

2022

Birds in an Ecological Web

Jeff Podos
University of Massachusetts Amherst

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Birds in Ecological Webs

workshop for the 2022 STEM Saturday Seminar Series

Jeff Podos

University of Massachusetts

Amherst, MA, USA

jpodos@umass.edu



1. Birds provide an accessible and memorable way to learn about nature and biodiversity, even in our own backyards
2. Watching and studying birds can tell us about animal behavior.
3. Watching and studying birds can tell us about ecological interactions among species.
4. Watching and studying birds can tell us about “webs of adaptation”.

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Clubs and Electronic resources for learning about bird diversity

- Hampshire Bird Club
- <https://www.massyoungbirders.org>
- Birdability
- Cornell Lab of Ornithology
 - ebird
 - Merlin
 - All About Birds
- iNaturalist



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photo by John van de Graaff

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Not a member of HBC? If you are new, your first year of membership is free! Please go to

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Clubs and Electronic resources for learning about bird diversity

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- Birdability
- Cornell Lab of Ornithology
 - ebird
 - Merlin
 - All About Birds
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Massachusetts Young Birders Club



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The Massachusetts Young
Birders Club (MYBC)
Welcomes You!

Clubs and Electronic resources for learning about bird diversity

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 - All About Birds
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Our vision is that birding truly is for everybody and every body, regardless of disability or other health concerns.

Through education, outreach and advocacy, Birdability works to ensure the birding community and the outdoors are welcoming, inclusive, safe and accessible for everybody. We focus on people with mobility challenges, blindness or low vision, chronic illness, intellectual or developmental disabilities, mental illness, and those who are neurodivergent, deaf or hard of hearing or who have other health concerns. In addition to current birders, we strive to introduce birding to people with disabilities and other health concerns who are not yet birders so they too can experience the joys of birding.

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We believe in the power of nature to ignite discovery and inspire action.

Join us on a lifelong journey to enjoy, understand, and protect birds and the natural world.



Blue Jay by Celine Bellemare/Macaulay Library

Show Transcript +

Visitor Center Hours

Trails open dawn to dusk

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Explore and Contribute

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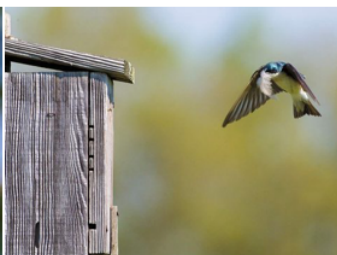


What you can do Lifelong Learning and Citizen Science

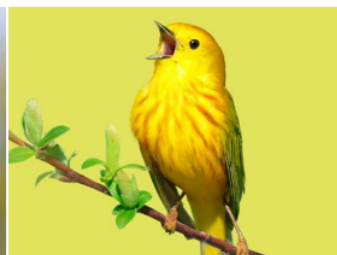
Begin your journey here. Choose a project to match your interests.



Seven Simple Actions to Help Birds



NestWatch
Find and monitor nests to help track success in the family lives of birds



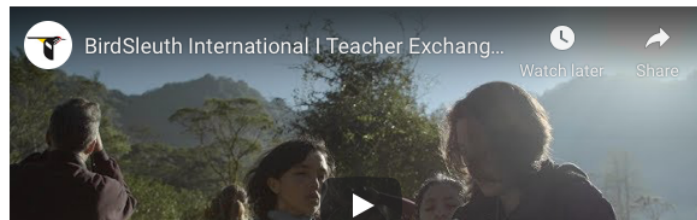
Bird Academy
Take an online course to transform your understanding of birds



Education

We open doors to the natural world

Help us foster inquiry and learning, starting with the earliest ages and lasting a lifetime. We're dedicated to inspiring new science and conservation leaders.



birds.cornell.edu


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The **Cornell** Lab of Ornithology

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Engagement in Science and Nature

Birds are not optional and life on earth is fundamentally interdependent—these concepts are at the heart of the Center for Engagement in Science and Nature’s educational mission. The Center inspires people of all ages and backgrounds to connect with birds and nature, build their knowledge, and share their observations so that together we can gain insight into how natural systems work and address global conservation challenges. We celebrate the collective power of our community to support bird and earth-friendly habits and policies.

the collective power of our community to support bird and earth-friendly habits and policies.

Projects



Bird Academy [↗](#)

Whether you're a bird lover, an educator, or a student, our interactive courses and multimedia-rich resources will lead you into the fascinating lives of birds, from birding basics to comprehensive ornithology.



K-12 Education [↗](#)

Our curricula and professional development opportunities empower educators to engage youth in scientific investigations, citizen-science projects, and habitat improvement initiatives to ignite a lifelong passion for nature.



Visitor Center [↗](#)

Come experience the Lab! If you live in Ithaca or are visiting from afar you can enjoy behind-the-scenes tours, guided walks, and exhibits. Log in virtually to gain access to Lab experts through webinars, workshops, and family programs.



Noise Project [↗](#)

Explore this co-created international community



Engaging Latin American and Caribbean Communities [↗](#)






Project FeederWatch [↗](#)

Contribute to a three-decade long dataset about

birds.cornell.edu

podolab @ umass... Course: BIOLOGY10... Amherst, MA 10-Da... Woodpecker Wonde... darwin's finches be... The Bird Beak Chall... Why Won't My Andr... Engagement in Scie...

About Get Involved Donate All About Birds



NestWatch

Help measure nature's success. Learn how to find and monitor bird nests, then record data on species, eggs, and young. Your contributions help scientists understand how climate change, urbanization, and land use affect breeding birds.

Celebrate Urban Birds

Join our bilingual year-round project by watching for 10 minutes and reporting on 16 "focal" species of birds. The project focuses on those who have historically been excluded from birding and citizen science though mini-grants and educational kits that support community art, local events and local habitat projects.

Great Backyard Bird Count

Birds are everywhere, all the time, doing fascinating things! Join us for one weekend in February to watch, celebrate, and count birds to create a real-time snapshot of bird populations from around the world. Put Your Birds On the Map.

Priorities

Powering Learning and Participation

- develop and co-create innovative [educational initiatives](#) with people of all ages
- host [citizen science](#) and [community science](#) projects that harness the power of participants worldwide
- work with [community leaders](#) and [educators](#) to spark interest in birds and nature
- welcome visitors to the Cornell Lab's [trails and educational center](#)

Developing and Supporting Engagement Strategies

- build cutting-edge [data-sharing apps](#), [educational platforms](#), and [learning games](#)
- develop effective engagement strategies with our [partners across the globe](#)
- publish [tools](#) and [case studies](#) focused on equity-building and inclusive practices
- study the process of engagement and offer best practices for encouraging and [measuring](#) participation in science and nature

Program Staff

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Foraging Behavior in Birds



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Inventors of Tomorrow

Hands-On Science and Engineering Education for kids age 3 – 6

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The Bird Beak Challenge



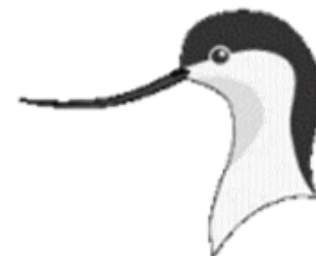
Generalist



Insect catching



Surface skimming



Mud probing



Grain eating



Coniferous-seed eating



Probing



Filter feeding



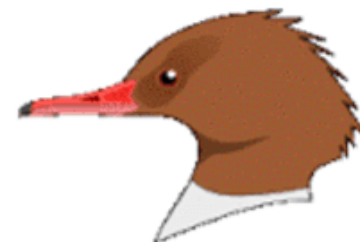
Nectar feeding



Fruit eating



Aerial fishing



Pursuit fishing



Chiseling



Dip netting

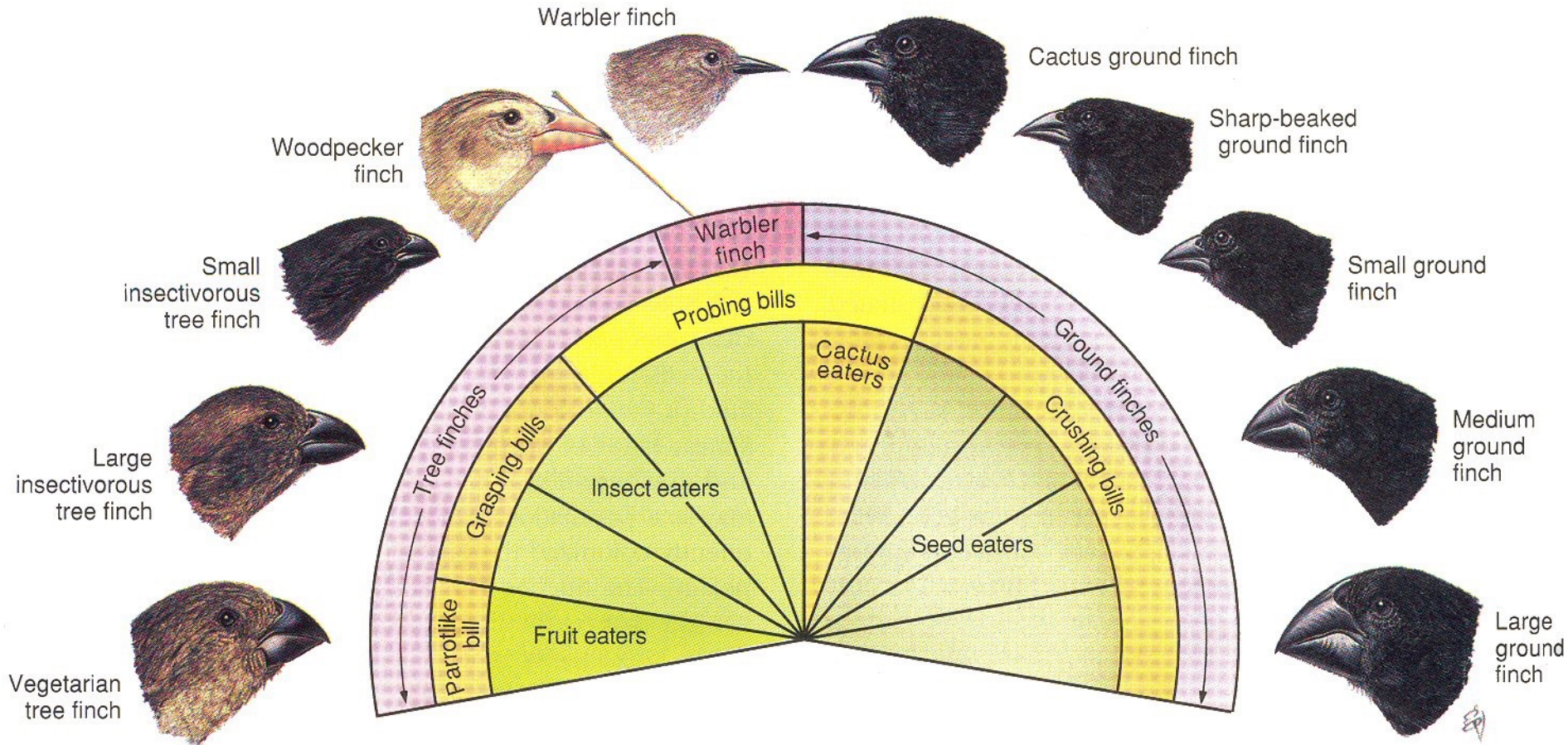





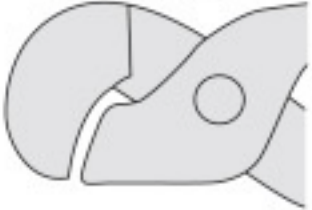

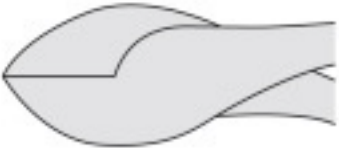






Scavenging



Raptorial

Galapagos finches



<p><i>Geospiza</i></p> 	<p>Heavy duty linesman's pliers</p> 	<p><i>Platyspiza</i></p> 	<p>Parrot-head gripping pliers</p> 
<p><i>Camarhynchus</i></p> 	<p>High leverage Diagonal pliers</p> 	<p><i>Pinaroloxias</i></p> 	<p>Curved needle nose pliers</p> 
<p><i>Cactospiza</i></p> 	<p>Long chain nose pliers</p> 	<p><i>Certhidea</i></p> 	<p>Needle nose pliers</p> 



