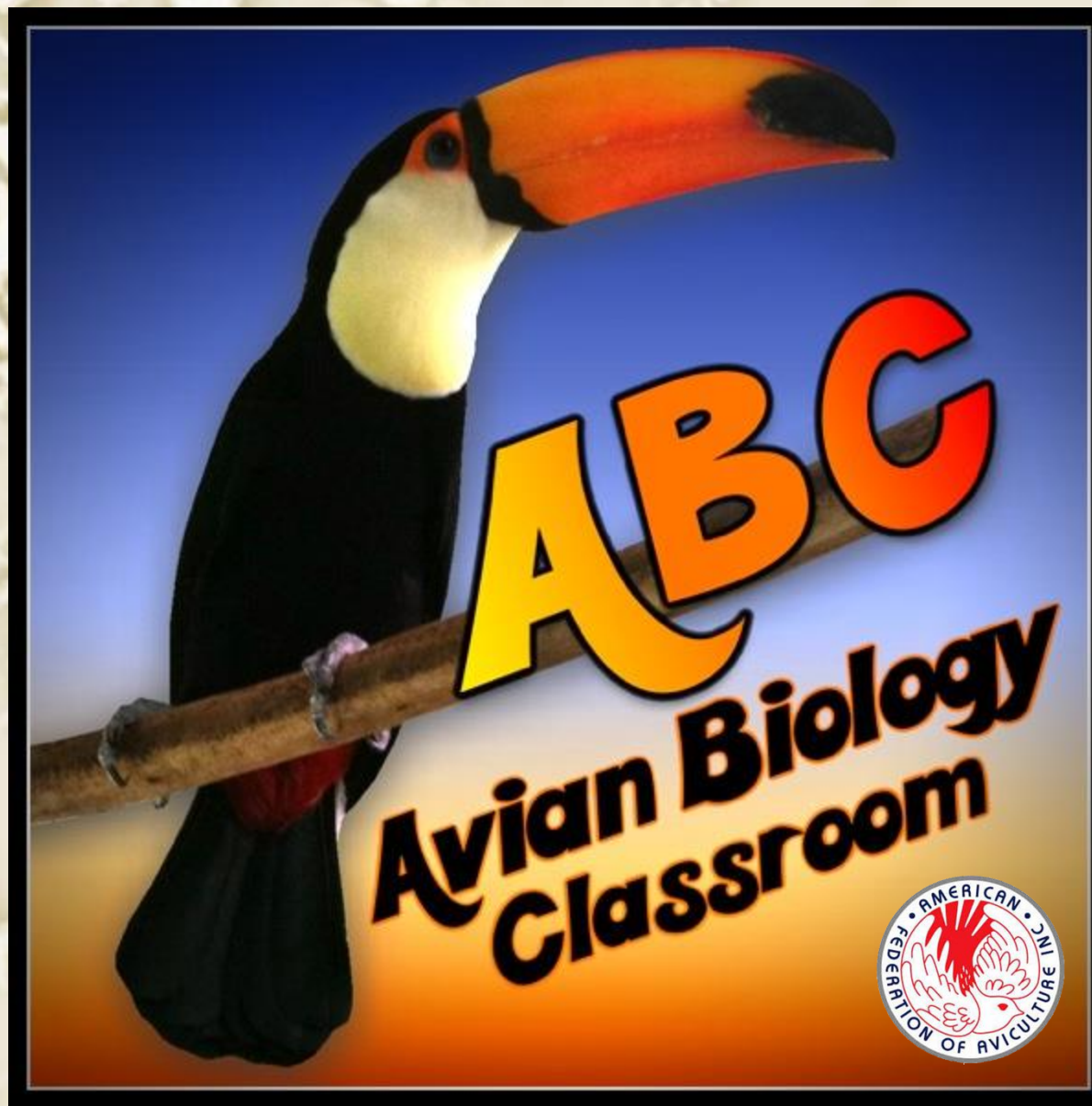




Module 1: The Scientific Method

To learn even more about birds...

