Considerations and Recommendations for Raising Live Amphibians in Classrooms

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A recent article by Pinou *et al*. (2009) in the journal *Science and Children* prompted us to consider carefully some recommendations made by those authors, and also the general notion of reducing disease risks associated with keeping living amphibians in K–12 classrooms—although the same concerns apply to living amphibians in all *ex-situ* situations (see Zippel *et al*., 2006; Pessier, 2008). In general, we applaud the schoolchildren's program outlined by Pinou *et al*. (2009), as it appears to be an engaging exercise that brings together qualitative data, the scientific method, and a wonderful element of amphibian natural history. However, a specific recommendation by them raised some initial concern, and led us to engage in some (hopefully) fruitful discussions related to amphibians in classrooms and the potential for spread of diseases. Pinou *et al*. (2009:33) suggest:

> *"Schools that are interested in participating in similar activities can contact the Herpetologists Education Committee of the Society for the Study of Amphibians and Reptiles (SSAR) at www.ssarherps.org. Ask for a partnering herpetologist that can provide eggs of regional species of amphibians that can be released back into their native habitat once hatched—preventing the disruption of the natural biodiversity."*

We first learned of the publication when, in fact, a number of teachers from around the US began contacting various SSAR officers, looking for leads to "partnering herpetologists." The officers were initially mystified as to the sudden flurry of similar requests, but a bit of investigating revealed the primary inspiration to be from Pinou *et al*. (2009). We read it with great interest and all quickly agreed that the authors have

outlined an insightful and engaging educational activity. The only problem is the line "*….amphibians that can be released back into their native habitat….*" Emerging infectious diseases (e.g., amphibian chytrid fungus and ranaviruses) are now acknowledged as a leading cause of amphibian declines and extinctions (Daszak *et al*., 2003; Skerratt *et al*., 2007) and there is increasing recognition that important amphibian pathogens have been disseminated to new locations by anthropogenic means (Weldon *et al*., 2004; Jancovich *et al*., 2005; Picco and Collins, 2008). As a result, biosecurity becomes an essential consideration as amphibians are being moved between locations, be they any combination of natural habitats and/or captive facilities. The model proposed by Pinou *et al*. (2009) raises a real potential risk of transferring non-native pathogens back into the natal pond of the salamanders included in the classroom exercise.

It was of primary importance to us not to simply squelch this classroom exercise for reasons of risk avoidance. To us, this exercise is a great example of the spirit of encouraging a collective public conscience of "bioliteracy" outlined so eloquently by Ehrlich and Pringle (2008:11584):

> *"The earlier in the developmental process comes exposure to nature, the better the odds of inspiring devotion to biodiversity and its conservation. It is a rare conservationist who did not encounter nature as a child. Every one of us can go to elementary schools to show pictures of animals and plants and tell funny stories about ecology. The teachers will be happy to have us. More ambitious people might think about how to finance and institutionalize school field trips to natural areas."*

We put authors Pinou, Flanigan, and Drucker (2009) in this latter "ambitious" category, as their program brings salamanders to first-graders, and wraps it all in a solid framework of quantified science. So, how can we encourage programs like this without adding to the already horrendous problem of pathogens and amphibian survival in the wild? We believe that one simple precaution may solve the problem:

- Proceed with the program of Pinou *et al*. (2009) verbatim, but with the important caveat that absolutely *no other live amphibians are also maintained in the classroom, or that the amphibians cannot come into contact with any other materials shared with other amphibians (e.g., re-used aquaria that have not been sterilized), or that at the time any amphibians are brought into the classroom, they should be maintained in isolation from all other aquatic organisms and their potential pathogens. Setting up the specimens in new or sterilized enclosures will insure this.* This is the simplest, surest, way to eliminate the risk of introducing foreign pathogens back into the pond with those newly hatched amphibians.

We make this simple, but stark, recommendation in full realization that it will limit the diversity of amphibian-related natural experiences that may be presented in the classroom. In other words, we understand that any teacher receptive to the program of Pinou *et al*. (2009) is likely to be the same teacher who also has a tank full of metamorphosing leopard frog tadpoles, some fire-bellied toads, or perhaps a poison dart

frog or two in the same classroom. We certainly experienced (and appreciated) like-minded teachers in our school days—but, sadly, the world has changed and the specter of emerging infectious diseases as a real conservation threat to wildlife no longer makes such activities acceptable.

This last point brings to light another, related, concern about amphibians in the classroom. A great variety of amphibians are readily available in pet stores (*Bombina* [fire-bellied toads], *Hymenochirus* [African dwarf frogs], *Litoria* [Australiasian treefrogs], and *Xenopus* [African clawed frogs] seeming to be especially common among the larger retail chains) and numerous ready-made kits are available so that families and classrooms can watch together the marvel of amphibian metamorphosis. Some retailers and online outlets provide literature advising against release of the tadpole or froglet, some do not. Regardless of the literature accompanying the purchased amphibian, we reiterate here that:

- No amphibian purchased or received from any commercial or informal (e.g., a neighbor) source may be released into the wild. This recommendation applies whether the species is technically "native" to the region of release, or not.