March 19 2022, Rio de Janeiro







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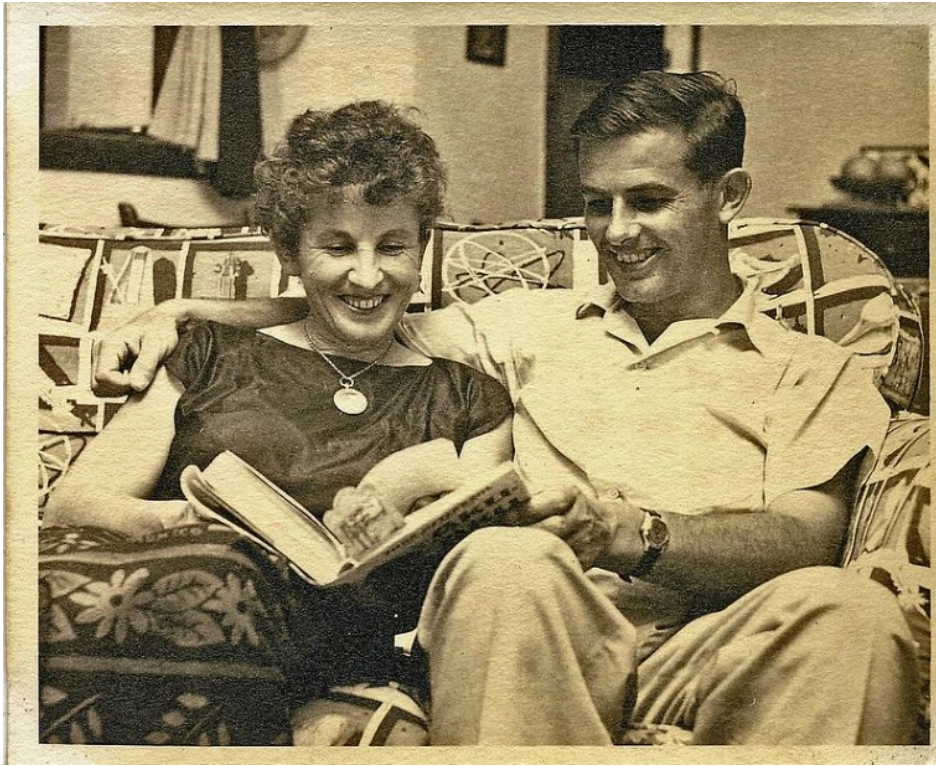
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Galápagos finches in a web of adaptation

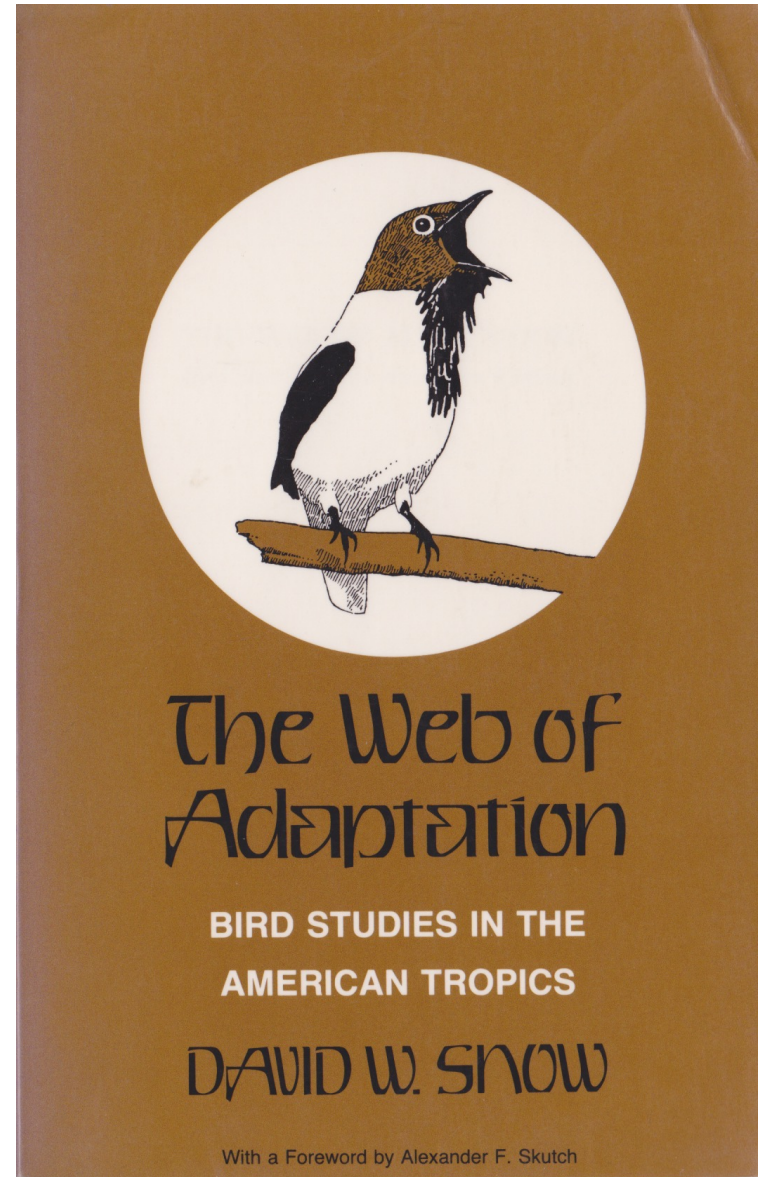
Jeff Podos

University of Massachusetts

Amherst, MA, USA



Barbara and David Snow, ca. 1959 (wikipedia)



1976

frugivory

solo parenting;
release from
territoriality

fathers free to
seek extra-pair
mates

strong
sexual selection

sex dimorphism;
lek polygyny

insectivory

joint parenting;
resource defense

selection favors
good parenting

weak
sexual selection

sexual
monomorphism;
social monogamy



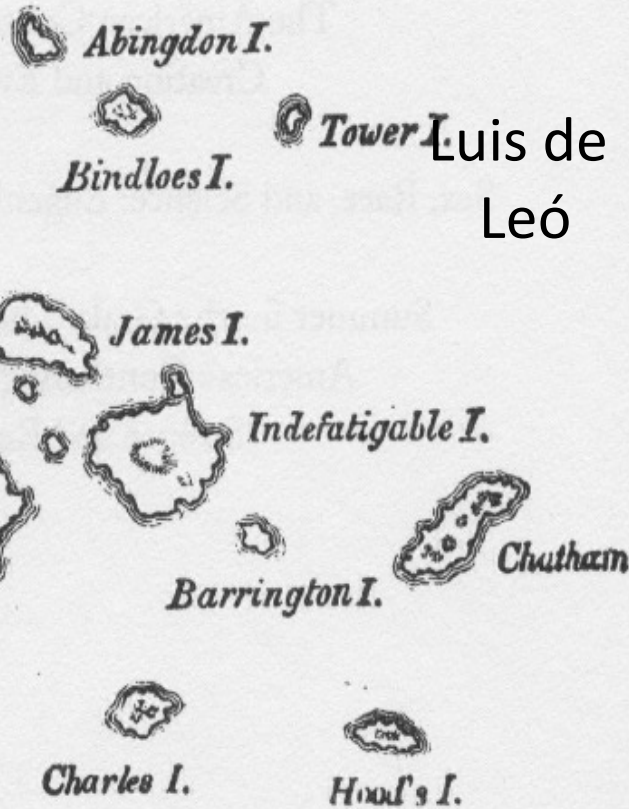
Contents



FOREWORD <i>by Alexander F. Skutch</i>	vii
INTRODUCTION	ix
1 <i>The Bellbirds</i>	3
2 <i>The Cock-of-the-Rock</i>	22
3 <i>The Black-and-White Manakin</i>	36
4 <i>The Blue-Backed Manakins: Courtship by Duets and Trios</i>	51
5 <i>Some Consequences of Eating Fruit</i>	72
6 <i>Sexual Selection</i>	82
7 <i>The Calfbird</i>	93
8 <i>Nests</i>	110
9 <i>Oilbirds</i>	121
10 <i>The Web of Adaptation</i>	139
11 <i>The Future for the Cotingas</i>	153
NOTES	163
APPENDIX	175

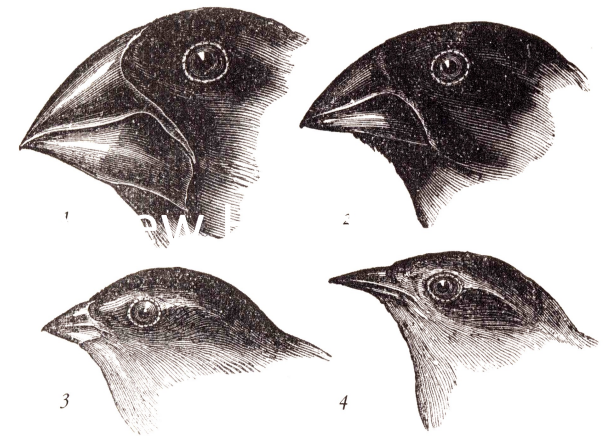
Culpepper I.

Wentworth I.
Anthony
Herrel



Sarah
Narborough I.
Huber

Luis de
Leó



Darwin 1839

Oxford Series in Ecology and Evolution

The Ecology of Adaptive Radiation

Dolph Schluter

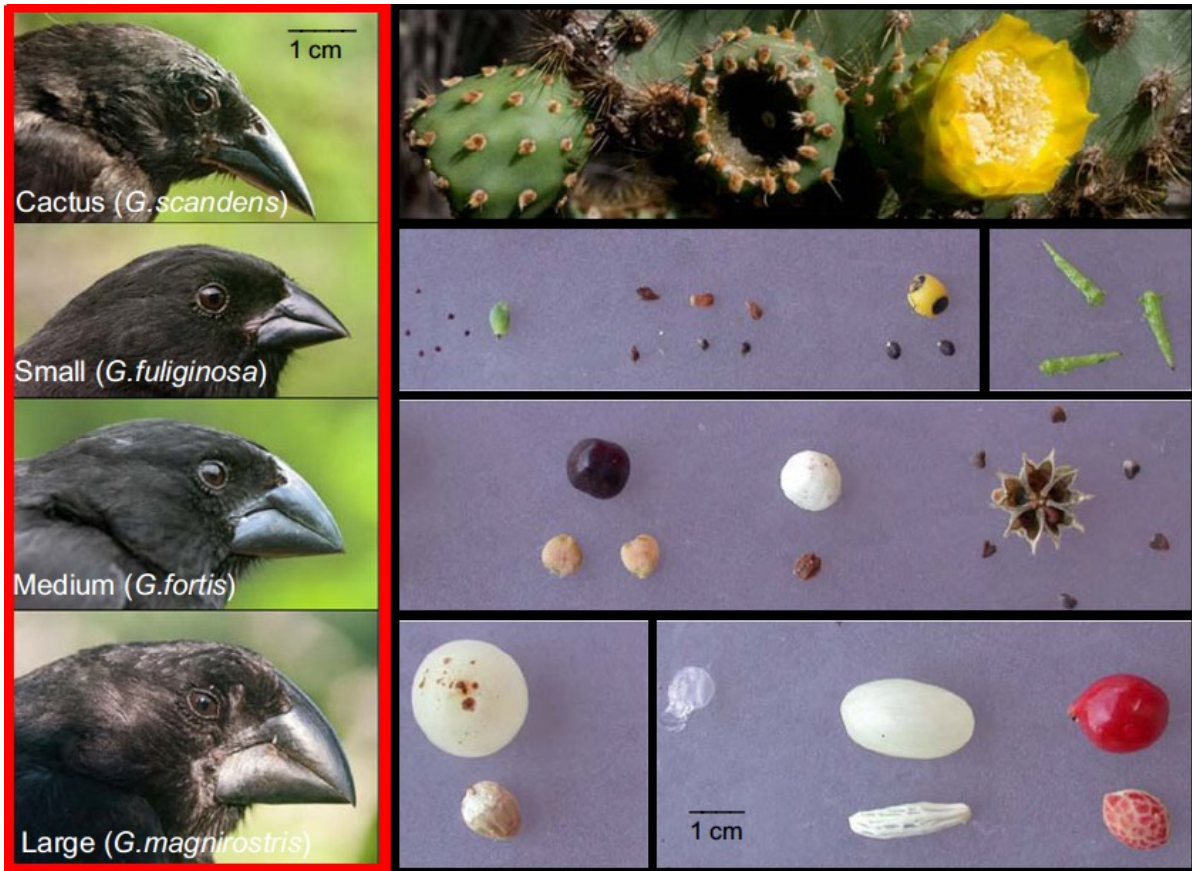




- 15 research visits between 1999 and 2019
- Santa Cruz Island: large island, multiple sites
- 9 of 14 Galápagos finch species
- focus on 4 *Geospiza* species
- behavioral ecology, evolutionary ecology, functional morphology



