***Euryce*Alliance Summer Conference 2014**

Sponsored by: Department of Biology

Art.Science.Gallery.

Date: Friday June 6, 2014

Time: 10 am – dinner

Place: Art.Science.Gallery.

916 Springdale Rd, Building 2 #102

Austin, TX 78702

SCHEDULE

***Eurycea*Alliance Summer 2014 Meeting**

June 6, 2014 | Art Science Gallery

Time	Speaker	Title
9:45-10:30	Coffee, Breakfast & Check-In	BYO mug if you can!
10:30	Hayley Gillespie + Caitlin Gabor	Introduction, Welcome + *Eurycea*Alliance news
10:45	Kristina Zabierek	Antipredator Response of the San Marcos Salamander to a Nocturnal and a Diurnal Predator
11:00	Caitlin Gabor	The effects of urbanization on physiological stress of Jollyville Plateau salamanders, *Eurycea tonkawae*
11:15	Nathan Bendik	Examining the ecology of spring-dwelling Jollyville Plateau salamanders through changes in body size
11:30	Break	
11:45	Pete Diaz	Effects of urbanization on water quality and contaminants in salamanders
12:00	Hayley Gillespie	Recent *Eurycea* listings and conservation implications of the proposed 4D special rule regarding the Georgetown salamander (*Eurycea naufragia*) as a threatened species
12:15	Peter Sprouse	Biological inventories at three springs in the Salado Creek Watershed: How hard is *Eurycea* detection?
12:30	Lunch	In house - by Jalapeno's Taco Bar (Austin, TX)
14:00	Ruben Tovar	"All roads lead to Rome" in the development of a vestigial eye: Convergent evolution between *Eurycea rathbuni* and *Astyanax mexicanus*
14:15	Amanda Laird	Identification of photoreceptors in two paedomorphic salamander species of south central Texas, *Eurycea sosorum*, and *Eurycea nana*.
14:30	Val Cantu	A comparison of two culture methods to spawn *Eurycea sosorum* (Plethodontidae)
14:45	Group Discussion	
15:30	Happy Hour	

Please limit talks to 12 m with 2 mins for questions. Schedule is subject to change in the event of cancellations.

ABSTRACTS

Antipredator Response of the San Marcos Salamander to a Nocturnal and a Diurnal Predator

Kristina Zabierek[1] and Kristen Epp[2],

[1]*Texas State University, Department of Biology, San Marcos, TX 78666*

[2]*Ottawa University, Department of Biology, Ottawa, KS*

The San Marcos Salamander (*Eurycea nana*) is a federally threatened, fully aquatic, nocturnal salamander endemic to the San Marcos River, and faces threats from decreased water flow, pollution, and the introduction of non-native predators. In this experiment, we wanted to determine whether *E. nana* exhibits a differential anti-predator response to kairomones of a diurnal predator (*Lepomis cyanellus*) and a nocturnal predator (*Procambarus clarkii*). It is an important conservation initiative to study the effect of diel cycles on antipredator behavior for potential reintroduction purposes and to better understand the intricacies behavior that can potentially increase the vulnerability of a species. In concordance with the threat sensitivity hypothesis, we predicted that *E. nana* would match their level of antipredator behavior with the perceived threat level. We predicted that *E. nana* would show increased antipredator behavior (reduced activity) to the diurnal predator during the day, and increased antipredator behavior to the nocturnal predator at night. We found that although there was a significant difference in antipredator behavior of *E. nana* between *L. cyanellus* and *P. clarkii*, there was no significant effect of time of day.

Notes:

The effects of urbanization on physiological stress of Jollyville Plateau salamanders, *Eurycea tonkawae*

Caitlin R Gabor*[1], Nate Bendik[2], Drew Davis[1], Kristina Zabierek[1], & Megan Mondelli[1]

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Jollyville Plateau salamanders (*Eurycea tonkawae*) inhabit streams and springs which have been negatively impacted by anthropogenic disturbance. Within streams affected by urbanization, salamander populations typically have lower densities and are less abundant than at unaffected sites. Assessing baseline stress hormone levels (corticosteroids) and responsiveness of the hypothalamic-pituitary-interrenal (HPI) axis to acute stress in field-caught animals provides important insight into population health and stability. Using a recently developed technique to evaluate water-borne stress hormone levels, we compared baseline corticosterone (CORT) levels of salamanders across two urbanized and two non-urbanized sites. We also examined the stress response of salamanders from each site to an agitation test (HPI responsiveness). We found that salamanders from urbanized sites had significantly higher CORT levels than salamanders from non-urbanized sites. Three sites, except one non-urban site, show HPI responsiveness. Our results indicate that anthropogenic disturbance may be contributing to elevated CORT levels in populations of *E. tonkawae* but the sites are mostly not chronically stressed.

