

# *Visualizing Data with the PCI: Experiment on Acceptable Mgmt Actions*

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# ***Need for Effective Communication***

- **Goal of Human Dimensions Research**
  - Conceptualize, measure, & interpret variables & their relationships in a way that bears meaning on problems of managerial or scientific interest
- **Challenge**
  - Communicate meaning of abstract statistics (e.g., standard deviation, standard error)
- **A Solution – Potential for Conflict Index (PCI)**  
(Manfredo et al., 2003; Vaske et al., 2006)

# *Potential for Conflict Index (PCI)*

- Simultaneously displays information about:
  - Central tendency
  - Shape of distribution
  - Agreement or consensus
- Uses graphic display: Easy interpretation
- Places findings in managerial context  
(e.g., acceptability of a given mgmt. action)

# *PCI Measurement Requirements*

-3	-2	-1	0	1	2	3
Highly Unacceptable	Moderately Unacceptable	Slightly Unacceptable	Neutral	Slightly Acceptable	Moderately Acceptable	Highly Acceptable

## **Response scale**

- Balanced scale with equal number of response options on either side of “Neutral” point
- Number of response options can be 3, 5, 7, 9 (typically 5 or 7)
- Numerical ratings must be assigned with center point given value of 0

# *PCI Assumptions*

- **Greatest potential conflict (PCI = 1) occurs with bimodal distributions:**
  - 50% rate mgmt. action “Highly Unacceptable”
  - 50% rate mgmt. action “Highly Acceptable”
  - 0% are “Neutral”
- **No conflict (PCI = 0) occurs when:**
  - 100% rate mgmt. action “Highly Unacceptable” OR
  - 100% rate mgmt. action “Highly Acceptable” OR
  - 100% are “Neutral”
- **Index range: 0 (no conflict) to 1 (most conflict)**

# PCI Formula

$$PCI = \left[ 1 - \frac{\sum_{i=1}^{n_a} |X_a|}{X_t} - \frac{\sum_{i=1}^{n_u} |X_u|}{X_t} \right] * \frac{X_t}{Z}$$

Where:

$X_a$  = an individual's "acceptable" (e.g., 1, 2, or 3) score

$n_a$  = all individuals with acceptable scores

$X_u$  = an individual's "unacceptable" (e.g., -1, -2, or -3) score

$n_u$  = all individuals with unacceptable scores

$Z$  = maximum possible sum of all scores =  $n \times$  extreme score  
(e.g.,  $Z = 3n$ ), where  $n$  = total number of subjects

$$X_t = \sum_{i=1}^{n_a} |X_a| + \sum_{i=1}^{n_u} |X_u|$$

# *Past Studies & Current Needs*

- PCI Studies

- Yellowstone wolf management
- Chronic wasting disease
- Wildlife values in the western USA
- National forest & grassland mgmt.
- Wildland fire management



- Need: Experimental tests to validate PCI
- One research question: Does scale width (number of response options) impact PCI?

# Objectives

Examine differences in acceptance of management actions depending on:

- Severity of human-wildlife interaction
  - Presence of animal (seen in area)
  - Nuisance animal (getting into garbage)
  - Human death from animal
- Number of scale response options (3, 5, 7 point scales)
- Location of respondents (U.S. vs. Thailand)



# *U.S. Sample*

- Colorado State Univ.  
( $n = 238$ )
- Oregon State Univ.  
( $n = 126$ )
- 3 versions randomly distributed  
3pt, 5pt, 7pt response scales
- Acceptability of 6 mgmt. actions in 9 scenarios

Species	Scenario
Raccoon	Presence
Raccoon	Nuisance
Raccoon	Kills Human
Bear	Presence
Bear	Nuisance
Bear	Kills Human
Mtn Lion	Presence
Mtn Lion	Nuisance
Mtn Lion	Kills Human

# *Thailand Sample*

- Kaset Sart Univ.  
( $n = 150$ )
- 3 versions randomly distributed  
3pt, 5pt, 7pt response scales
- Acceptability of 6 mgmt. actions in 9 scenarios

Species	Scenario
Elephant	Presence
Elephant	Nuisance
Elephant	Kills Human
Monkey	Presence
Monkey	Nuisance
Monkey	Kills Human
Tiger	Presence
Tiger	Nuisance
Tiger	Kills Human

# Scenario Example (7 Point Scale)

Situation 1. People report seeing a black bear roaming in their neighborhood. Although there have not been direct negative encounters between humans & the bear, residents have raised concern over the presence of the bear.