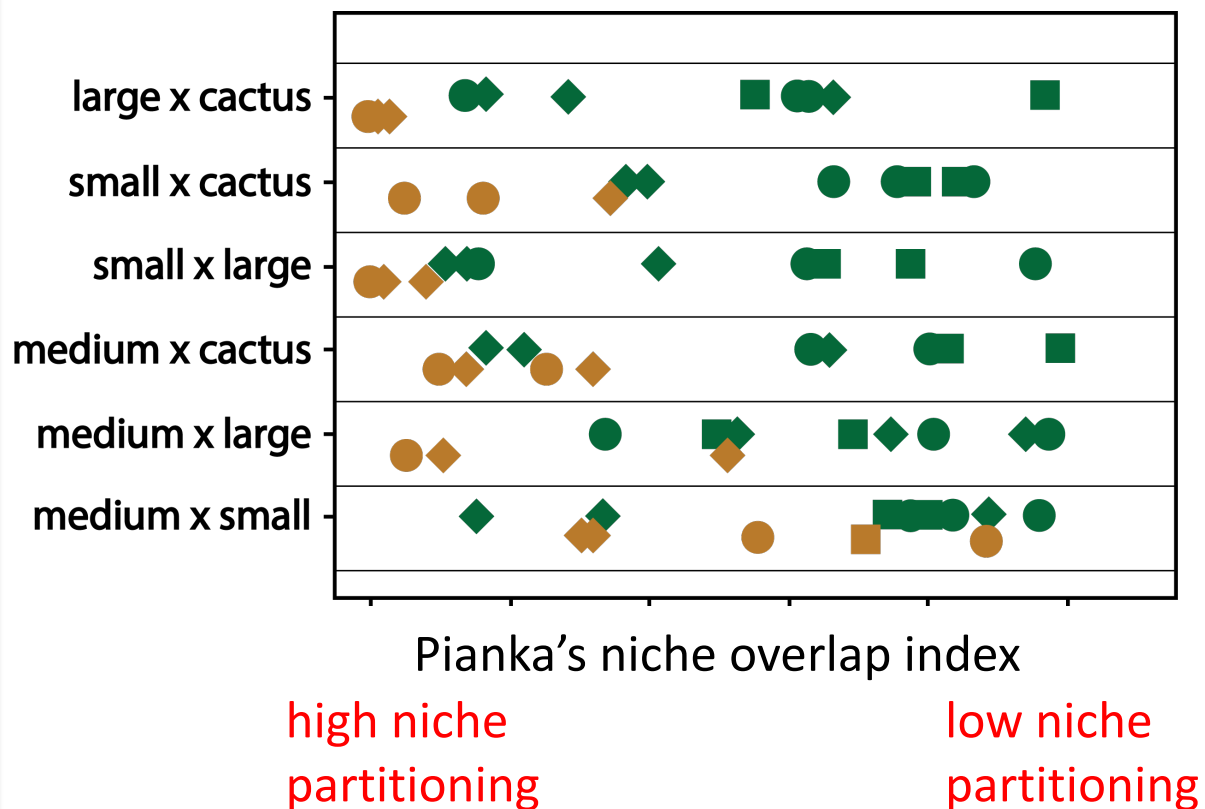
niche
partitioning



de Leon, L, Podos, J, Gardezi, T, Herrel, A & Hendry AP, 2014.
Darwin's finches and their diet niches: the sympatric co-
existence of imperfect generalists. *J. Evol. Biol.* 27:1093-1104

niche
partitioning

reliance on
"private" resources

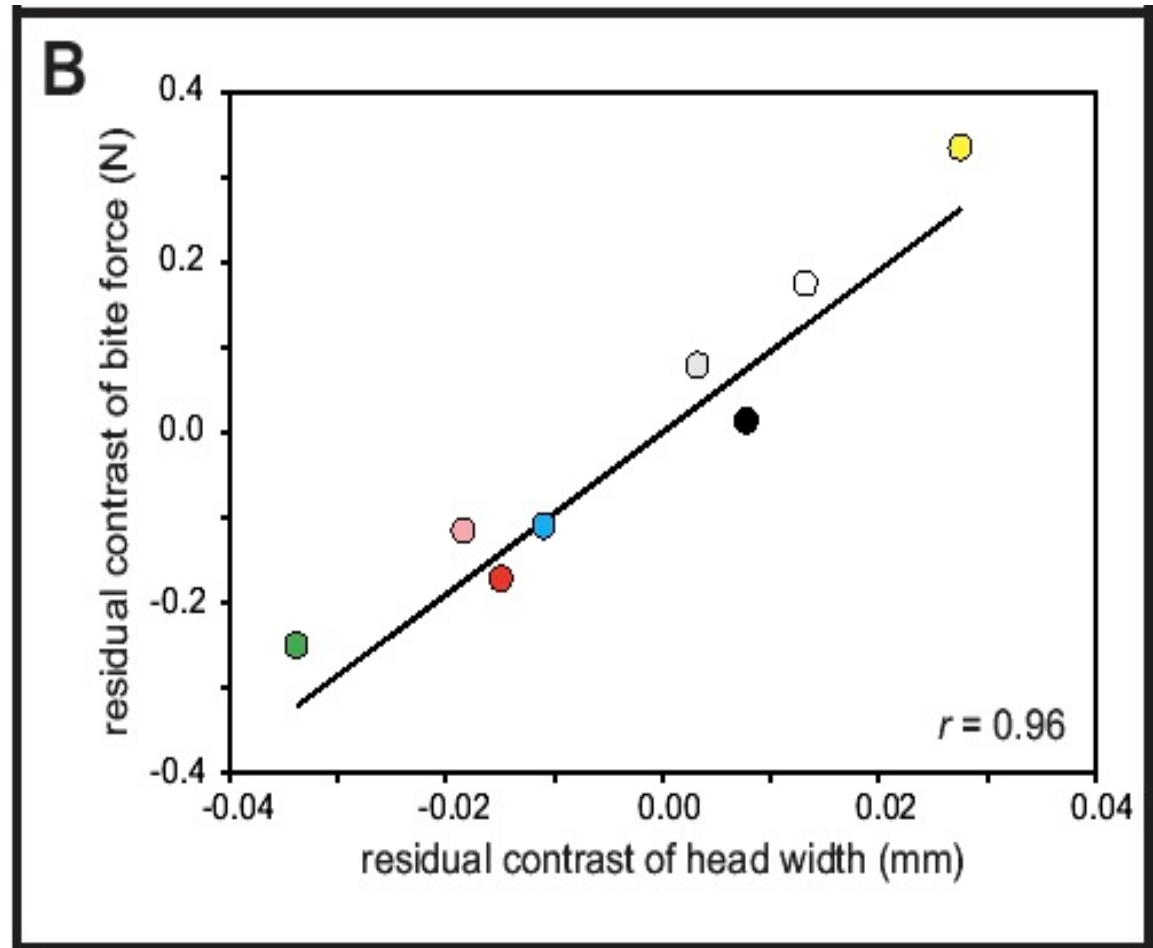


de León, L, Podos, J, Gardezi, T, Herrel, A & Hendry AP, 2014.
Darwin's finches and their diet niches: the sympatric co-
existence of imperfect generalists. *J. Evol. Biol.* 27:1093-1104

niche
partitioning

reliance on
“private” resources

bite force
capacity



Herrel, A, Podos, J, Huber, SK, & Hendry AP, 2005. Evolution of bite force in Darwin's finches: a key role for head width. *J. Evol. Biol.* 18:669-75

niche
partitioning

reliance on
“private” resources

bite force
capacity

safety factors
& scaling

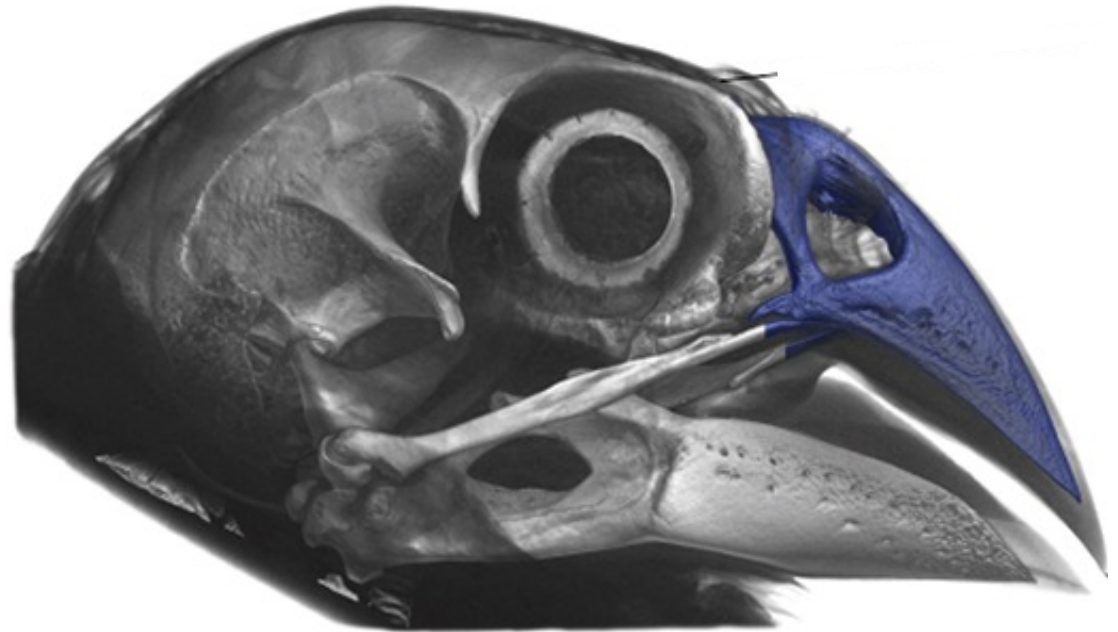


niche
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Soons, J, Genbrugge, A, Podos, J, Adriaens, D, Dirckx, J, & Herrel A, 2015. Is beak morphology in Darwin's finches tuned to loading demands? *PLoS ONE*. 10: e0129479

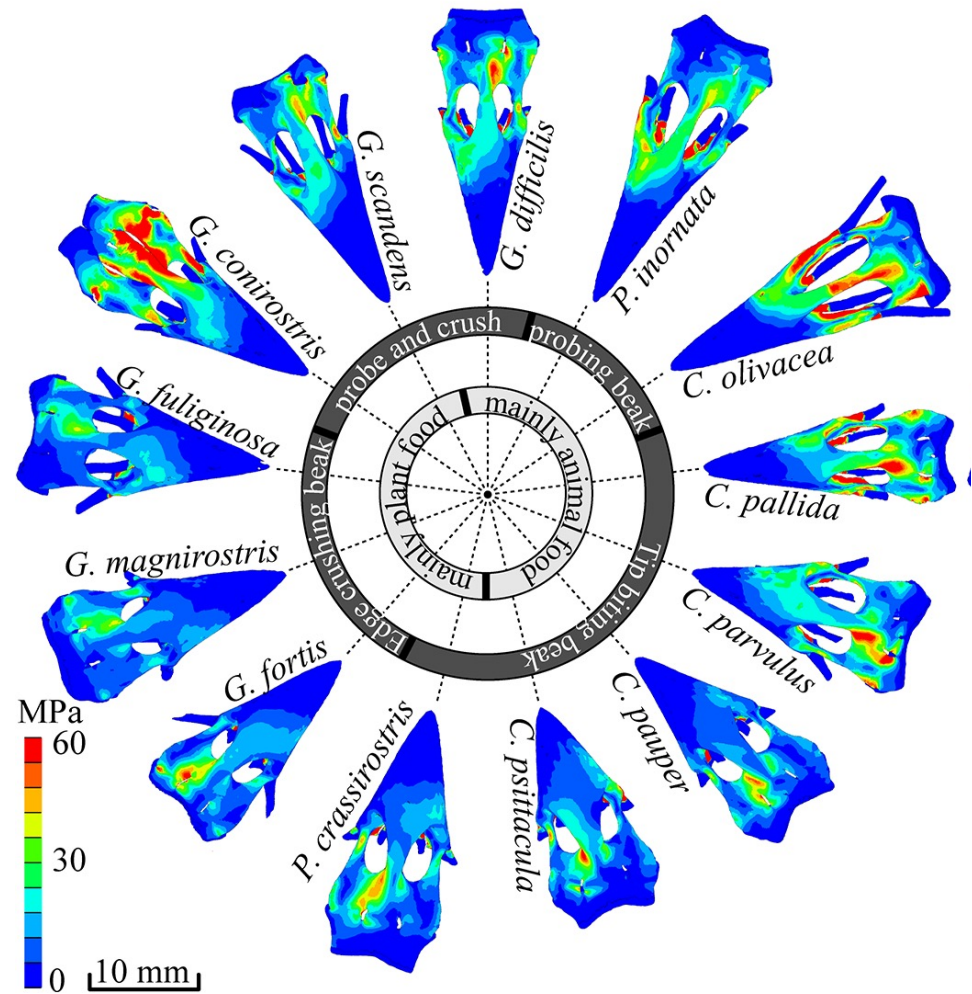
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safety factors
& scaling

beak size
& shape



Soons, J, Genbrugge, A, Podos, J, Adriaens, D, Dirckx, J, & Herrel A, 2015. Is beak morphology in Darwin's finches tuned to loading demands? *PLoS ONE*. 10: e0129479