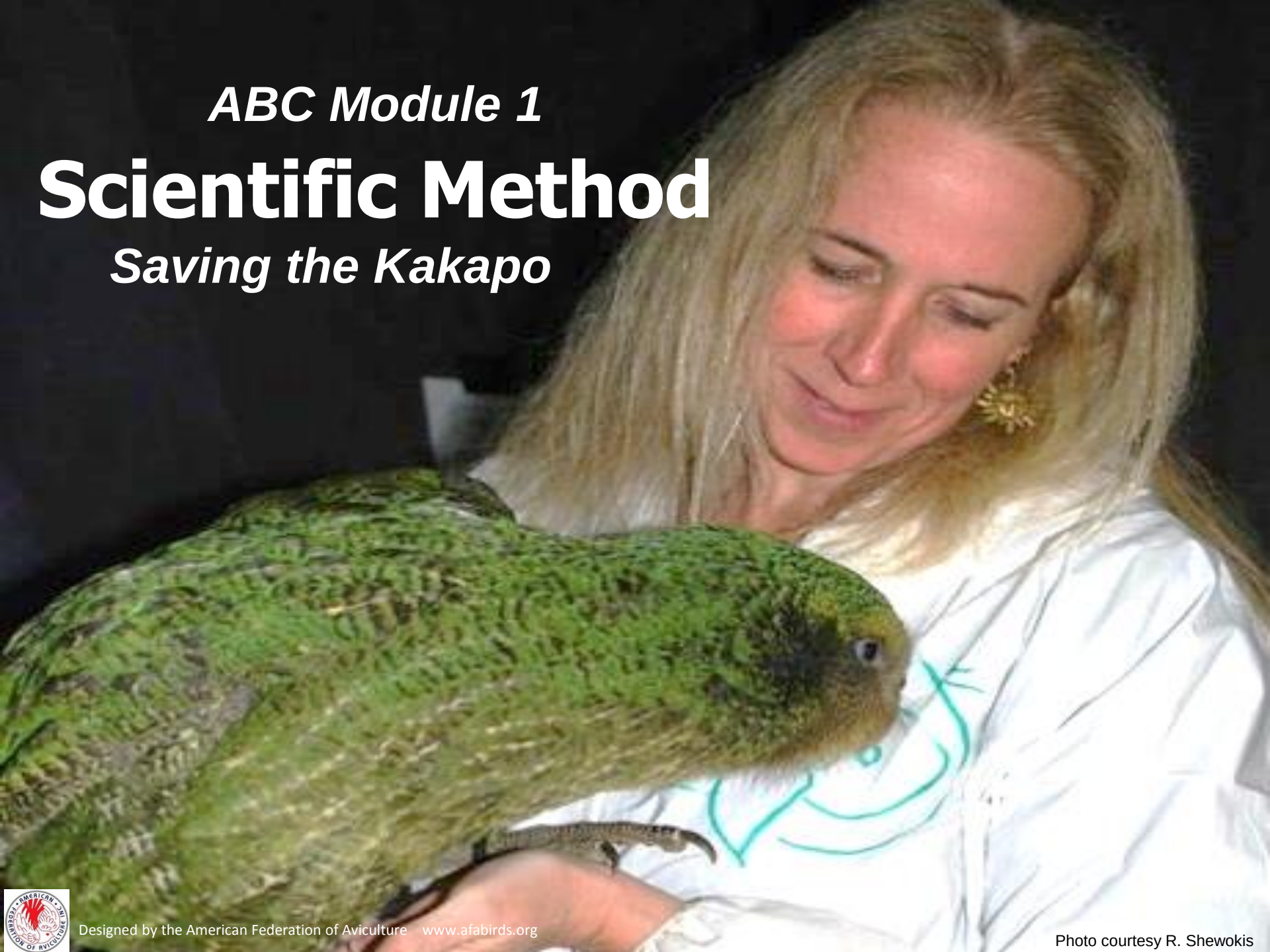
- Take the online ***Fundamentals of Aviculture course I and II!***
- *A comprehensive course for all that takes a deeper look into the lives and science of birds.*
- Visit www.fundamentalsofaviculture.com



ABC Module 1

Scientific Method

Saving the Kakapo



What is a kakapo?

