

Science Communication for Adult and Child Audience

By: Lauren Pharr and Murry Burgess
10 - 11:30 AM

Agenda:

1. Lauren's Presentation on How to SciComm to Adult Audiences (~20 min)
2. Murry's Presentation on Navigating Social Media and Youth SciComm (~20 min)
3. Time for Questions (~10 min)
4. Activity (~20 min)
5. Discussion / Further Questions (~10 min)

Where to Join SciComm Groups

- <https://comscicon.com/> - for grad students
- State SciComm Groups: (NC example: <https://www.sconc.org/>)
- Newspapers and TV/radio involvement at organizations or institutions

Books about Science Writing and Communication

- The Best American Science and Nature Writing - yearly compilation book
- The Craft of Science Writing - ed. Siri Carpenter
- Don't Be Such a Scientist - Randy Olson
- Getting to the Heart of Science Communication - Faith Kearns
- Houston, We Have a Narrative - Randy Olson

Kids Environmental Education Resources and Trainings

- Project WILD: <https://www.fishwildlife.org/projectwild>
- Project Learning Tree: <https://www.plt.org/>
- 4-H Chapters
- Local Schools, Museums, Nature Parks

SciComm Workshop Activity!

- Read real paragraphs from scientific journal articles
- Figure out how you would communicate the information by:
 - *Rewording the paragraph to be more digestible*
 - *Highlighting what main ideas you would emphasize to your target audience*
 - *(for kids) Developing a hands-on activity or engaging lesson based on the content*
- Audience and Facilitator suggestions after each prompt

Ponds are ubiquitous habitat features in both urban and nonurban landscapes. In nonurban landscapes, ponds have been demonstrated to support greater regional diversity of flora and fauna compared to rivers and lakes (Davies et al., 2008). This biodiversity value may result from spatial and temporal diversity in pond environmental variables (Hassall et al., 2011, 2012), which create a highly heterogeneous ‘pondscape’ of habitats that provide a diverse array of ecological niches. Ponds have been acknowledged as providing important network connectivity across landscapes, acting as ‘stepping stones’ that facilitate dispersal (Pereira et al., 2011). Within urban areas, ponds provide a diverse array of habitats and occur in a wide range of forms including garden ponds (Hill & Wood, 2014), sustainable urban drainage systems (SUDS; Briers, 2014; Hassall & Anderson, 2015), industrial, ornamental and park ponds (Gledhill et al., 2008; Hill et al., 2015), recreation and angling ponds (Wood et al., 2001), and nature reserve ponds (Hassall, 2014) which typically display heterogeneous physicochemical conditions (Hill et al., 2015).

Hill et al. 2017 Global Change Biology (2017) 23, 986–999

Target Audience: 5th Grade Science Class

Suggestions:

- I would start by stating that scientists have shown that ponds have an important role in increasing biodiversity (the # of spp) and asking the students if they have any thoughts about why that might be (let them tell me, rather than listing/lecturing all the reasons why in the paragraph).
- activity for 5th graders ...have examples of species of animals or other creatures/plants that you might find in a pond and those you might find in a river or lake (maybe Davies et al. has examples) and see if they can guess who lives where, eventually showing the ponds actually hold more diversity than the rivers/lakes
- Start by asking: what a pond is? Draw out all of the different things that a pond is. Ask: What does a pond do? Draw answers on the same pond. Then write down together what a pond is and why it is important
- Depending on resources: pictures of ponds/biota, or a bucket of pond water and magnifying lenses. It would be preferred to take them to a pond and let them catch/explore. Once they have an idea of life that might be around ponds, do some drawing/sketching/filling in a diagram that allows them to place different animals in different areas of the pond where they expect to find them
- If the class has access to ponds, taking them out to sample macroinvertebrates to see the diversity first-hand

In many species where females compete intensely for breeding opportunities, they show unusual behavioral, physiological, or anatomical characteristics. Female meerkats are more frequently aggressive to each other than are males, and their body weight has a stronger influence on their chances of acquiring and maintaining dominant status (34). Both in meerkats and in naked mole-rats, females that attain dominant status show elevated levels of testosterone at particular stages of the reproductive cycle, as well as a secondary period of growth (40, 41). Heightened testosterone levels in breeding females also occur in spotted hyenas (42, 43) and in some lemurs (44, 45), as well as in some breeds of domestic cattle where females have been selected for competitive ability (46). In a number of these species, the genitalia of females show evidence of masculinization (44, 45, 47, 48) while, in the cooperative cichlid fish (*Neolamprologus pulcher*), larged pinnate leg scales that honestly reflect their fecundity and males choose females with large leg scales (51). Fat-padded breasts, thighs, and buttocks in human females may have evolved for similar reasons (52).