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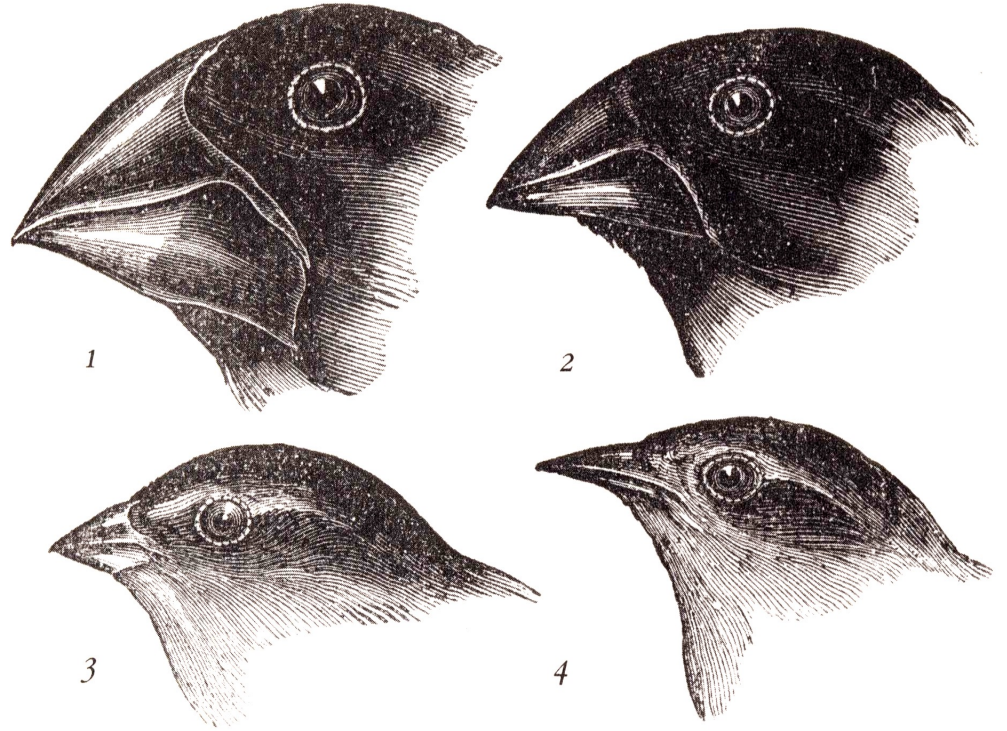
reliance on
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bite force
capacity

safety factors
& scaling

beak size
& shape

tradeoffs:
force x velocity



Darwin 1839

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partitioning

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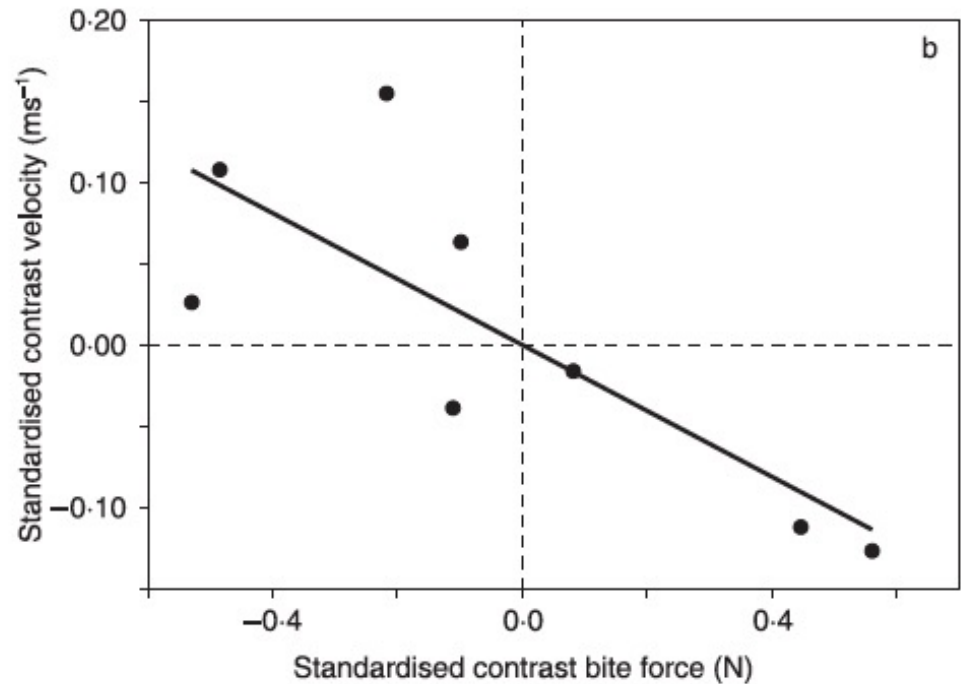
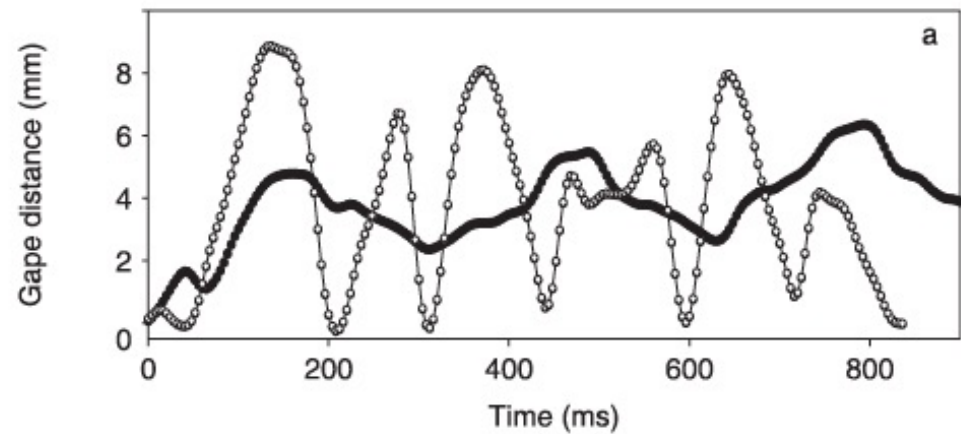
bite force
capacity

safety factors
& scaling

beak size
& shape

tradeoffs:
force x velocity

vocal
performance



Herrel, A, Podos, J, Vanhooydonck, B, & Hendry AP, 2009. Force-velocity tradeoff in Darwin's finch jaw function: a biomechanical basis for ecological speciation? *Func. Ecol.* 23:119-125.

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capacity

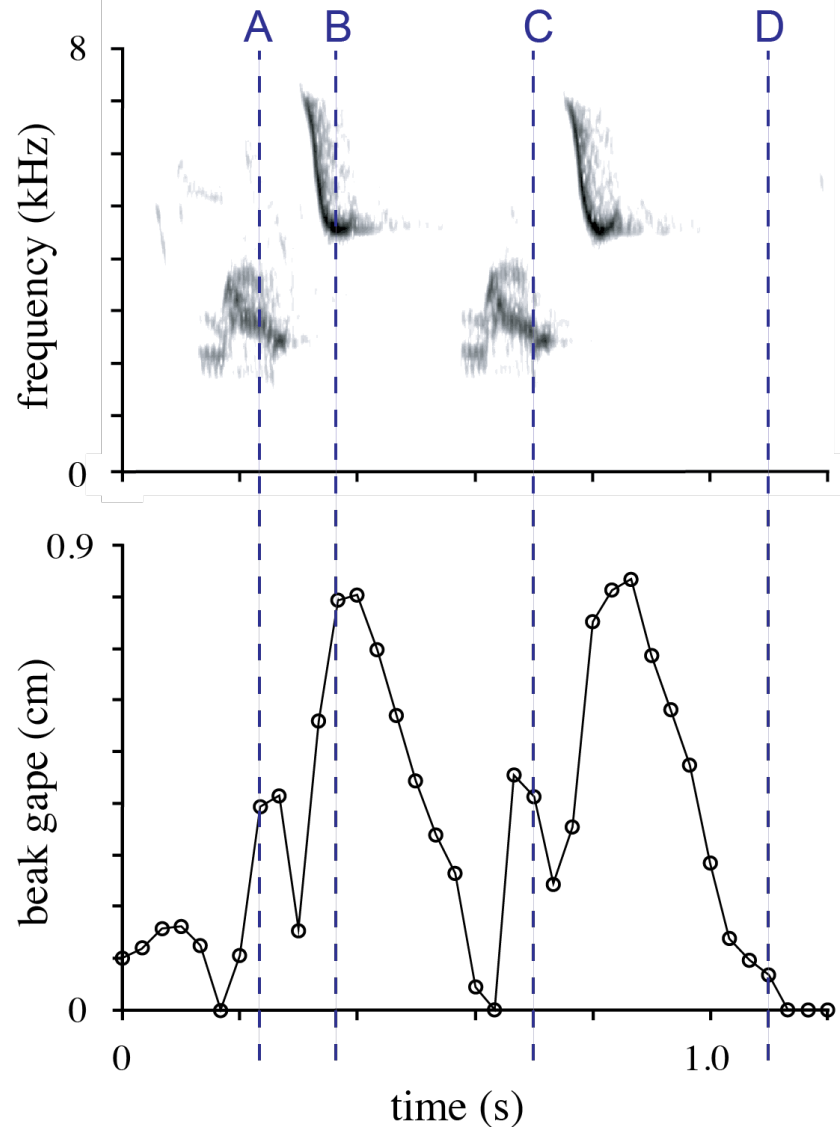
safety factors
& scaling

beak size
& shape

tradeoffs:
force x velocity

vocal
performance

song
structure



Podos, J., Southall, J.A. & Rossi-Santos, M.R. 2004 Vocal mechanics in Darwin's finches: correlation of beak gape and song frequency. *J. Exp. Biol.* 207:607-619.

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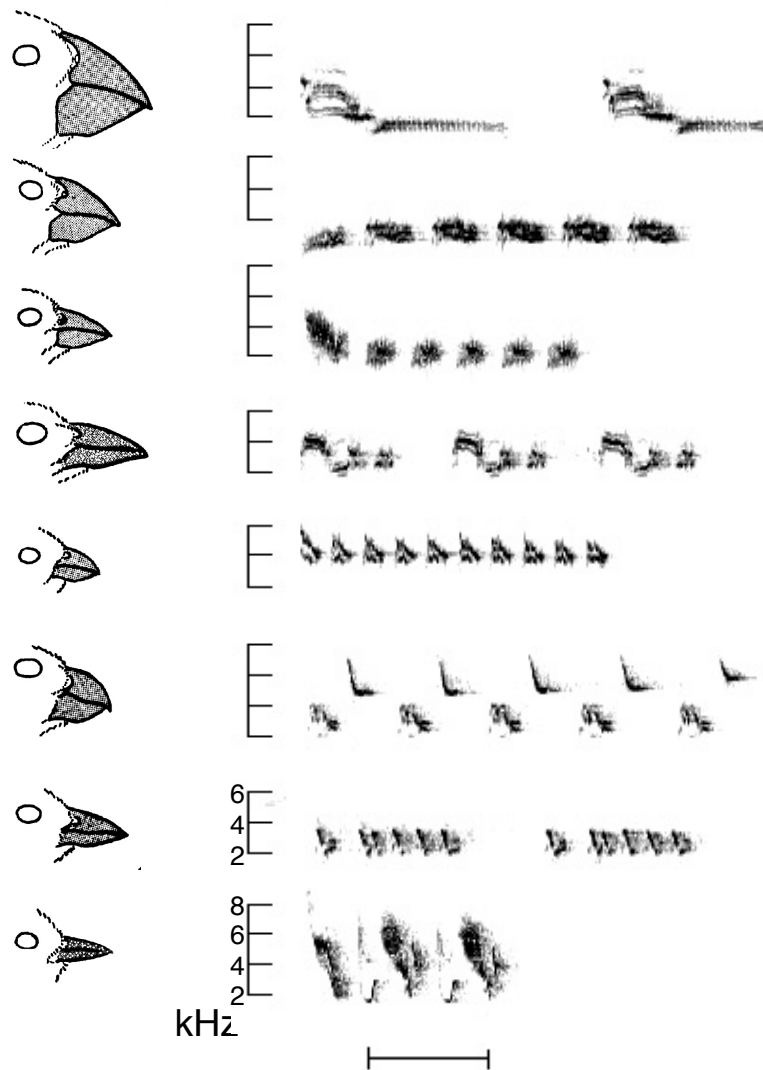
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beak size
& shape

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vocal
performance

song
structure



Podos, J. 2001. Correlated evolution of morphology and vocal signal structure in Darwin's finches. *Nature* 409:185-188.