- The **kakapo**, *Strigops habroptila* is a species of large, flightless nocturnal parrot endemic to New Zealand
- It is the world's heaviest parrot, weighing up to 9 pounds (approximately 4 kg).



As of 2010, there are only 131 left in the world.

How are researchers trying to save them?

- ***Incubating eggs and handraising***

- Almost 40% of the population consists of handraised birds.
- Thanks to the human intervention, more kakapos have been returned to the wild.

- ***Regular Health Checks***

- Birds are checked annually by being weighed, blood samples taken, and checked for parasites.

- ***Supplementary feeding***

- A special diet is put out in feeders so the parrots always have a food source.

Something interesting happened...

- Scientists were collecting data to see how many chicks were hatched after the feeders were made available.
- They were happy to find that more chicks hatched thanks to the feeders.
- They also realized that there were more male chicks hatched from females who ate from the feeders.
- What could have caused this?

Basic Scientific Method

How we answer questions...

- **Asking Questions:** *What are you trying to discover?*
- **Hypothesis:** *Make an educated guess based on your prior knowledge... there are no wrong answers!*
- **Experiment:** *Always do many experiments to test your hypothesis. The more data, the more reliable it is.*
- **Collect Data:** *Collect your results and organize them for better understanding.*
- **Analyze results:** *What does the data tell you?*
- **Conclusion:** *State the outcome of your experiment and how it affects your hypothesis. Either way, you answer your question!*
- **Share your Findings:** *Sharing with others who might have the same questions expands understanding of biology and the specific issue that you are researching. This also allows others to replicate what you have done to see if different results are produced.*

Scientific Method

- This is not a linear process as this cycles back and leads to new questions and explorations.
- Observations throughout the process can lead to new ideas and encourage thinking about old ideas in new ways.
- Every person is involved in the scientific method every day; it's how we think and learn naturally!
- For a more in-depth look at scientific method, visit the interactive flow chart at <http://undsci.berkeley.edu/article/scienceflowchart>

Ask the Question

- *What do we know about the kakapo? What do they need to produce healthy chicks?*
- It costs more energy to produce a big male than a female.
- If resources are plentiful, a son can be produced.
- They picked a single variable to observe: diet.
- Variable: the thing you test that differs between the control and the experimental group
- ***Our question: Does the diet affect the number of male chicks produced?***



Hypothesis

- Hypothesis: an educated guess based on prior knowledge
- Write **ONLY ONE** of the following:
 - ***Diet does not affect the number of male chicks produced.***
 - ***Diet does affect the number of male chicks produced.***
- Does it matter if your hypothesis is proven false?
- No! Either way you get an answer to your question.

Experiment

Procedure:

- 1) Weigh all female birds.***
- 2) For hens over 1.5 kg (3.3 lbs), cut the supplemental diet (experimental group).***
- 3) For hens under 1.5 kg (3.3 lbs), continue the supplemental diet (control group).***
- 4) After the breeding season, count the number of male and female chicks in each group.***
- 5) Calculate the percentage of male chicks for each group.***
- 6) Collect and compare data to control group.***