Clutton-Brock. 2007. VOL 318 SCIENCE

Target Audience: A Nature Magazine

Suggestions:

- Start with a “sensational” article title, something like “These Dominant Females Show Unusual Characteristics” or whatever would entice people to read
- I would start by describing some of the unusual characteristics in greater detail describing what the animal looks like or is doing... then explain why all those things are happening-- explaining the examples given
- Summarize these ideas a bit up front, and remove some of the more specific details while still providing accurate information: "Sexual dimorphism is a common trait in the animal kingdom. We often think about this as males being bigger and stronger, or having a flashy color like in birds or a mane like lions. But the same happens when the female is competing for a mate. We see this in animals like meerkats where females fight for dominance, or african hyenas which can have increased testosterone before competitive mating."
- something with a nod to Bumble (female driven dating app)

Mountain lions significantly altered their movement through the same physical landscape in response to hearing humans (Fig. 1), exhibiting antipredator behaviours comparable to those previously documented in small-scale experiments (Smith et al. 2017), but at a substantially larger scale (Fig. 2a). Observational and manipulative studies have similarly found that risk from humans affects large carnivore behaviour across the landscape, including in our study area, where increased human development is correlated with impacts on mountain lion movement and habitat use (Wilmers et al. 2013; Wang et al. 2017). Our results confirm that, even in the absence of changes in human infrastructure (e.g. buildings, roads) or habitat fragmentation, increased human presence can impact large carnivore movement by inducing antipredator responses, which, if sustained for long periods, could lead to effective habitat loss for carnivores by limiting hunting and feeding behaviour (Smith et al. 2015) or forcing individuals to abandon high risk areas of their home range (Schuette et al. 2013).

Suraci et al. 2019. Ecology Letters. 22: 1578–1586

Target Audience: Nature Park Lecture Series in Colorado

Suggestions:

- Considering the target audience and what their previous experiences and encounters with mountain lions might be. Might be good to get info about the nature park itself and the local mountain lion populations
- people in colorado seem to like being out in nature-- and i feel like many pride themselves on exploring backcountry off the beaten trail-- maybe this is wrapped up with a petition to recognize even the most cognizant hikers/explorers that "leave no trace" are affecting wildlife in ways you don't realize. Even if you don't leave your garbage-- your presence alone is impacting wildlife in significant ways.
- Focus of the talk would be that "leave no trace" park use includes sound: if the goal is to preserve predator habitat - or to encourage predators to share the park space - then be thoughtful about dogs* that bark (a lot) and avoid/limit personal speakers and other sources of noise on certain trails.
- For anti-mountain lion people: emphasizing why mountain lions are important to the ecosystem and ways to mitigate human-wildlife conflicts... lions can flourish in their habitats while people can hike their trails
- I would start this series by doing an overview of the ecology of mountain lions, their conservation status, and addressing common misconceptions. After establishing a baseline knowledge, which many of the residents probably already have, I would start with defining any scientific words (like antipredator behavior) that are critical to the information of the talk. I would want to use as much laymen terms as possible, but there are sometimes words that you just have to keep in. Then after setting the stage, I would start with a question, and why this is important. Make people understand the relationship between exploring the outdoors and its impacts on wildlife.

