


Abundance of the Louisiana Black Bear in the Upper Atchafalaya River Basin



Carrie Lowe
University of Tennessee
Department of Forestry, Wildlife and Fisheries





USGS Roy O. Martin

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Background/Justification

- Mississippi River Alluvial Valley
- Historically contained 10 million ha of bottomland hardwood forest
- Today only ~2.8 million ha remain

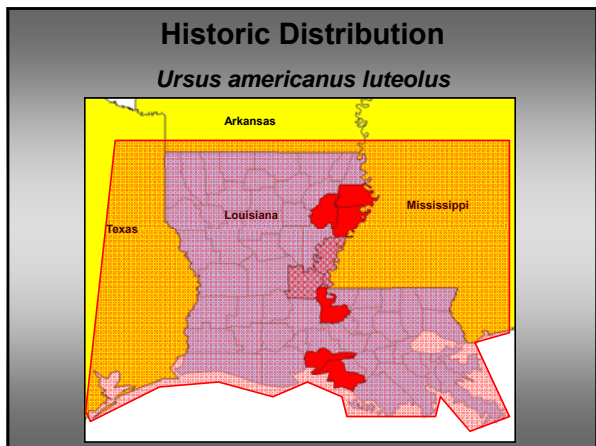
the 'Delta'

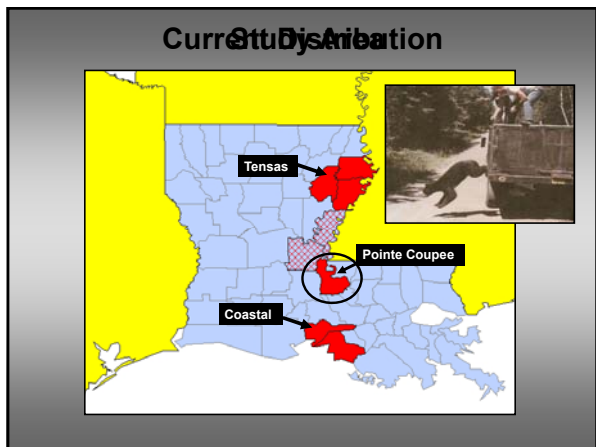


Background/Justification

- Bears historically 'common'
- Over-exploitation







Background/Justification

- In 1992 the USFWS listed the Louisiana black bear as “threatened”
- Recovery efforts based on Louisiana Black Bear Recovery Plan

➔ 2 of the 3 subpopulations viable
➔ habitat connectivity

Objective

To estimate abundance of the Louisiana black bear in the Upper Atchafalaya River Basin





Study Area: Upper Atchafalaya River Basin




Study Area



Study Area





Private land

- Agriculture
- Logging
- Pipelines

Study Design


- **Mark-Recapture**
Estimates abundance through capturing, releasing, and recapturing individuals

- **DNA 'capture'**
- **Genetic 'tagging'**
 - non-invasive
 - efficient

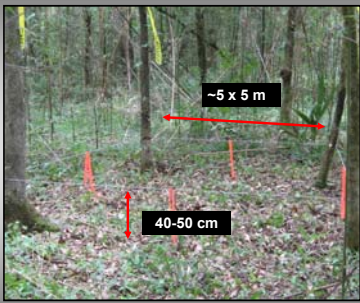
$$\frac{n_1}{N} = \frac{m_2}{n_2}$$

Study Design - Field



Bait

- bakery products
- scent lure

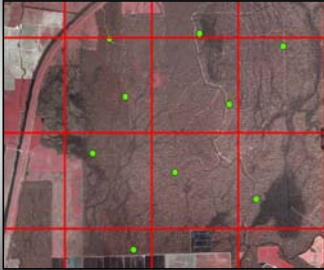


Barbed wire hair 'traps'

Study Design - Field

Site Placement

- ≥ 4 per home range
(Otis et al. 1978)
- Random vs. logistical
- 115 total sites




Otis, D. L., K. P. Burnham, G. C. White, and D. R. Anderson. 1978. Statistical inference from capture data on closed animal populations. *Wildlife Monographs* 62: 1-135.