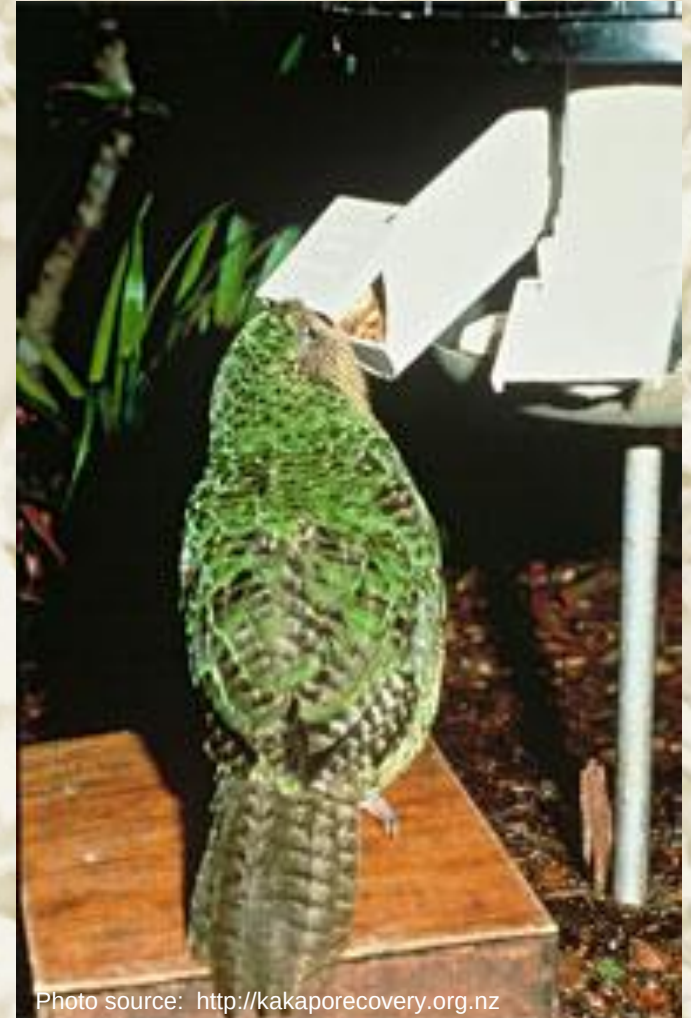
Materials & Methods

- Weigh scale and feeder
 - Birds must get on the scale to eat from the feeder
- High quality feed
 - High in protein and fats for hens to bulk up for breeding season



Collect data

- What percentage of male chicks were produced by hens on the supplemental diet?
- What percentage of male chicks were produced by hens on the reduced diet?



<i>Reduced diet</i>	<i>Control group</i>
<i>54% males 46% females</i>	<i>86% males 14% females</i>

Analyze Results

- What do the results tell us?
- How do we know this is what the results mean?
- ***What were the strengths of this experiment?***
 - ***1)***
 - ***2)***
- ***What were the weaknesses of this experiment?***
 - ***1)***
 - ***2)***

Conclusion

- Either discuss or write a 3-5 sentence conclusion, including the following:
- A summary of the experiment,
- Restate your hypothesis,
- Explain why the data proved your hypothesis true or false, and
- What would you do different to make the experiment more effective.

The Cycle of Inquiry

- **Science always seems to end with more questions.**
- **What are some new questions that may have come out of this study?**
- **How could we test these new questions?**
- **How could this new information help conservation?**

Activity:

The Birds & the Bloodsuckers

In agricultural fields in the southern United States, barn owls are often used as a natural way to control rodent populations, called biological pest control. Owls are an important predator that help balance ecosystems by keeping prey populations under control. Since there are no places for owls to roost or nest in these fields, artificial nestboxes are constructed and hung for them.



Photo courtesy of C. Efstathion

Caroline Efstathion, an aviculturist and researcher, conducted an experiment where 60 nest boxes were erected. To determine if decreasing the amount of insect parasites in nestboxes would increase chick survival, a bird-safe insecticide was applied inside the box. Many of these blood-sucking insects can cause discomfort and even transmit diseases, called vector-borne diseases, to the nestling owls. Half (30) of the nest boxes were sprayed with an insecticide and the other half (30) were left untreated. Boxes were checked once a week. Nestlings were monitored until they fledged (left the nest). The number of nestlings fledged was recorded for each nest box.