The total length of the avian wing derives from the underlying wing bones (humerus, radius/ulna and manus) and the functional primary feathers (Fig. 1). Although scaling exponents vary slightly depending upon whether the effects of common ancestry are controlled for using independent contrasts or not ($M^{0.35}$ and $M^{0.39}$ respectively, table 1 in [1]), it is well established that wingspan (b) in birds scales with slightly positive allometry with respect to body mass ($M^{1/3}$) [1–4]. This positive allometry, however, appears related to size dependent variation in flight behaviour [1]. Specifically, the line of best fit is depressed at lower body masses and elevated at high body masses, because slow speed flapping flight styles seen in smaller birds are associated with short-wings, while the soaring flight styles of larger birds favour longer wings [4]. Surprisingly, and in spite of variations in flight behavior, the relative contribution of the primary feathers to overall wing length has received little attention from ornithologists.

Nudds et al. 2011. PLoS ONE 6(2): e15665.

Target Audience: High School Summer Science Camp

Suggestions:

- A way more non-jargony explanation of the relationship between wing bones, body mass, and feathers. I can see incorporating this as a math / physics lesson, but on a high school level.
- Start with defining the terms “allometry” and ”scaling” (or figure out how to describe the concepts without jargon, but I think high schoolers can handle some terms). From there, talk about how bird wings are structured to best suit the species’ life history and flight style, with examples. I think having examples like study specimens or videos of bird flying would help.
- For a summer camp, this could be an all-summer-long project where teams of students work to build a functioning bird/wing using mathematical modelling. End of the project showing how they made their “bird” fly.

The lack of antibodies against CDV in wild canids and the high prevalence in domestic dogs highlight that the introduction of CDV from domestic dogs into naïve wild canid populations could have devastating consequences (with generalized viral spread and severe clinical signs a likely outcome of infection) (Harder and Osterhaus 1997; Deem et al. 2000). Close monitoring of mortality and improved knowledge of species-specific sensitivity and specificity of the tests used would help evaluate these results further. The local domestic dog population showed evidence of exposure and may act as a source of infection to naïve wild canid populations. Direct contact is required for efficient transmission of CDV through aerosols of respiratory and other body secretions, although the virus can survive in the environment for 2 days at 25 °C or longer at lower temperatures (Deem et al. 2000). Therefore, high contact rates of wild canids and domestic dogs as inferred from our study area might cause CDV spread and perpetuation. Studies in other areas reported antibodies for CDV and mortality caused by distemper in wild canids, and recent case reports confirmed natural infection of CDV in crab-eating foxes and hoary foxes in Brazil, with phylogenetic analyses of the viruses implicating domestic dogs as the source of infection.

Curi et al. 2010. Biodivers Conserv 19:3513-3524

Target Audience: Museum Visitors

Suggestions:

- Wild canids are easily susceptible to diseases from domestic dogs. These diseases wreak havoc on wild populations. Because direct contact between wild canids and domestic dogs is required to spread disease... explain how the disease spreads in simpler terms and then have some tips on how/when to avoid certain trails, always keep your dog leashed, avoid transmission, etc.
- I would show the relationships between domestic dogs and disease prevalence in wild canid populations, with examples of specific species in the area. I would emphasize characteristics, ecosystem function, and conservation status of the wild species. Make people understand the relationship between bringing pets outside and the effects that may have on wildlife.
- Museums get visitors of all ages. Can't think of a good idea at the moment, but combining information for adults as well as an activity of some sort to keep the kids engaged. Perhaps something that shows how the disease transmits from dog to wild canid?
- Today's audiences are all familiar with covid and the devastating effects it has on us. Making that relate to the topic here to emphasize its importance.

The causal effects of pesticide use and land use on bird biodiversity could be confounded by unobserved factors that may also affect bird biodiversity metrics, such as types of vegetation or land management practices. We conduct the Durbin–Wu–Hausman test for endogeneity of pesticide use, cropland acreage and developed land acreage. We find that we can reject the null hypothesis of exogeneity of pesticide use and cropland acreage but not of developed land acreage (Supplementary Tables 4 and 5). We therefore analyse the effect of neonicotinoid use on bird biodiversity by estimating a fixed-effects panel data model with instrumental variables for pesticide use and cropland use (see Methods for details). We estimate Moran's I statistic to test for spatial autocorrelation in the error term and reject the null hypothesis of no spatial autocorrelation.

Li et al. 2020. Nature Sustainability.