Study Design - Field


Sampling schedule

- Sites checked once per week for 10 weeks
- Summer months of 2007-2009
- 3 years allows for use of **Robust Design**



June 2008	July 2008	August 2008
Su Mo Tu We Th Fr Sa	Su Mo Tu We Th Fr Sa	Su Mo Tu We Th Fr Sa
1 2 3 4 5 6 7	1 2 3 4 5	1 2
8 9 10 11 12 13 14	6 7 8 9 10 11 12	3 4 5 6 7 8 9
15 16 17 18 19 20 21	13 14 15 16 17 18 19	10 11 12 13 14 15 16
22 23 24 25 26 27 28	20 21 22 23 24 25 26	17 18 19 20 21 22 23
29 30	27 28 29 30 31	24 25 26 27 28 29 30

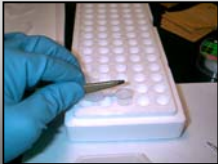
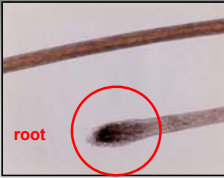
**A sample =
 ≥ 5 hairs per barb**




Study Design - Analysis

Sub-sampling

- 25 randomly selected sites per sampling period
- One sample from each selected site

• DNA extracted & amplified with PCR



• Genetic analysis by WGI (Nelson, British Columbia)

Study Design - Analysis

DNA microsatellites

- provide individual genetic profile

Bear A
162 bp

Bear B
162 bp 178 bp

Study Design - Analysis

Capture Probabilities

2008

Bear A = 1000100110
Bear B = 0000000001

Study Design - Analysis

Closed Population Models

Assumptions:

- Population is closed
 - geographic
 - demographic
- Marks are not lost or overlooked
- Equal probability of capture

= Biased abundance estimate


Study Design - Analysis

Closed Population Models

All animals have an equal chance of being captured
 → not realistic!

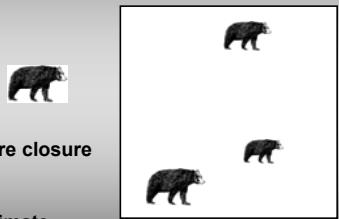
Models to relax this assumption:

- Heterogeneity Model
-age, sex, trapping effort
- Behavior Model
-trap happy/shy
- Time Model
-weather, season



Study Design - Analysis

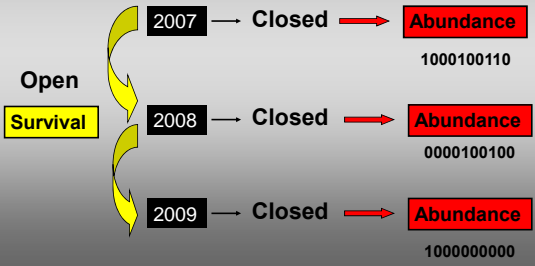
Mark-Recapture: Open Population Models



- Does not require closure
- Less precise abundance estimate

Study Design - Analysis

Robust Design: combines open and closed models



Open Survival

2007 → Closed → Abundance
1000100110

2008 → Closed → Abundance
0000100100

2009 → Closed → Abundance
1000000000

Study Design - Analysis

Program MARK

- ranks models based on Akaike's Information Criterion (AIC) values
- most precise & least biased estimate

Model	AICc	Delta AICc	AICc Weight	Model Jkallroot	No. Par	Deviance
(Phi _c) p(1) Phi ₀	322.5227	0.0000	0.96003	1.0000	2	41.8147
(Phi ₀) p(1) Phi ₀	330.0567	7.5340	0.02253	0.0225	7	38.8147
(Phi _c) p(0) Phi ₀	336.6794	8.1267	0.01650	0.0172	7	39.4374
g0h1p0t0	338.4543	13.8816	0.00783	0.0070	11	35.4013

Study Design - Analysis

Program DENSITY

HR radius
'effective trapping area'

Density = $\frac{N \text{ individuals}}{\text{Area occupied}}$

Old

→

Uses spatial capture histories to estimate density

New

Acknowledgments

- Maria Davidson & Louisiana Department of Wildlife and Fisheries
- USFWS
- USGS
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- Roy O. Martin Lumber
- University of Tennessee
- Dr. Joe Clark & students in the 'bear lab'
- Kristy Craig, Butch Morsey, & Dave Telesco
- John Barton, Sr. and members of Lottie Wildlife Protective Association
- Landowners (too many to list)!