Notes:

Examining the ecology of spring-dwelling Jollyville Plateau salamanders through changes in body size

Nate Bendik, City of Austin

Using capture-recapture data and photographs from thousands of individuals, I will discuss recent work aimed at understanding patterns in body size as it relates to the ecology of the Jollyville Plateau salamander. I will summarize seasonal changes in body size distributions to gain insight into their population dynamics. I will also examine whether body size is related to spring hydroperiod. Using mark-recapture data coupled with body size information, I will attempt to construct von-Bertalanffy growth models to describe differences in growth rates, asymptotic size, and individual heterogeneity of growth among different populations.

Notes:

Effects of urbanization on water quality and contaminants in salamanders

Pete Diaz, Fish and Wildlife

Numerous studies have documented the deleterious effects of urbanization on water quality and preliminary review of the 2013 data set from this study appears to lend additional support to this existing body of science. Overall, average concentrations of contaminates were relatively low in fish and salamander tissues, with some variability by site. However, low concentrations do not necessarily equal no adverse effect since multigenerational exposures to complex chemical mixtures is poorly understood and may directly or indirectly impact species growth, survival, and reproduction in ways not easily observed. These chemical stressors are often accompanied by changes to the physical and biological characteristics of springs, which further degrades habitats impacted by urbanization. Salamanders occupying springs in watersheds with higher levels of impervious cover had higher overall chemical body burdens, with an increase in both the frequency and concentration of contaminants detected. In addition, aquatic invertebrate species diversity and abundance also declined with increasing levels of impervious cover

Notes:

Recent *Eurycea* listings and conservation implications of the proposed 4D special rule regarding the Georgetown salamander (*Eurycea naufragia*) as a threatened species

Hayley Gillespie, *Eurycea*lliance / Art.Science.Gallery.

Four central Texas *Eurycea* species have been the recent focus of listing processes under the Endangered Species Act. In August 2012, the USFWS published a proposal to list all four species as endangered. In August 2013, *Eurycea waterlooensis* (Travis County) and *Eurycea tonkawae* (Travis and Williamson Counties) were listed as endangered and threatened, respectively. Citing "substantial disagreement" about the best available science,the USFWS extended the listing determination for *E. naufragia* and *E. chisholmensis* by 6 months. In January 2014 these two species were listed as Threatened. The USFWS also proposed a special 4D rule regarding *E. naufragia* in reaction to City of Georgetwon Ordinance 2013-59 adopted in late December 2013. The 4(d) special rule would allow for the take of *E. naufragia* incidental to activities that are consistent with the conservation measures contained in the ordinance.

Here I present a scientific assessment of this ordinance and the conservation implications for *E. naufragia*, prepared in collaboration with other biologists familiar with *Eurycea* ecology, and why it cannot provide adequate protection for populations or the surface and groundwater habitat on which *E. naufragia* depends. The contributors to this assessment concur that a Habitat Conservation Plan (HCP), drafted under the usual Section 10 process and with the necessary scientific peer review, would be a more appropriate and comprehensive course of action.

Biological Inventories at Three Springs in the Salado Creek Watershed: How Hard is *Eurycea* Detection?
Krista McDermid and Peter Sprouse, Zara Environmental LLC

Three spring outlets in the Hidden Springs complex in Bell County, Texas were sampled eleven times for fauna. These springs are situated between known localities for the Salado salamander, *Eurycea chisholmensis*. Sampling methods included mop traps, bottle traps, drift netting, and kick netting. No aquatic subterranean species were detected at the three springs. Juvenile *Cambala sp.* millipedes and *Ceuthophilus* cave crickets were captured in the drift net at one of the springs that only exhibits occasional flow, indicating connection with a subterranean void containing habitat appropriate for karst invertebrates. While Salado salamanders have historically been difficult to detect, we do not know if lack of detection at Hidden Springs represents absence, or insufficient sampling.