Target Audience: Birding Club

Suggestions:

- This audience might be really familiar with this topic. Might could include some of the graphics / data for them on the relationship between specific bird species, pesticides, and land use. But definitely eliminating the jargon and boring details about hypotheses and data analysis methods.
- Eliminate the technical aspects of the methods and replace it with more of a personal story or experience with collecting the data, or how you figured out this issue, or how you've personally noticed pesticide use affecting bird biodiversity in your area. Any narrative structured around the technical stuff to keep the audience engaged.
- Focus on the actual results instead of the hypotheses and analysis techniques. Relate them to the target audience with the focus being more so on bird biodiversity / how to limit pesticide use to promote biodiversity

General Do's

- Get to know your audience
- Tell a story
- Make posts as accessible as possible
- Opportunities for audience engagement
- Cute animals!
- Be your authentic self



All About the Story

- Construct a narrative
- Include personal anecdotes
- Have fun with it!

ABT Worksheet for Story-Making

	<p>Background: Who What When Where</p> <p>What's already known and understood</p> <p>How we got here</p>
AND	
	
	<p><i>Dramatic</i> <i>Problem, Challenge</i> <i>Confusion, Doubt</i> <i>What isn't known</i> <i>What's missing</i></p>
THEREFORE	
	<p>Solution Resolution Decision Plan Action!</p>

Don't Be Such a Scientist and Houston, We Have a Narrative by Randy Olson

Accessibility



Alt: a great egret standing against foliage

- Subtitles or transcripts for videos
- Alternative text for images
 - Twitter: @get_altText or @captions_please
- Don't overuse emojis or hashtags
- Hashtag in camel case
 - #ThisIsCamelCase
- Avoid changing the typeface

Be Careful Posting Animals

- No animal that seems distressed
- No blood / injuries
- No dead animals
- Careful with captured / contained animals
- Always note ethicality and legality



Activities by Age: Elementary (5 - 8)

CHARACTERISTICS	TEACHING METHODS
Limited muscle development and motor skills	Simple tasks
Concrete thinkers	Use 5 senses in activities
Physical activities and hands-on learning	Provide opportunities for individual attention
Sensitive to criticism and failure	Doing, not finishing, is important

Example: Bird Lunch Bag



Activities by Age: Middle School (9 - 11)

CHARACTERISTIC	TEACHING METHODS
Mostly still concrete thinkers	Limit of 1 “abstract” idea
Easily motivated and eager to be part of new things	Participation in simple community science projects
Easily jump from topic to topic	Short, guided activities
Sensitive to criticism	Task completion = success

Example: Mock Banding Station

May 7, 2022

Time	Species	Wing Length (mm)	Head Length (mm)	Tail Length (mm)	Band Number	Bander's Initials
1:28	Mocker	2in	1in	7in	045	EW
1:34	CRO	9mm	5mm	6mm	360	NOYE
2:06	CROW	2 wings	5mm	5in	067	WSD

May 7, 2022

Time	Species	Wing Length (mm)	Head Length (mm)	Tail Length (mm)	Band Number	Bander's Initials
1:30	Shrew	2in	1in	6in	011	ALL
1:30	Snowbird	2in	2in	2in	038	all
10:34	Chickadee	6in	3in	3.5in	015	ROU
3:06	FLUFFY EAT	3/4in	2.4in	1in	051	WS