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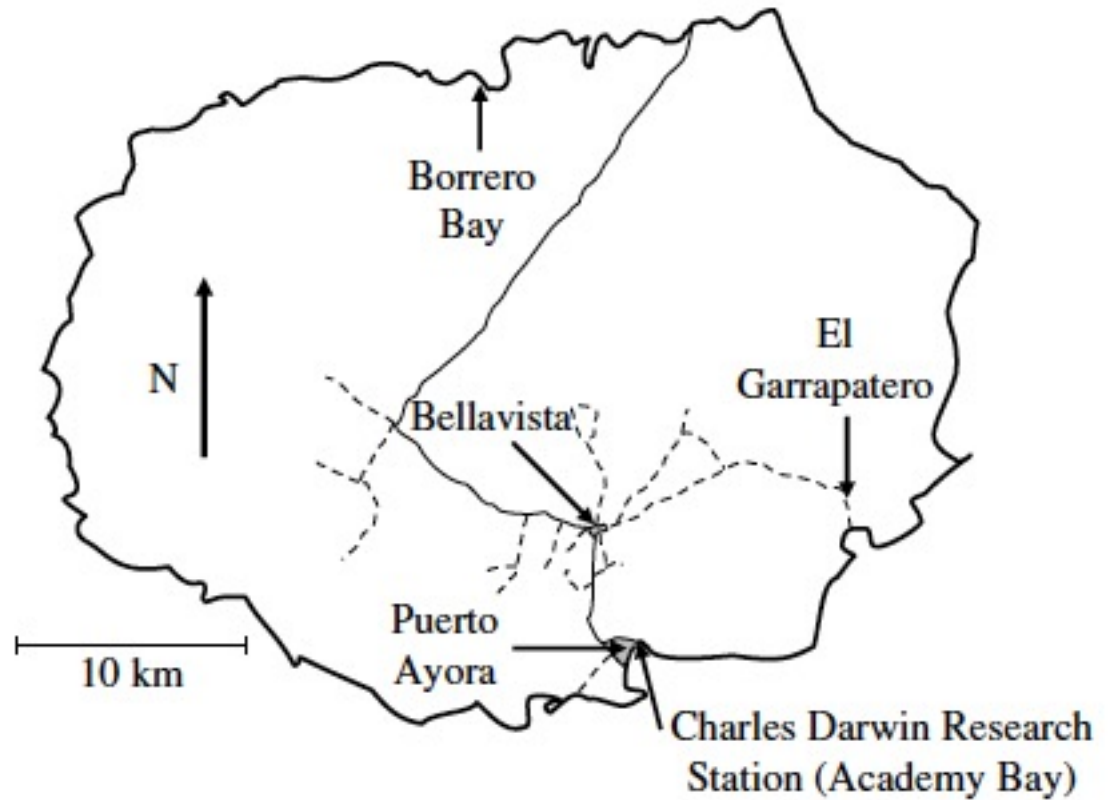
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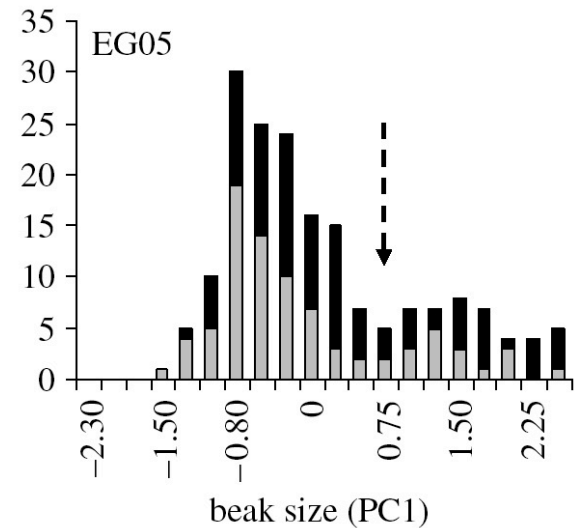
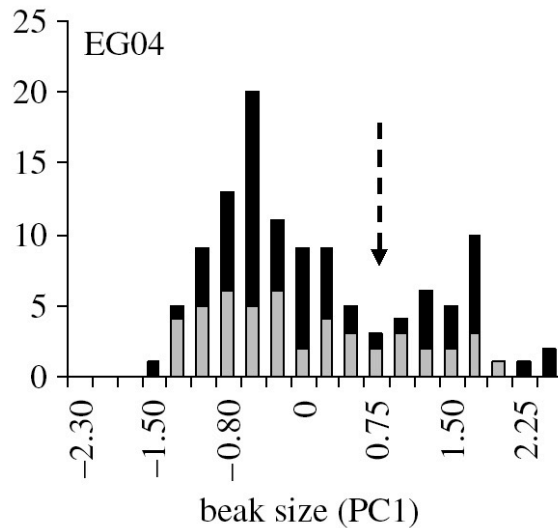
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vocal
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song
structure



Hendry, A.P., Grant, P.R., Grant, B.R., Ford, H.A., Brewer, M.J. & Podos, J. 2006. Possible human impacts on adaptive radiation: beak size bimodality in Darwin's finches. *Proc. R. Soc. B.* 273:1887-1894.

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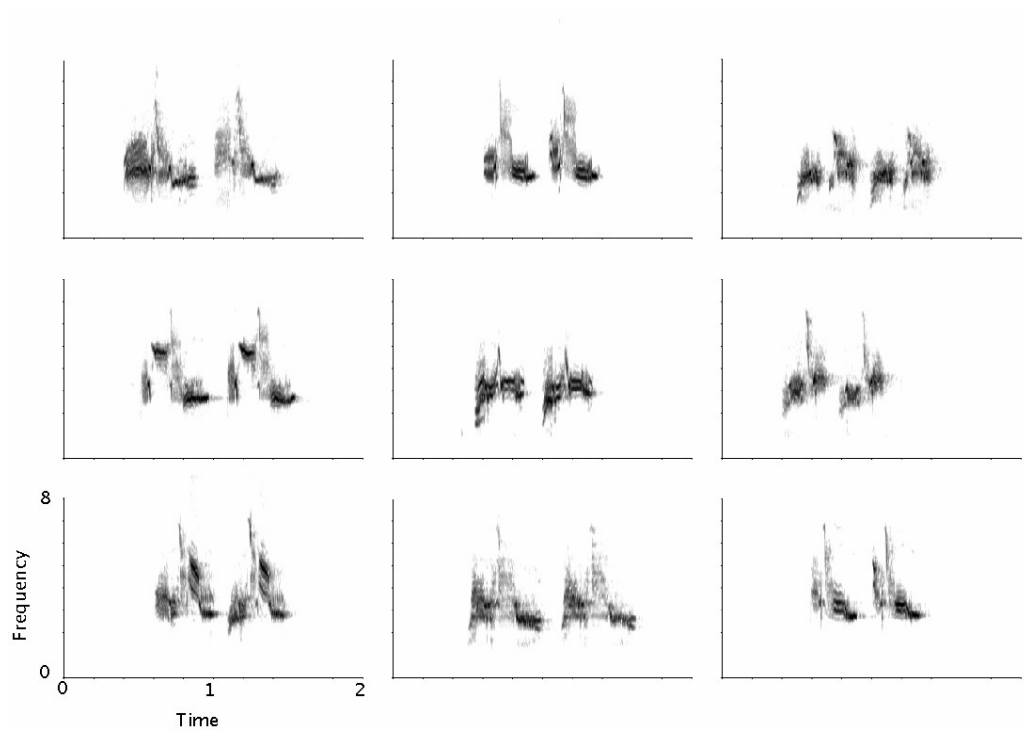
safety factors
& scaling

beak size
& shape

tradeoffs:
force x velocity

vocal
performance

song
structure



Small morph

Huber, S.K. & Podos, J. 2006. Beak morphology and song features covary in a population of Darwin's finches. *Biol. J. Linn. Soc.* 88:489-496.

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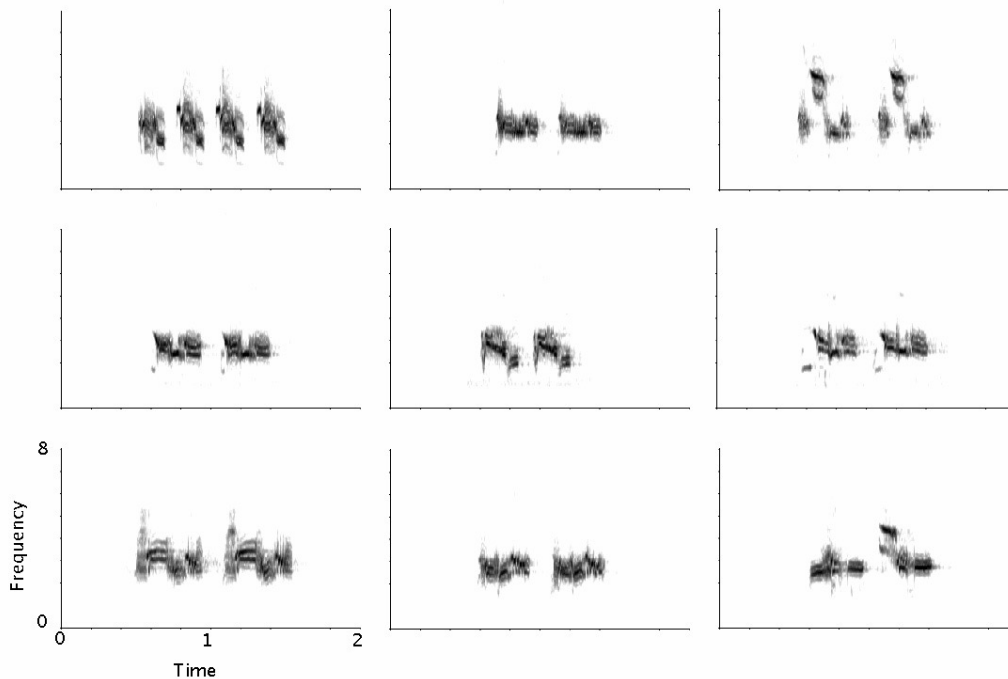
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Large morph

Huber, S.K. & Podos, J. 2006. Beak morphology and song features covary in a population of Darwin's finches. *Biol. J. Linn. Soc.* 88:489-496.

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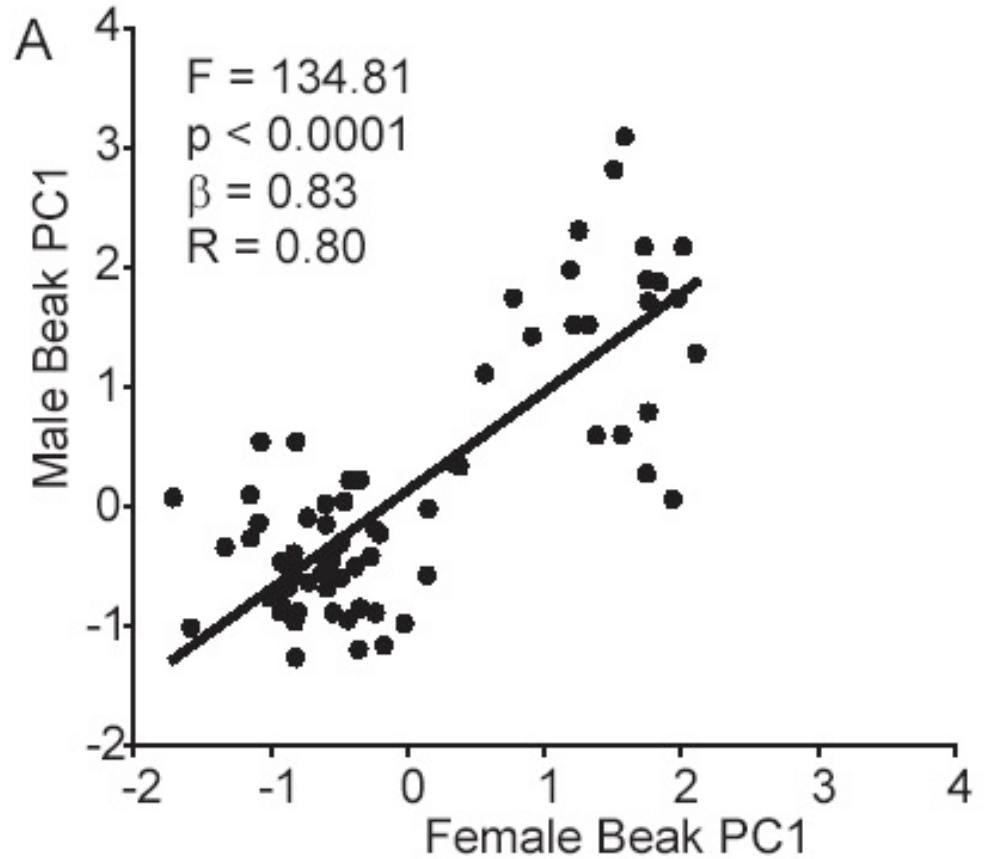
beak size
& shape

tradeoffs:
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performance

song
structure

assortative
mating



Huber, S.K., de León, L.F., Hendry, A.P., Bermingham, E., & Podos, J. 2007. Reproductive isolation of sympatric morphs in a population of Darwin's finches. *Proc. R. Soc. B.* 274:1709-1714.

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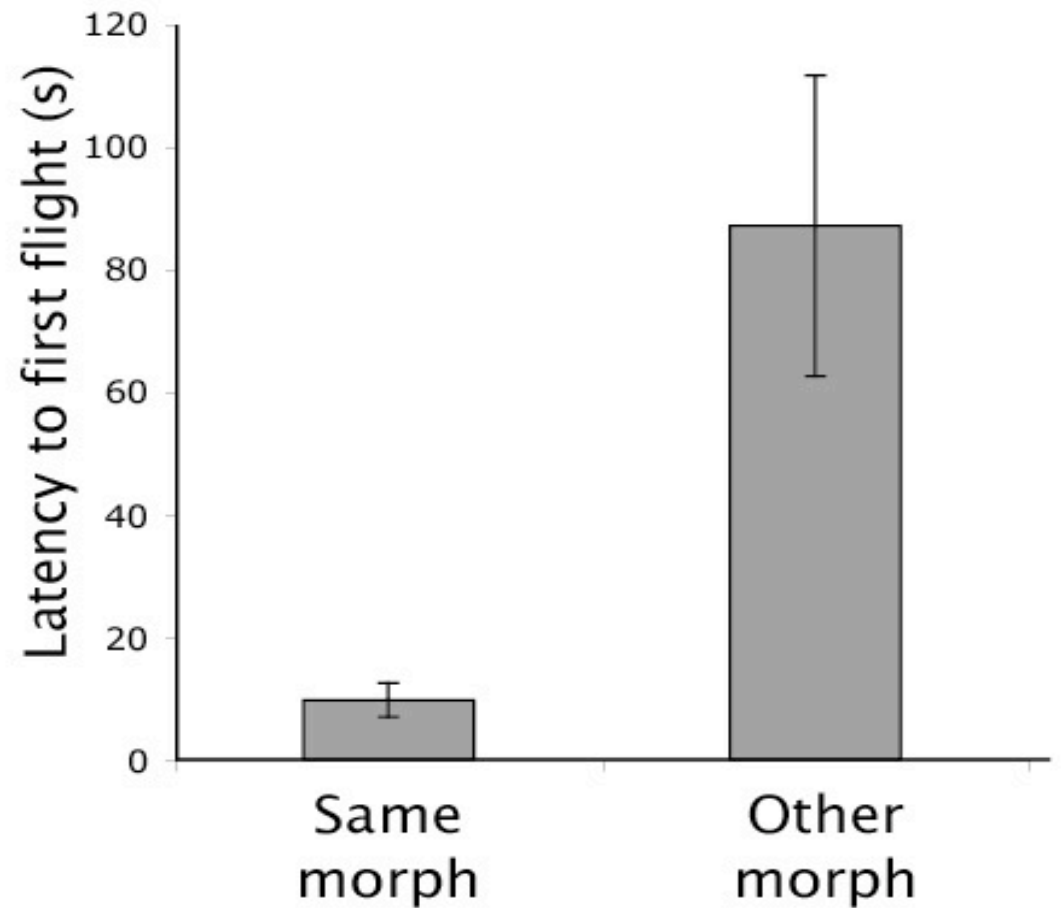
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song
structure

assortative
mating





Podos, J. 2010. Acoustic discrimination of sympatric morphs in Darwin's finches: a behavioral mechanism for assortative mating? *Phil. T. Roy. Soc.* 1031-1039.