Notes:

"*All roads lead to Rome*" in the development of a vestigial eye: Convergent evolution between *Eurycea rathbuni* and *Astyanax mexicanus*
Ruben U. Tovar, and Dana M. García, Texas State University

The south central Texas *Eurycea* clade exhibits a continuum of karst salamander phenotypes. The Texas blind salamander (*E. rathbuni*) is considered a stygobiont because it completes its life cycle in the aquatic subterranean habitat of the Edwards Aquifer where it lives in perpetual darkness. Consequently, *E. rathbuni* exhibits a broad head, gracile limbs, limited pigmentation and highly reduced eyes. In contrast, the Barton Springs salamander (*E. sosorum*) is epigean and is endemic to surface habitats; it exhibits small robust limbs, pigmentation, and well developed eyes. To determine the sequence of events during development that lead to widely disparate ocular outcomes and to gain insights into the molecular mechanisms responsible, expression of *pax6* and *shh* during ocular development of the two salamander morphotypes was examined. *E. sosorum* maintained expression of *pax6* and *shh* through embryogenesis and into a juvenile stage. Decreased labeling of Pax6 protein was observed during later stages of *E. rathbuni* development, while Shh protein labeling was increased in a select subset of cells surrounding the brain and eye. Interestingly, these results parallel *pax6* and *shh* expression in two morphotypes explored in *Astyanax mexicanus,* suggesting convergent evolution of the developmental mechanisms that lead to the development of vestigial eyes.
Notes:

Identification of photoreceptors in two paedomorphic salamander species of south central Texas, *Eurycea sosorum*, and *Eurycea nana*

Amanda Laird, Ruben Tovar, and Dr. Dana Garcia, Texas State University

The Barton Springs salamander (*Eurycea sosorum*) and the San Marcos salamander (*Eurycea nana*) are examples of spring dwelling paedomorphic salamander species with fully developed eyes. In contrast, the Texas blind salamander (*Eurycea rathbuni*) is found in the aquifers underlying the above species and has vestigial eyes. Previous studies indicate surface species (*E. nana* and *E.sosorum*) have a well-developed retina with photoreceptors, while the subterranean species (*E. rathbuni*) retina remains underdeveloped. Photoreceptor cells, located in the retina of eyes, are used to detect and convert light into electrical impulses to then be interpreted by the brain. There are two types of photoreceptor cells: rods, which are used for low light vision, and cones, used for bright light vision. To test the presence of photoreceptors in the retina and to better understand their morphology, opsin and rhodopsin were labeled using an immunohistochemistry technique and imaged using a confocal microscope. Results suggest the presence of opsin in both *E. sosorum* and *E. nana*. Importantly, labeling is concentrated on the outer segments of the photoreceptor, where phototransduction is initiated via conformational changes in the opsin protein. Interestingly, no labeling or cones were identified in *E. rathbuni*. Rhodopsin labeling was inconclusive largely due to autofluorescence. That said, rod shaped photoreceptors can still be identified in the above ground species. Neither labeling of rhodopsin nor presence of rods was observed in *E. rathbuni*. These results suggest the absence of proteins integral to phototransduction in *E. rathbuni*. Reciprocal labeling of the above ground species by anti-opsin, and the identification of rods suggests the ability to see in dim-light.

Notes:

A comparison of two culture methods to spawn *Eurycea sosorum* (Plethodontidae)

Val Cantu, US Fish and Wildlife Service, San Marcos National Fish Hatchery & Technology Center

Predictable and controlled reproduction of Bartons Spring salamanders is integral for the maintenance of refugia stocks and restocking purposes. Therefore we compared two culture methods that separated Barton Springs salamanders by sex by for two months and then combined them as pairs to trigger courtship behavior and oviposition of eggs. Sixty male and female pairs were combined in individual aquaria. After two weeks males were removed from half of the aquaria and both treatment groups of salamanders were given a chance to lay eggs. Although no significant difference were found in oviposition rates (% females that laid eggs) by females and numbers of eggs laid between treatments, single females laid eggs significantly twice as fast as females when maintained with males. Of 60 females 13 females oviposited 13 clutches of eggs (total = 594 eggs, mean = 46 eggs, range = 14 - 70 eggs) 69 days after they were combined (average = 25 d, range = 6 to 55 d). Overall eggs took 27 days to hatch (range = 14 to 40 eggs) with a hatch success of 17.3 % (total = 103 larvae, range = 0 to 36 larvae). It took an average of 16 days for larvae to absorb eggs sacs (range = 8 to 21 d), and 3 days for larvae to begin to feed (range = 1 to 6 d). In eggs where embryos failed to be fertilized or develop it took an average of 11 days for fungus (range = 4 to 24 d) to develop. This study not only provides biologists with a non-invasive way to trigger courtship behavior and ovipositions in Barton Springs salamanders, but provides additional baseline information to predictably trigger reproduction and optimize genetic diversity in endangered Plethodontid salamanders should they be extirpated.

Notes:

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