Question & Hypothesis

- Write the main research question the researcher was trying to answer.
- Write the hypothesis you think the researcher is testing with this experiment.

Let's look at the data...

Spring	# nest attempts	# nests hatched	# nest fledge	# eggs laid	# eggs hatched	# chicks fledged
Treated	8	7	7	47	35	18
Untreated	21	17	15	92	67	40
Total	29	24	22	139	102	58

Fall	# nest attempts	# nests hatched	# nest fledge	# eggs laid	# eggs hatched	# chicks fledged
Treated	24	21	20	118	75	60
Untreated	16	16	9	71	39	22
Total	40	37	29	189	114	82

- Discuss this data with your group.
- What patterns do you observe?
- Write your observations on your sheet.

Data Analysis

- How do we calculate the following?
- % nests hatched
- **# nest hatched / # nest attempts**
- % nests fledged
- **# nest fledged / # nest hatched**
- % eggs hatched
- **# eggs hatched / # eggs laid**
- % chicks fledged
- **# chicks fledged / # eggs hatched**

Conclusions



- **Why is the % nests hatched data important?**
- **How could studying this help conservation?**
- **Why is the % nests fledged data important?**
- **How could studying this help conservation?**
- **Why is the % eggs hatched data important?**
- **How could studying this help conservation?**
- **Why is the % chicks fledged data important?**
- **How could studying this help conservation?**

About the author...

Jason Crean, MA, MS is a degreed biologist and avid aviculturist, specializing in the propagation of green aracaris and white-backed mousebirds, President of The Avicultural Society of Chicagoland, Regional Director and Education Committee Chair for the American Federation of Aviculture, and moderates the Holistic Bird Care and Avian Raw, Whole Food Nutrition groups on Facebook. Crean often speaks to avicultural groups across the country and acts as consultant to zoos and other institutions, including the Chicago Nature Museum and Wildlife Genetics lab at Loyola Medical Center in Chicago, Illinois. He also runs a live animal education program that does free interactive programs for a host of different audiences to increase the presence of aviculture.

Crean is also a biology instructor at the high school and university level. He is also a curriculum designer and instructor in the Education Department at Chicago Zoological Society. Crean has been awarded the Presidential Award for Excellence in Science Teaching by President Obama in 2009, the 2010 High School Science Teacher of the Year by the American Association for the Advancement of Science, as well as awards from the National Science Teachers Association, the National Association of Biology Teachers, the Illinois Science Teachers Association, among others. He has authored several curricula, including the award-winning “Zoo Genetics” curriculum (www.xy-zoo.com) and “Harry Potter Biology” curriculum (harrypotterbiology.com). He was also recently awarded the “Teacher of Distinction” award by the Golden Apple Foundation. He serves as President-elect for the Illinois Science Teachers Association, Vice-President for the Illinois Association of Biology Teachers, and sits on the Board for the Association of Presidential Awardees in Science Teaching and the National Science Advisory Panel on the national College Board.



Thanks to Our Contributors



Robin Shewokis, Enrichment Specialist

Robin specializes in the enrichment of birds and other animals in zoos and private homes. Always the innovator, she presents often on the many ways to enhance the lives of our companion animals. Robin is an AFA State Coordinator.



Caroline Efstathion, PhD candidate

Caroline has a Master's degree in entomology, but has always had a focus on birds. Through her work, she has been looking into how insects like bees are impacting birds in the wild. Caroline is a long-time AFA member.

For all questions, please contact us at
education@afabirds.org

- All rights reserved. No part of this publication may be reproduced, distributed, altered or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods, without the prior written permission of the publisher, except in the case of copying worksheets for participant use and certain other noncommercial uses permitted by copyright law. For permission requests, write to the publisher, addressed “Attention: Education Committee Chair,” at the address below.
- American Federation of Aviculture, Inc.
PO Box 91717
Austin TX 78709-1717