Given Situation 1, how acceptable or unacceptable would it be for wildlife agencies to take each of the following actions?

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Management Action	Neither Unacceptable nor Acceptable						
	Unacceptable					Acceptable	
Do nothing	-3	-2	-1	0	1	2	3
Monitor the situation	-3	-2	-2	0	1	2	3
Educate the public	-3	-2	-1	0	1	2	3
Frighten the bear away	-3	-2	-1	0	1	2	3
Capture & relocate the bear	-3	-2	-1	0	1	2	3
Destroy the bear	-3	-2	-1	0	1	2	3

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# ***Univariate Results – Traditional Method***

Example – Acceptability ratings for scenario where

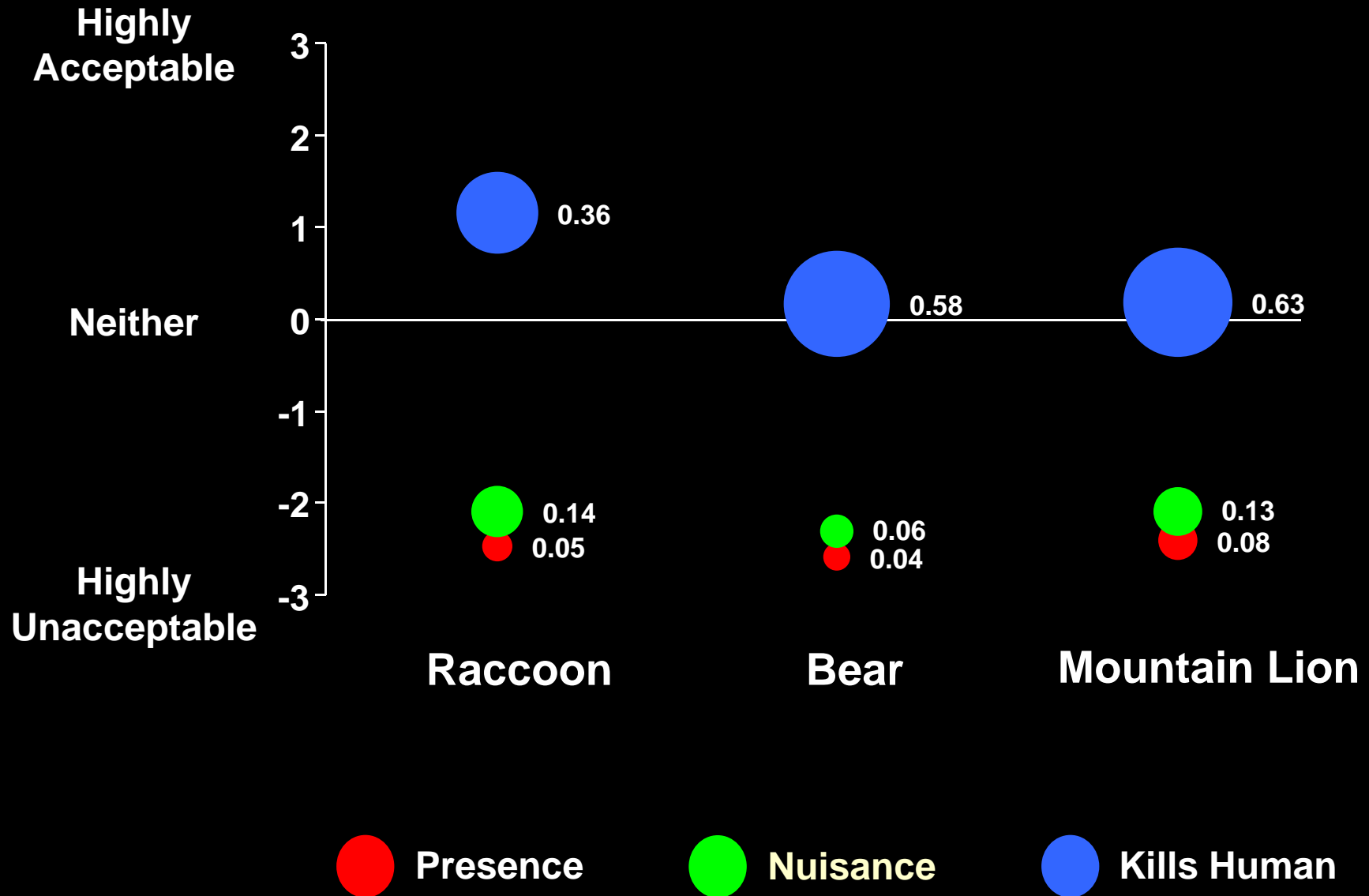
- Severity of interaction: ***Human death***
- Management action: ***Destroy animal***
- Scale: ***7-point***