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reliance on "private" resources

bite force capacity

safety factors & scaling

beak size & shape

tradeoffs: force x velocity

vocal performance

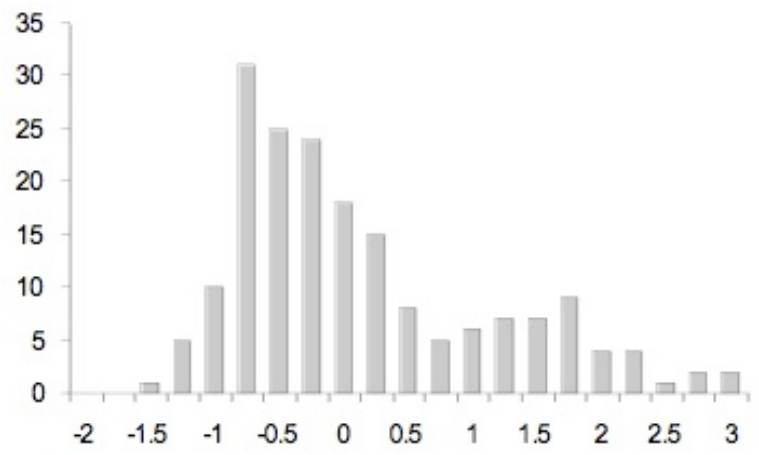
song structure

assortative mating

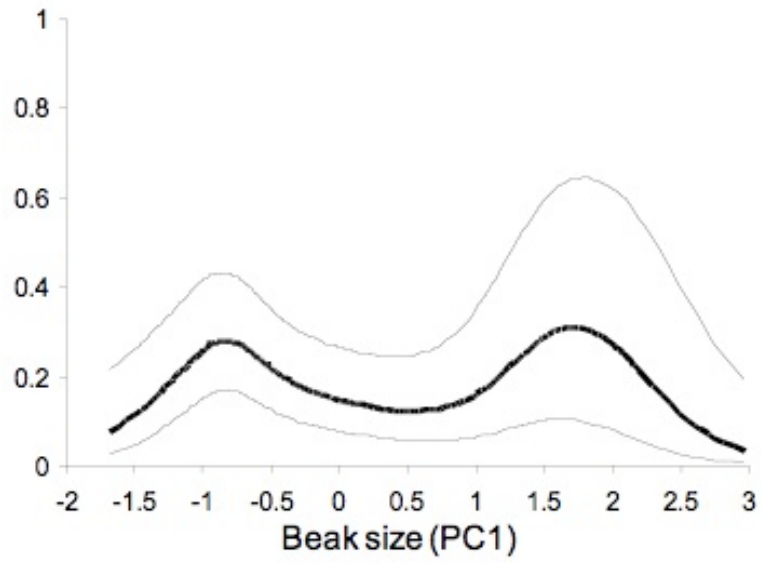
intra-species divergence

incipient speciation

birds



fitness



Hendry, A.P., Huber, S.K., de León, L., Herrel, A. & Podos, J. 2009. Disruptive selection in a bimodal population of Darwin's finches. *Proc. R. Soc. B.* 276:753-759.

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inter-species
competition



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partitioning

reliance on
“private” resources

bite force
capacity

safety factors
& scaling

beak size
& shape

tradeoffs:
force x velocity

vocal
performance

song
structure

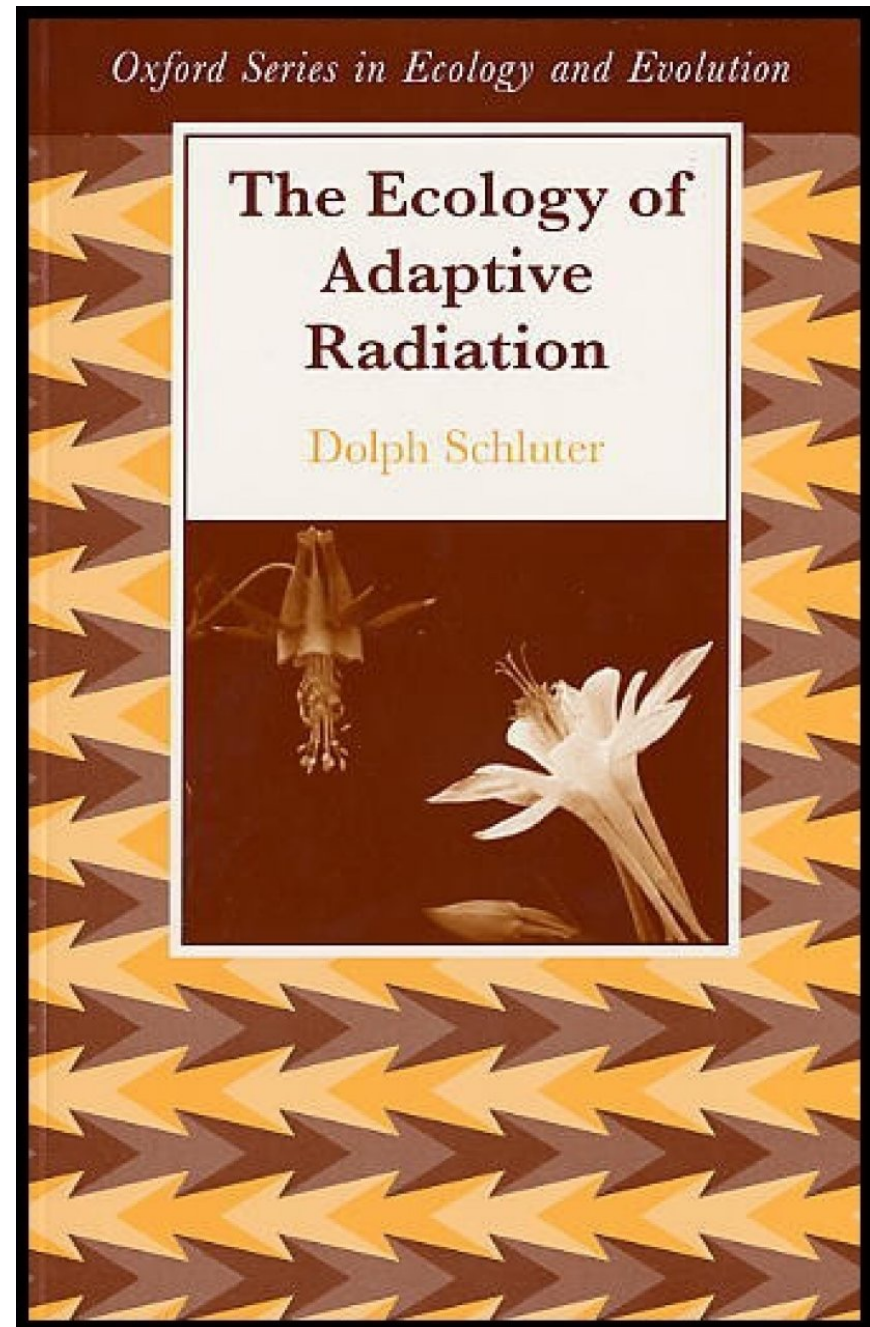
assortative
mating

intra-species
divergence

incipient
speciation

inter-species
competition

niche
partitioning



niche
partitioning

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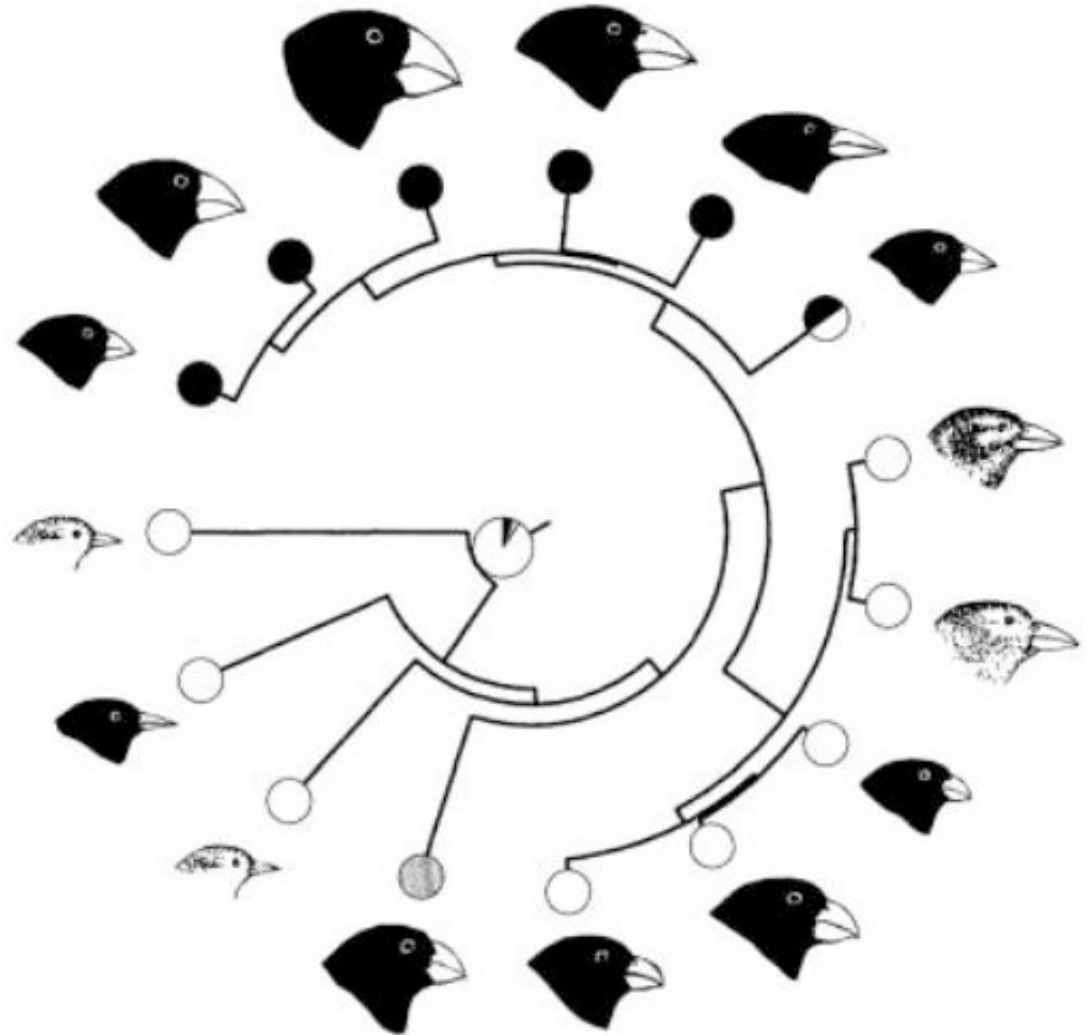
assortative
mating