Families or teachers considering the purchase of commercially available amphibian adults or larvae must realize that they are embarking on a commitment for the natural life of that amphibian. We found one online testimonial for a commercial tadpole kit where the family raised the "Bullfrog" for 33 years; this is longer than the careers of some teachers. We also note that some amphibian species are small and relatively simple to maintain in good health, but that others—e.g., American Bullfrog (*Lithobates*

catesbeianus)—are large and decidedly not so simple to maintain. It is important to note that some diseased amphibians may appear to be completely healthy, showing no signs of illness whatsoever. We pose the scenario that watching chicks hatch from commercially available fertile eggs would also be a wonderful classroom experience, but how many teachers would go on to release those chickens into nearby fields, and how many poultry farmers would accept them (being of unknown genetic lines and veterinary history) into their operations? We present this, at the risk of overstatement, because we have all met teachers, parents, and students of all ages who have released the amphibians from their in-house or classroom experiences into the "pond down the road." They did so with good intentions, but the practice cannot continue and, should in fact, be classed as illegal. The seriousness of the threat of the amphibian chytrid fungus was made clear by its recent classification as a 'notifiable' disease by the World Organisation for Animal Health (OIE). This means member countries will have to declare annually the status of these diseases in their country and what they are doing to control them.

As we endeavor to be as supportive as possible of introducing children to amphibians, especially via a strong science curriculum, we suggest the following well-executed resources for teachers to consider bringing into their classrooms:

- *The Amphibian Project* http://www.helpafrog.org/toolkit.htm
- *Amphibians*. 35 min. (by EyeWitness Videos; SKU WW73872M27) Describes amphibian life cycle and anatomy; behaviors and adaptations; and amphibian characteristics. Grades 5-12
- *Caterpillar and the Polliwog* (by Jack Kent ISBN 0-671-66281-3) Book and video that describe metamorphosis of caterpillars and frogs. Grades K-3

- *Tale of a Tadpole* (Eyewitness Level I by Karen Wallace ISBN 0-7894-3437-7) Follows the life of a frog with simple, yet excellent photographs. Grades Pre-2

In closing, as we learn more about the devastating effects that emerging infectious diseases are having on amphibians globally (Daszak *et al*., 2003; Stuart *et al*., 2004), we are realizing that various commercial activities by humans are increasingly spotlighted as the culprit in spreading the disease. We know better now, and we hope our simple recommendations will allow innovative programs like that of Pinou *et al*. (2009) to continue to bring the wonder of amphibians to the classroom, and to do so without risking the very same amphibians we seek to admire.

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JOSEPH R. MENDELSON III Zoo Atlanta. Dear Author, Atlanta, GA 30315, USA.Â H. Hutchison, S. R. Isberg, D. Iskandar, J. B. Iverson III, K. Jackson, G. W. Kaiser, J. S. Keogh, A. Koch, G. KÃ¶hler, J. KÃ¶hler, G. Kuchling, A. Kwet, M. S. Y. Lee, J. D. Lynch, S. Maddock, D. Millar, J. C. Murphy, H. R. Mushinsky, D. Naish, J. F. Parham, W. G. Parker, C. L. Parkinson, S. J. Richards, J. M. Follow. Joseph R Mendelson III. Curator of Herpetology, Zoo Atlanta. Verified email at zooatlanta.org. Herpetology. Articles Cited by Public access. Title. Sort.Â Riding the wave: reconciling the roles of disease and climate change in amphibian declines. KR Lips, J Diffendorfer, JR Mendelson III, MW Sears. PLoS Biol 6 (3), e72, 2008. 599. 2008. Scientific and standard English names of amphibians and reptiles of North America north of Mexico, with comments regarding confidence in our understanding. Society for the Study of Amphibians and Reptiles. Committee on Standard Matthew Travers, Ross L. Hatton, Joseph R. Mendelson III, Howie Choset, David L. Hu & Daniel I. Goldman. Correspondence to: daniel.goldman@physics.gatech.edu This PDF le includes: Materials and Methods SupplementaryText Figs. S1 to S6 Tables S1 and S2 Captions for Movies S1 to S5 References 34-38 Other Supplementary Materials for this manuscript includes the following: Movies S1 to S5. Joseph R. Mendelson III1. I follow Mulcahy and Mendelson (2000) in recognizing Coastal-Plain toads (Bufo nebulifer) as a species distinct from Gulf Coast toads (Bufo valliceps). This study was based on an analysis of mtDNA sequences and corroborated comments by Mendelson (1998) that showed the northern and southern populations of the widespread taxon Bufo valliceps were likely not conspecific.Â Mulcahy and Mendelson (2000) resurrected the taxon B. nebulifer from the synonymy of B. valliceps Wiegmann, 1833, and applied it to populations generally north of the coastal village of Palma Sola, Veracruz, Mexico. Further discussions of variation in B. valliceps with respect to B. nebulifer appear in Mendelson (1998) and McCranie and KÃ¶hler (2000).