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Descriptive Statistics	Raccoon	Bear	Mountain Lion
Mean	1.16	.17	.18
Median	2.00	1.00	1.00
Mode	3.00	3.00	3.00
Standard Deviation	2.18	2.19	2.28
Variance	4.78	4.80	5.19
Standard Error of Mean	.20	.20	.21
Skewness	-.86	-.20	-.12

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# PCI & Graphic: Destroy Animal



# *Univariate Summary: Destroy Animal*

- For *presence & nuisance* situations
  - Unacceptable to kill all 3 species  
Considerable agreement (small bubbles)
- For *human death* situations
  - Acceptable to kill Raccoons  
Moderate agreement (medium bubble)
  - Mixed reaction for killing Bears & Mountain Lions  
Less agreement (large bubbles)

## ***Bivariate Results – Scale Width & Mean***

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	Scale		
	Mean	F-value	p-value
U.S. Sample		64.88	< .001
3-point scale	.20 <sup>a</sup>		
5-point scale	.09 <sup>b</sup>		
7-point scale	.08 <sup>b</sup>		
Thailand Sample		6.35	.002
3-point scale	-.07 <sup>a</sup>		
5-point scale	-.08 <sup>a</sup>		
7-point scale	-.13 <sup>b</sup>		

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**Note:** Scales standardized to 3 points for comparison purposes

## ***Bivariate Results – Scale Width & PCI***

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	Average PCI	F-value	p-value
U.S. Sample		0.14	.873
3-point scale	.26		
5-point scale	.24		
7-point scale	.26		
Thailand Sample		0.77	.464
3-point scale	.24		
5-point scale	.24		
7-point scale	.28		

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**Note:** Scales standardized to 3 points for comparison purposes

# *Bivariate Results*

## *Severity of Interaction & PCI*

	Average PCI	F-value	p-value
U.S. Sample		20.45	< .001
Presence	.20 <sup>a</sup>		
Nuisance	.18 <sup>a</sup>		
Human death	.38 <sup>b</sup>		
Thailand Sample		3.31	.039
Presence	.20 <sup>a</sup>		
Nuisance	.24 <sup>ab</sup>		
Human death	.30 <sup>b</sup>		

# Summary

- PCI visually highlights:
  - Acceptability of management alternatives (means)
  - Levels of consensus (bubble size) for each alternative
- PCI – insensitive to number of response options, but mean *is* sensitive
- PCI – sensitive to severity of interaction (less consensus on managing animal causing death)



# *Overall Conclusions*

- PCI offers an intuitive approach to summarizing statistical results
- Based on past experiences, wildlife managers understand & like PCI results
- Computing PCI is straightforward



# *Future Research*

- Extend PCI to other response scales
- Develop statistical significance tests for PCI
- Link PCI to practical significance indicators (Effect size, Confidence intervals, Odds ratios)
- Explore substantive differences (e.g., U.S. vs. Thailand differences)



*Questions?*