intra-species
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speciation

inter-species
competition

niche
partitioning



Schluter, D. 2000. *The Ecology of Adaptive Radiation*.
Figure 1.1

niche
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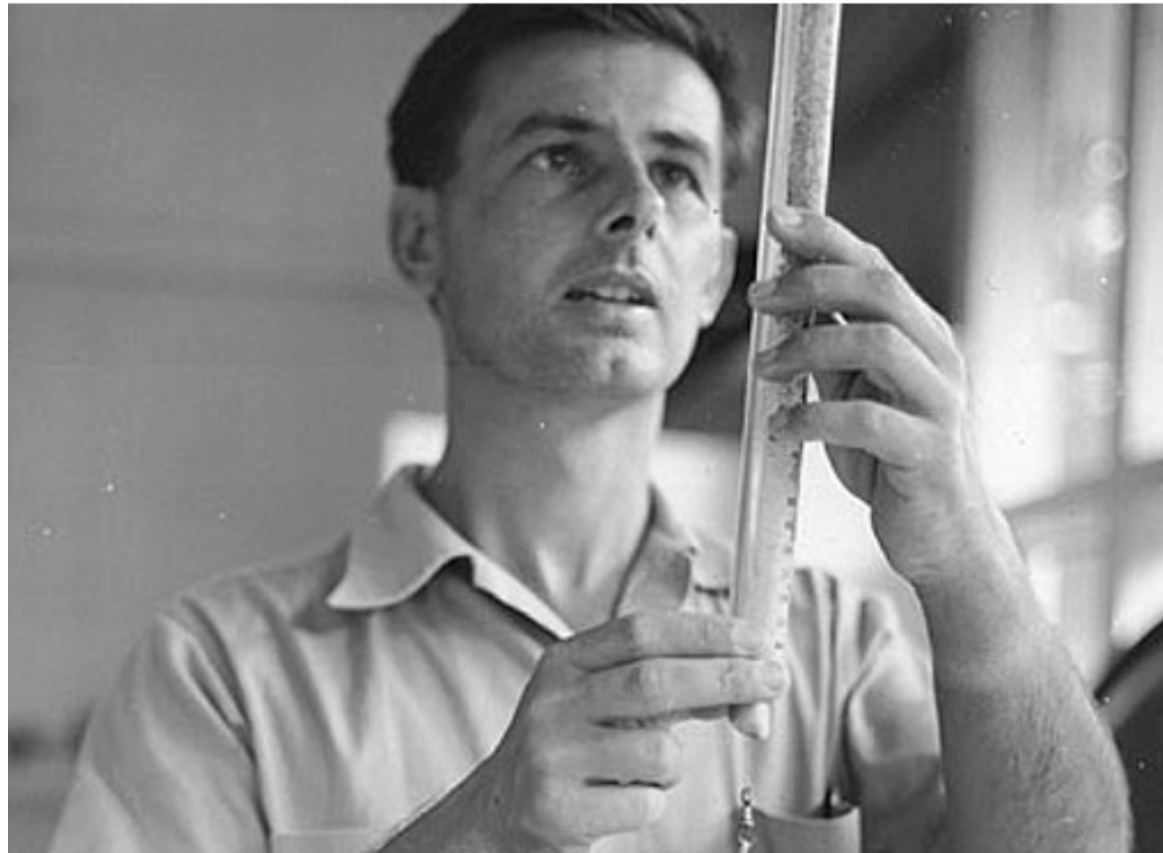
intra-species
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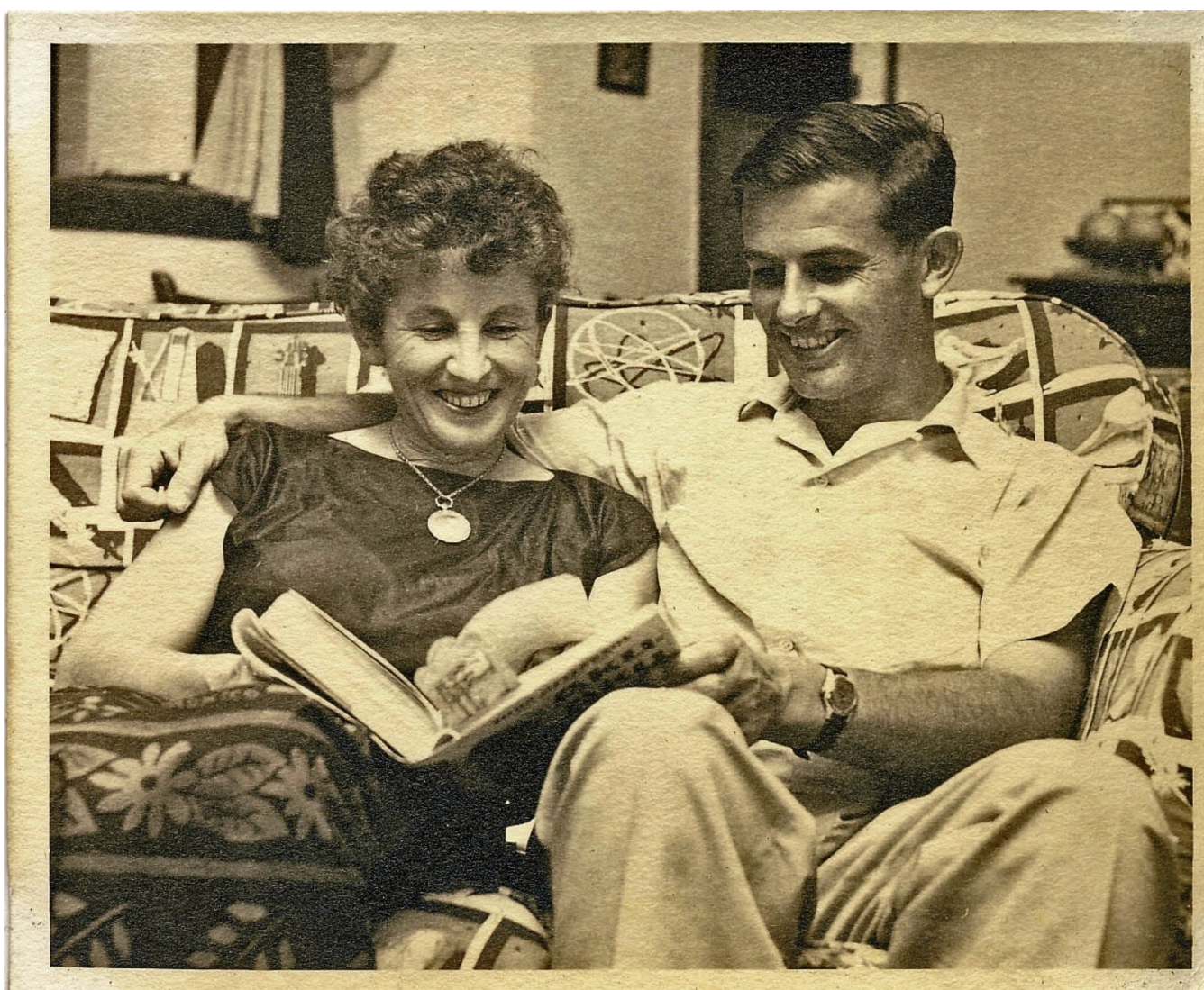
niche
partitioning

David Snow 1924-2009



*The Web of Adaptation*

Feeding habits, social behavior, nesting, anatomy, plumage—in any bird all are interconnected, each affects the others in various ways. Some of the connections can be traced, doubtless there are others which we cannot yet guess at. One cannot fully understand any aspect of a bird's natural history in isolation



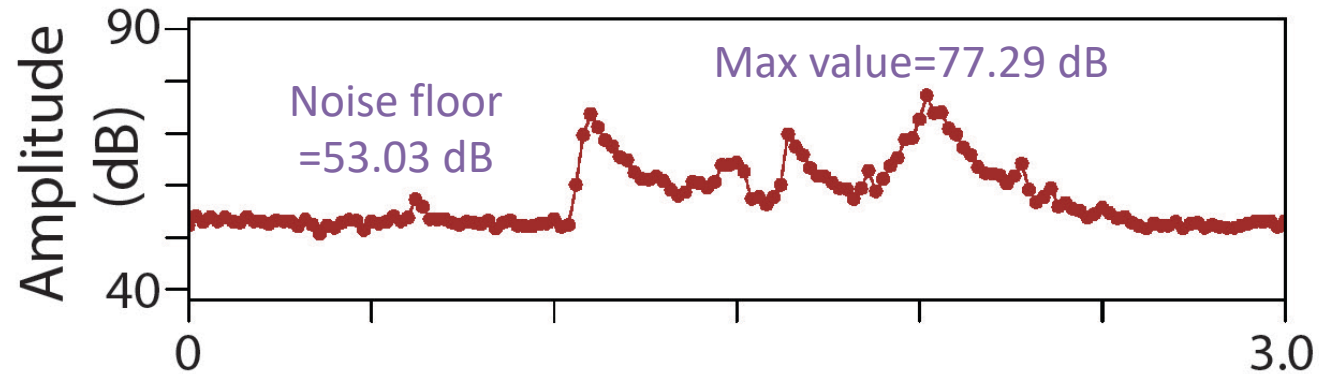
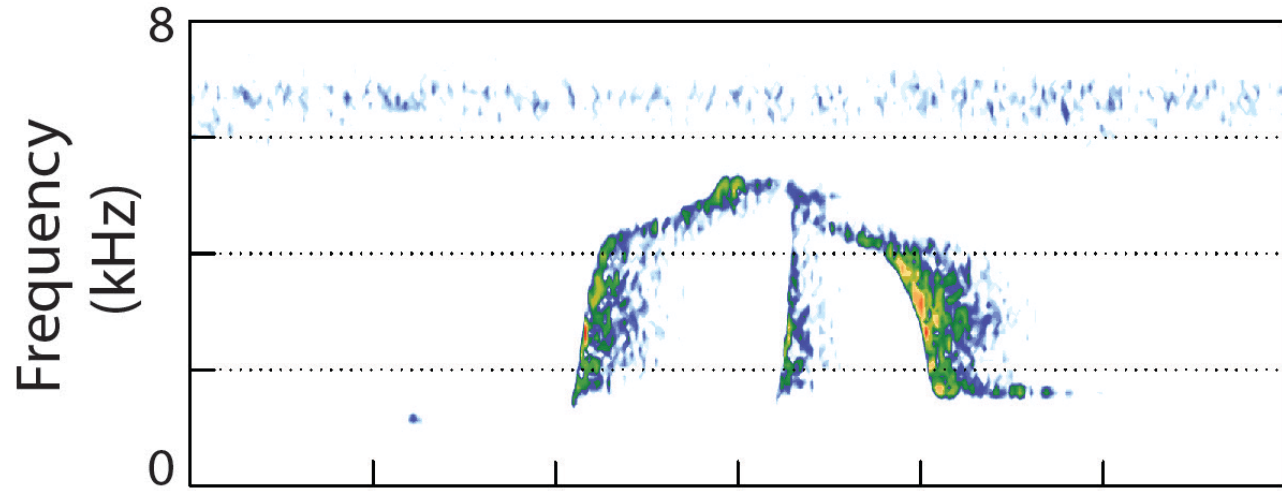
David Snow (1982): Male bellbirds sing “what are probably the loudest of all bird calls”



