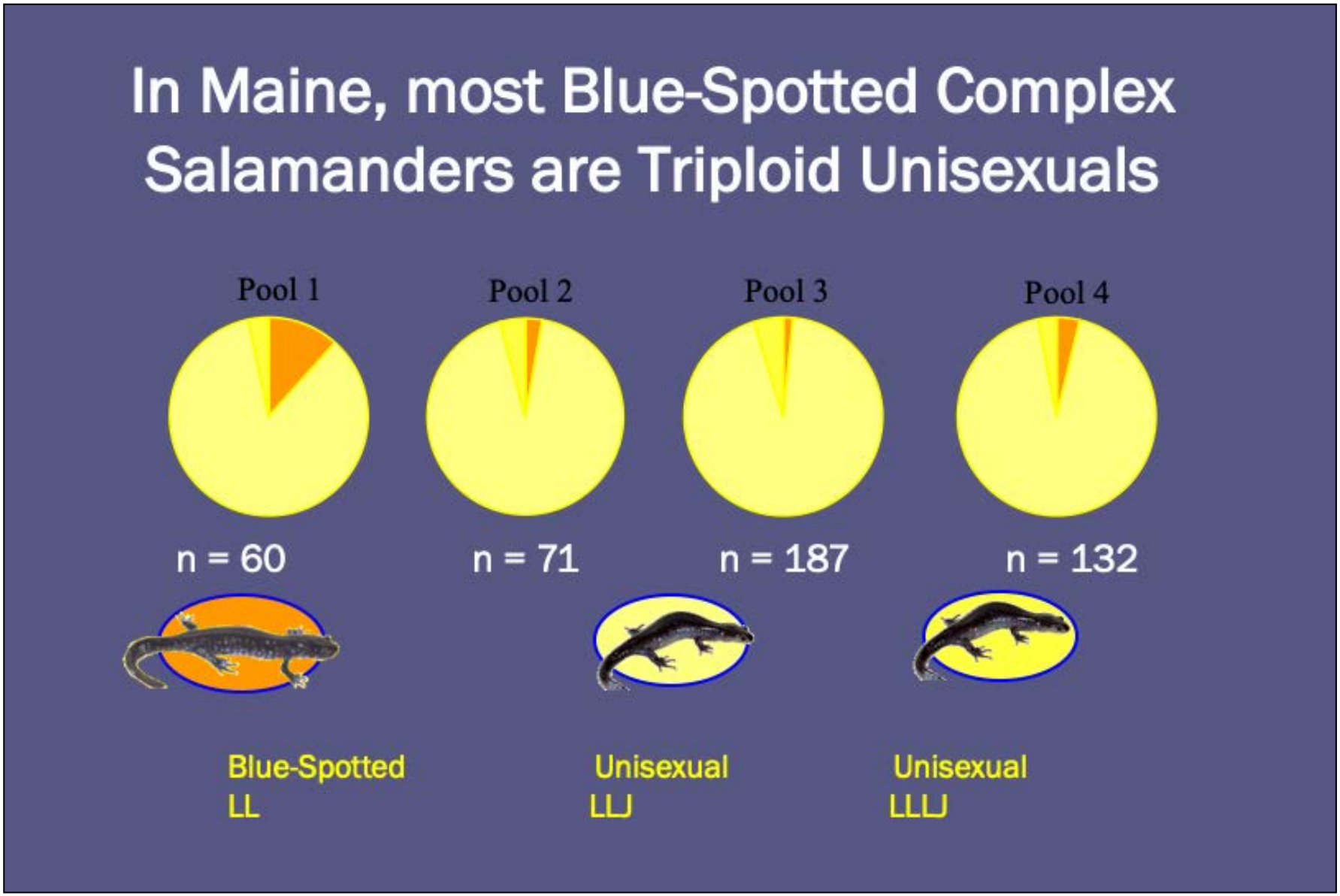
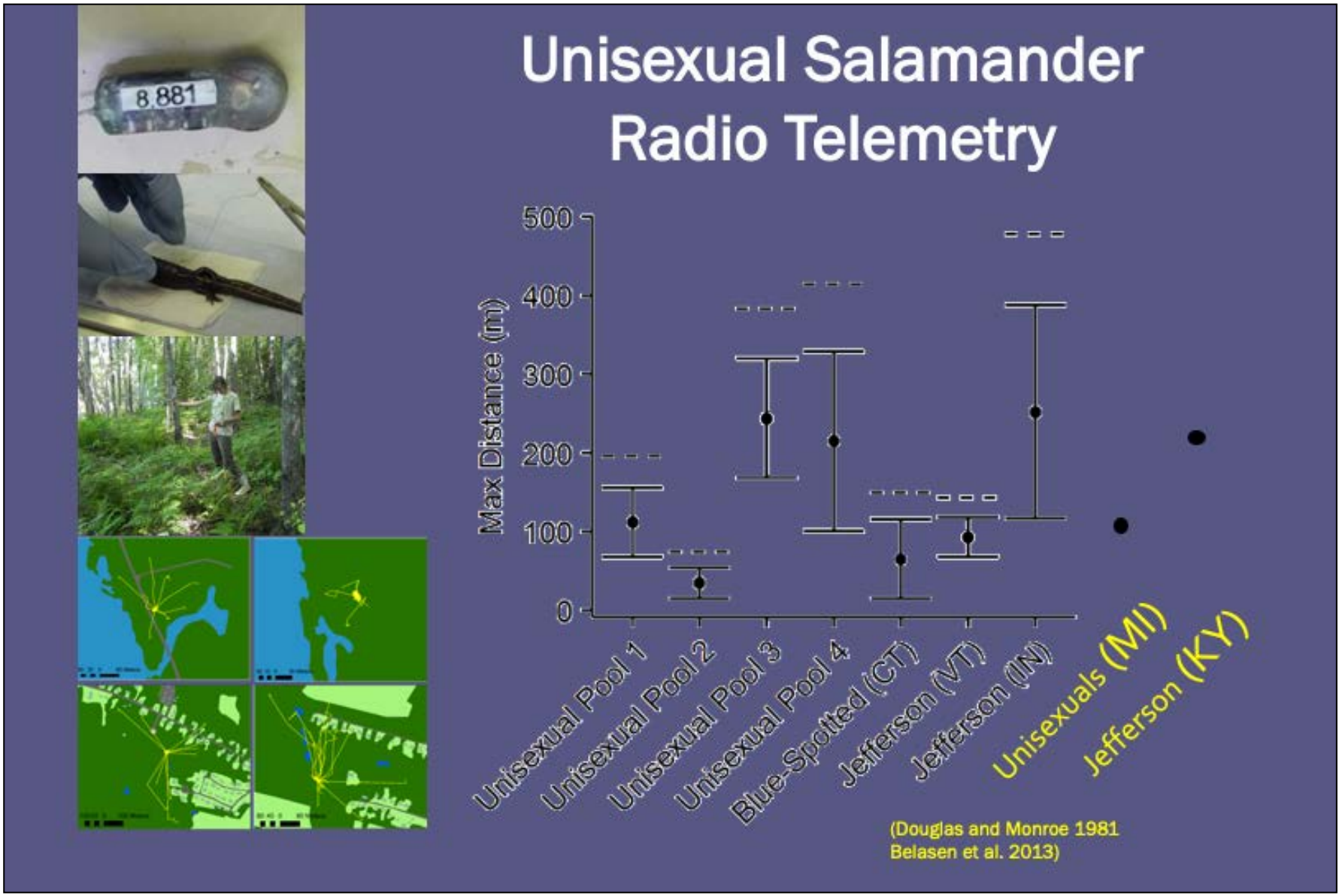
ABSTRACT.—**The behavioral phenotypes of hybrids vary in degree of similarity to their parent species. Unisexual salamanders (*Ambystoma laterale* sp.), the result of ancient hybridization, contain nuclear DNA of multiple sperm-host species whose habitat preferences differ from one another. We radio tracked unisexual salamanders from four vernal pools to quantify migration distances and post-breeding habitat selection and compared these to published accounts for Blue-Spotted Salamanders (*A. laterale*) and Jefferson Salamanders (*Ambystoma jeffersonianum*). Unisexual salamanders used sites with higher numbers of small mammal burrows, lower substrate temperatures, and lower cover by forest floor vegetation than available sites, similar to the sperm-hosts. Unisexual salamanders also migrated distances within the range reported for these sperm-hosts. Even so, individual migration distances were context specific. We implore managers to use caution when designating management zones around breeding pools by considering that some populations may move farther than those reported in published accounts.**

For more detailed ecology, see these papers under publications.



We collected the DNA of salamanders at 4 vernal pools. Here the blue represents "true" blue-spotted salamanders, light gray represents salamanders that are Unisexual and tripoid (have 3 copies of DNA) with two sets of blue-spotted salamander DNA and one set of Jefferson salamander DNA, while dark gray are tetraploid (4 copies of DNA) Unisexuals with three sets of blue-spotted salamander DNA and one set of Jefferson salamander DNA. This is confusing to researchers, because we do not understand how there can be so many unisexuals producing viable offspring without many blue-spotted salamanders to steal sperm from. Also note that while we do not have Jefferson salamanders in the state of Maine, we still have their DNA contributing to our ecosystems.



We surgically implanted transmitters into Unisexual Salamanders in Maine and followed them. The distances moved varied significantly by pool. In this plot, the mean distance that the salamanders moved from the pool is represented by a dot, with the whiskers representing the distances that include half of the salamander's movements, and the dotted line as the distance that the furthest salamander was from the pool. This plot also shows the distances of the parent species in other studies in other states. Since we saw so much variation in our sites, we hope more studies will examine distances in other locations and of the parent species so we can better understand what causes this variation and make better recommendations for managers.