May 7, 2022

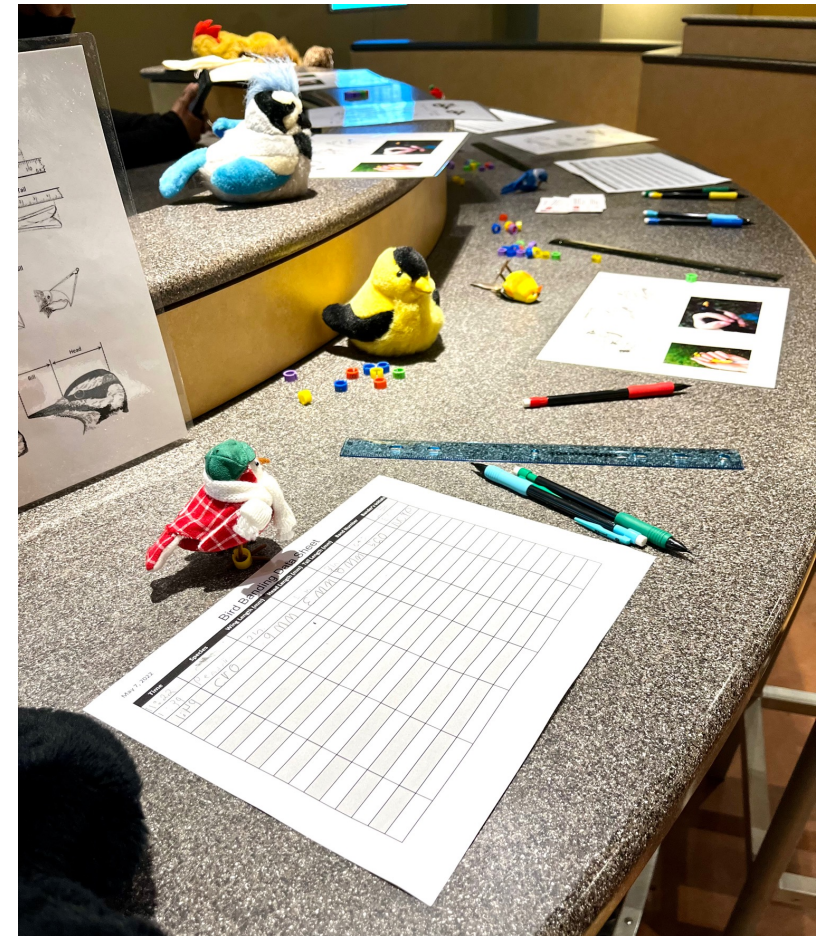
Time	Species	Wing Length (mm)	Head Length (mm)	Tail Length (mm)	Band Number	Bander's Initials
10:39	Eastern Bluebird	2in	2cm	1.55in	062	L.G
11:25	W	4.5cm	2cm	7cm	097	TL
1:21	Mocker	4cm	2.5cm	3.5cm	036	EMS
1:20	Robin	2in	1in	2.5in	057	DCP
10:24	Winter Wren	4cm	3.5cm	3.5cm	097	EEW
2:54 pm	Eastern Bluebird	2in	1in	4.5in	27	DWT

May 7, 2022

Time	Species	Wing Length (mm)	Head Length (mm)	Tail Length (mm)	Band Number	Bander's Initials
2:40	Gold Finch	5cm 2in	2cm	2.2in 5cm	089	EW
2:40	Woodpecker	4mm	7mm	5mm	002	SW/LP

May 7, 2022

Time	Species	Wing Length (mm)	Head Length (mm)	Tail Length (mm)	Band Number	Bander's Initials
11:21	cardinal	4mm	5mm	0.9in	089	EW
1:44	cardinal	4mm	2mm	5mm	080	NOYE
14:51	Snow Bird	45mm	20mm	50mm	088	PW



Activities by Age: Jr. High (12 – 14)

CHARACTERISTICS	TEACHING METHODS
More capable of abstract thought	Participation in community science projects or designing own experiment
Less dependent on adults; more dependent on peers	Group projects, teamwork
Moving toward independence and desire to explore further	Larger-scope or longer activities with limited guidance; design own experiment

Example: Backyard Bird Survey



Activities by Age: High School (15+)

CHARACTERISTICS	TEACHING METHODS
Mastering abstract thought and can interact on an adult level	Can handle real animals and equipment
Planning for their futures	Opportunities to build resumé and professional experience
Value and goal oriented	Project with concrete goals or purpose
Don't need much adult supervision	Self-designed, independent projects

Example: Mist Netting Workshop



Collaborations

- Increase your visibility and network
- Best way to connect with your community and meet their needs
- Knows their audience
- Best way to get practice!
- Leads to repeat and future opportunities



MUSEUM of **LIFE + SCIENCE**

girl scouts
north carolina
coastal pines

New Neighbors
 Partnership



In Conclusion

- Sharing knowledge with those outside of academia
- Positive experiences with nature promote learning, connection to nature, and ecological behavior, esp. in children
- Be the change and representation you wish to see!



Questions?

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