fotos: Anselmo d'Affonseca



Lipaugus vociferans



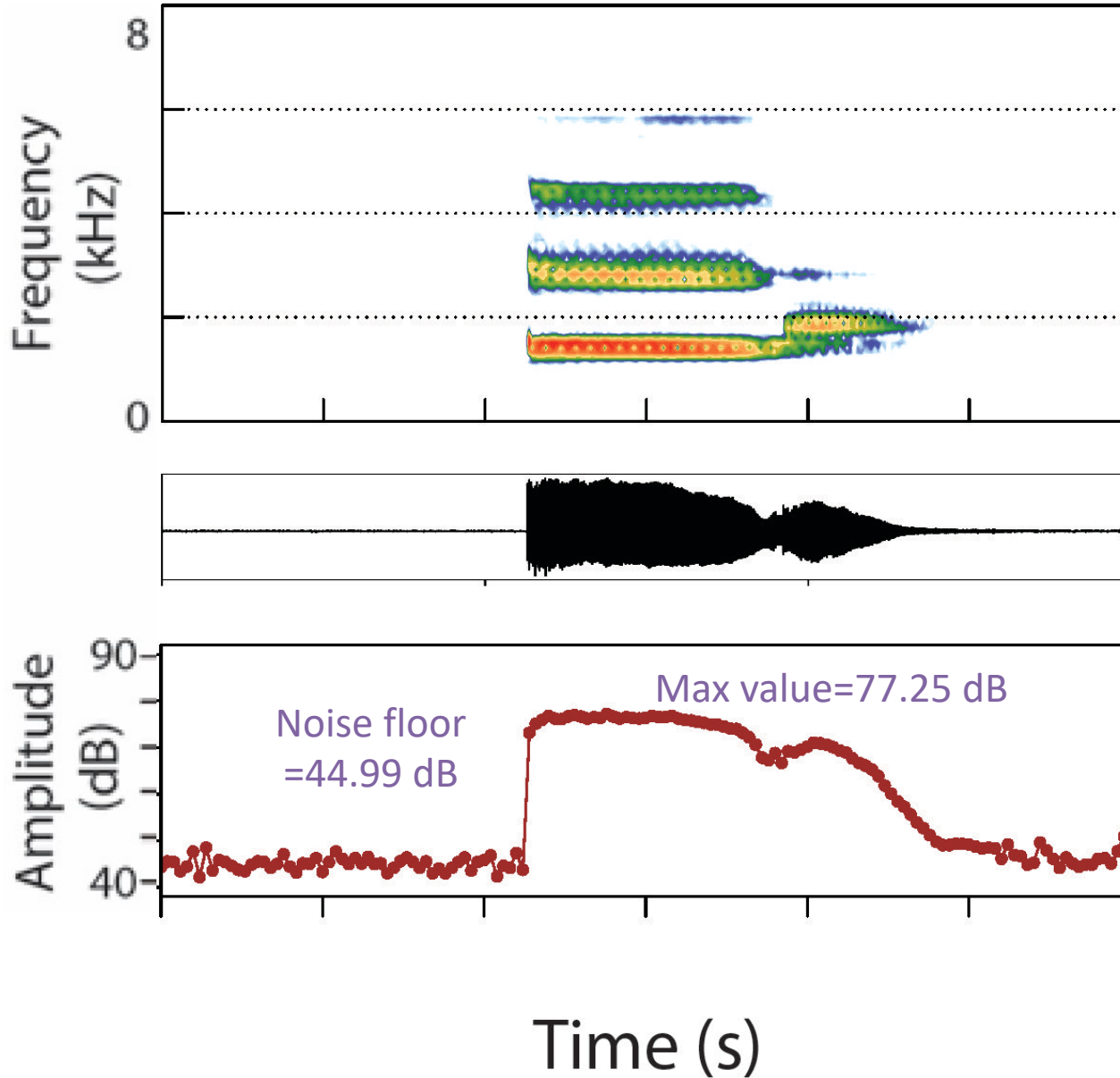
Noise corrected = 77.27 dB

Recorded @ 29 m

Corrected to 1m = 106.42 dB



Procnias albus Type 1 song

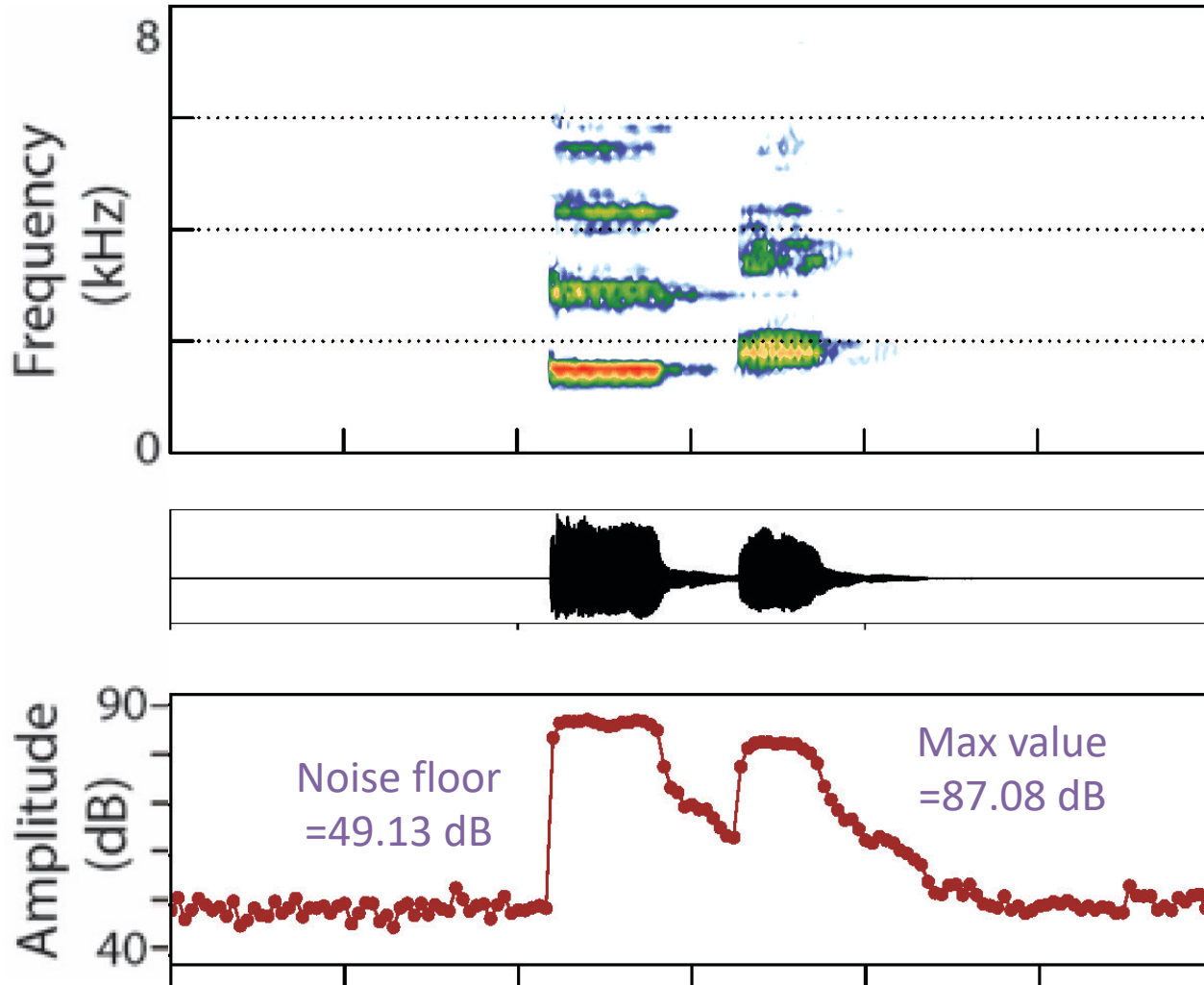


Noise corrected
= 77.25 dB

Recorded @ 43 m

Corrected to 1m
= 109.80 dB

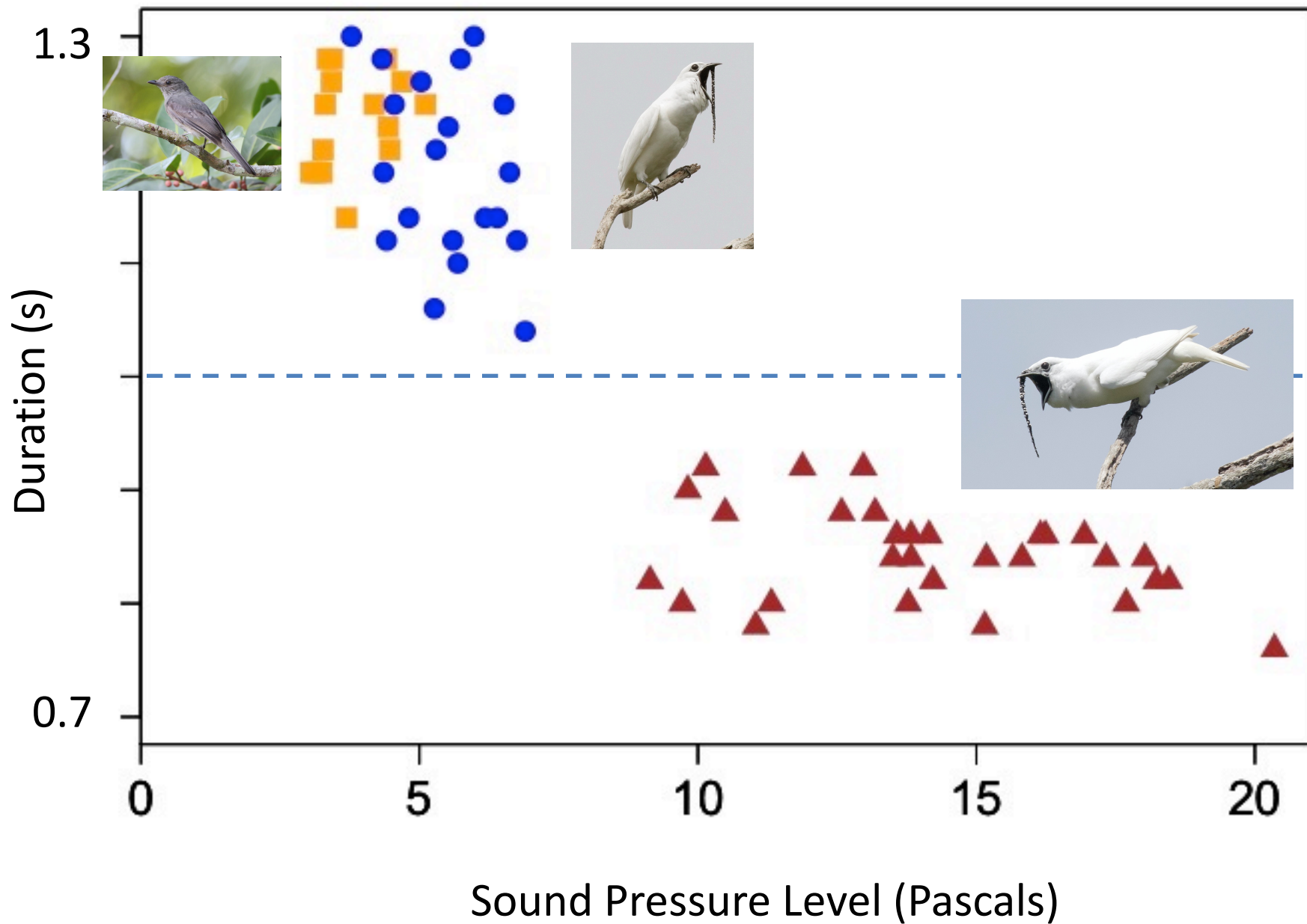
Procnias albus Type 2 song



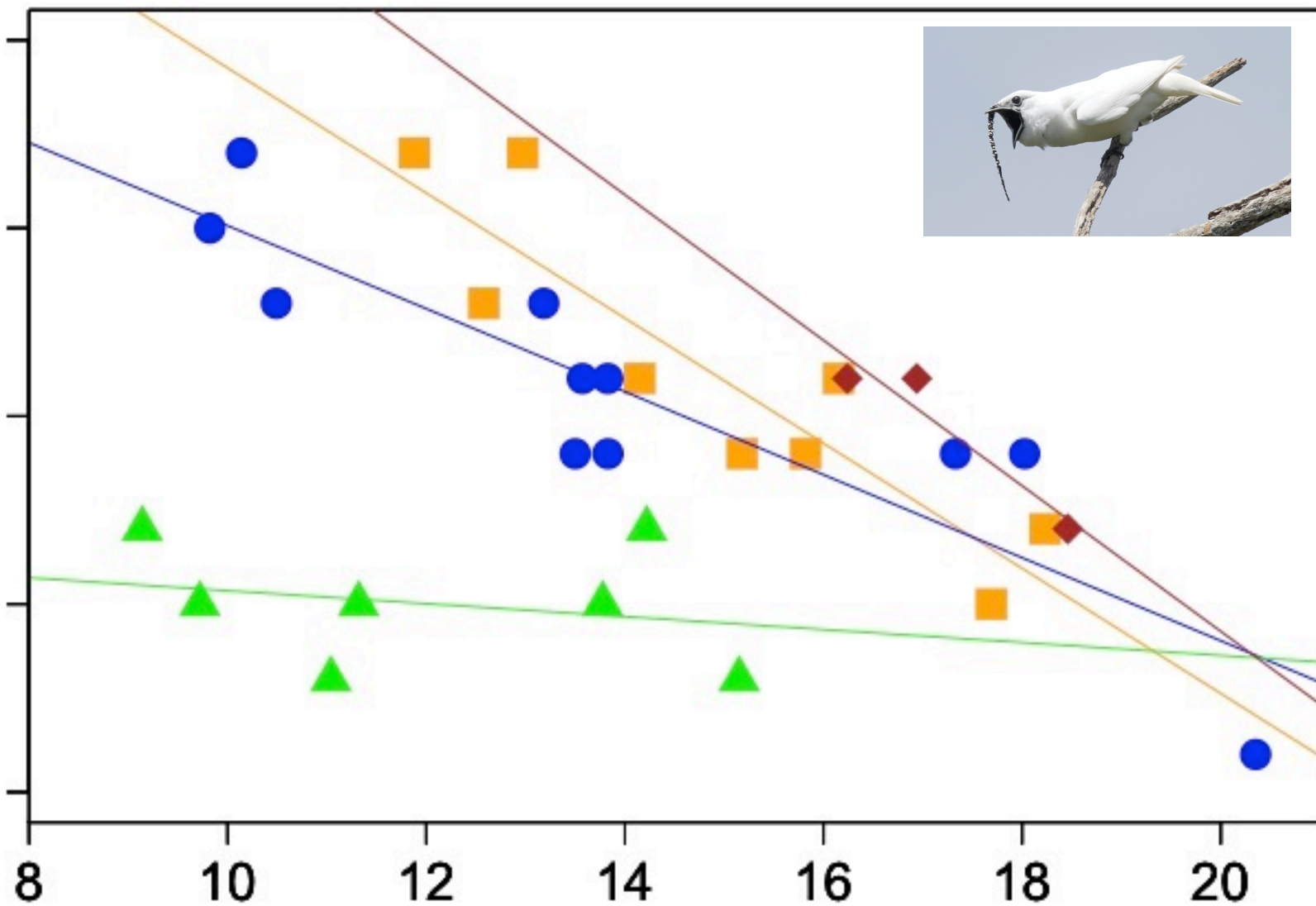
Noise corrected
= 87.08 dB

Recorded @ 34 m

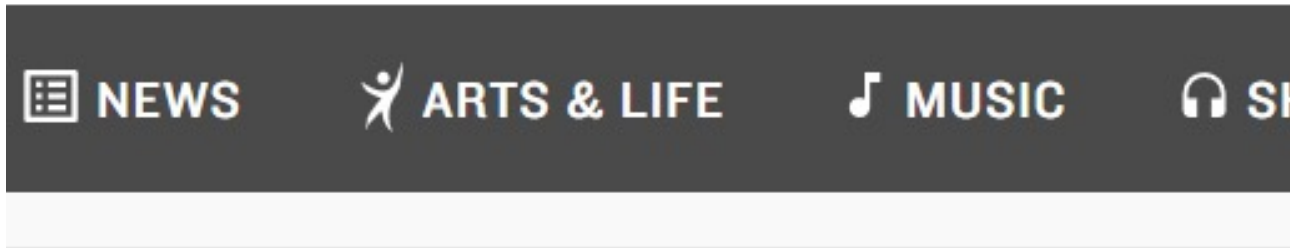
Corrected to 1m
= 117.61 dB



Duration (s)



Sound Pressure Level (Pascals)



**WAIT WAIT...
DON'T TELL ME!®**
FROM NPR® & WBEZ® CHICAGO

