

The Reproductive Ecology of the Desert Tortoise at the Marine Corps Air Ground Combat Center, 29 Palms CA

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 - **Marine Corps Air Ground
Combat Center**

Introduction

- **Federally Listed Threatened Species**
 - ◆ **Population Declines**
 - ◆ **Anthropogenic Habitat Alteration**

- **Population Viability Analyses Lack Data**

- ◆ **Reproductive output estimated at two sites**

- ◆ **Survivorship estimates based on:**

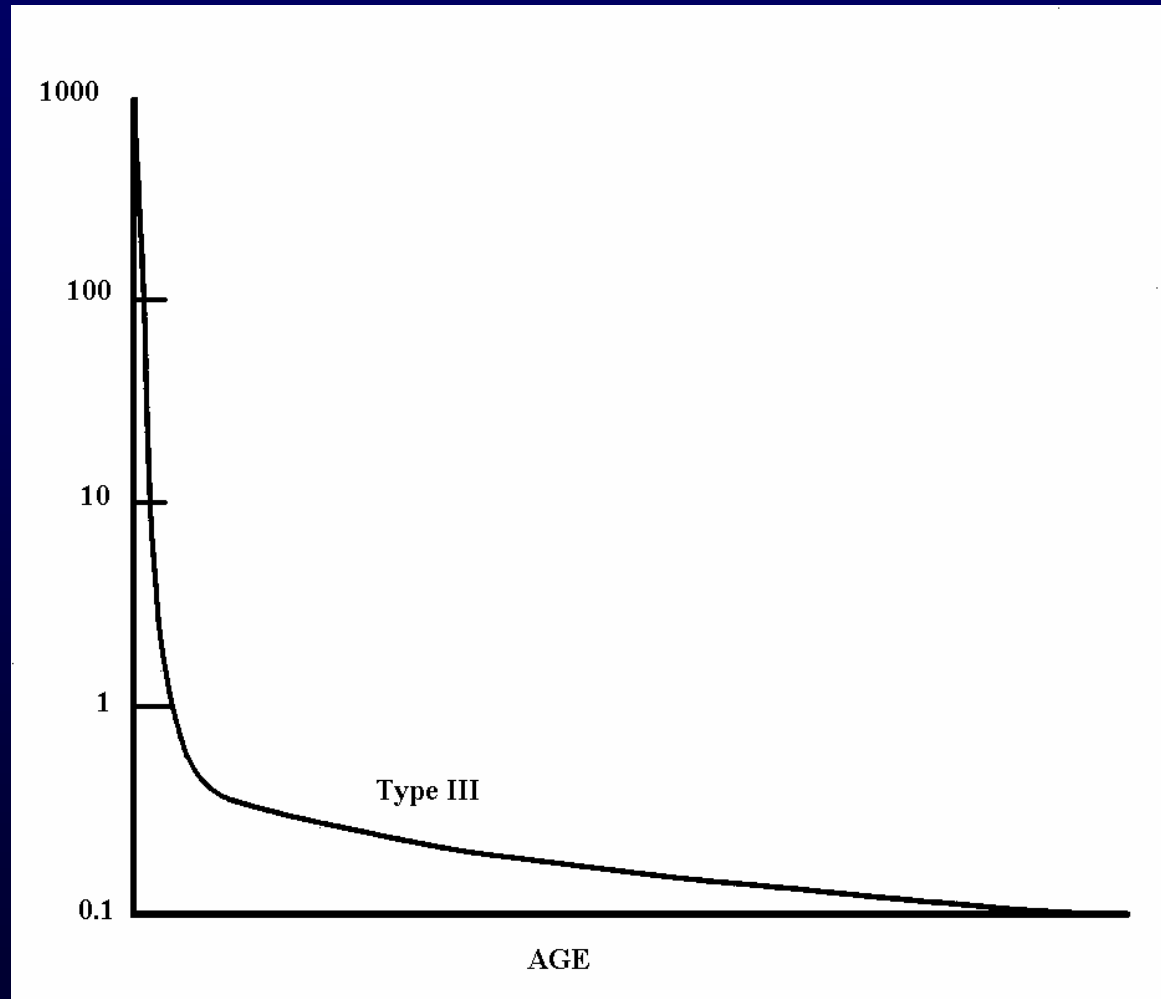
- ☞ **Post hoc analyses of tortoise remains**

- ☞ **Anecdotal reports**

Tortoise Life History

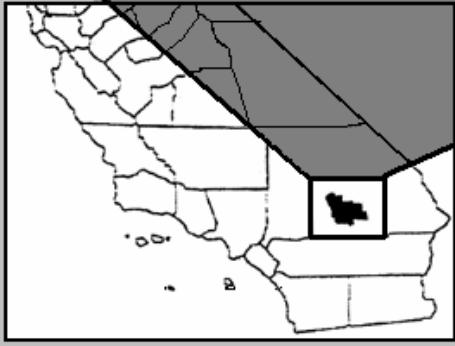
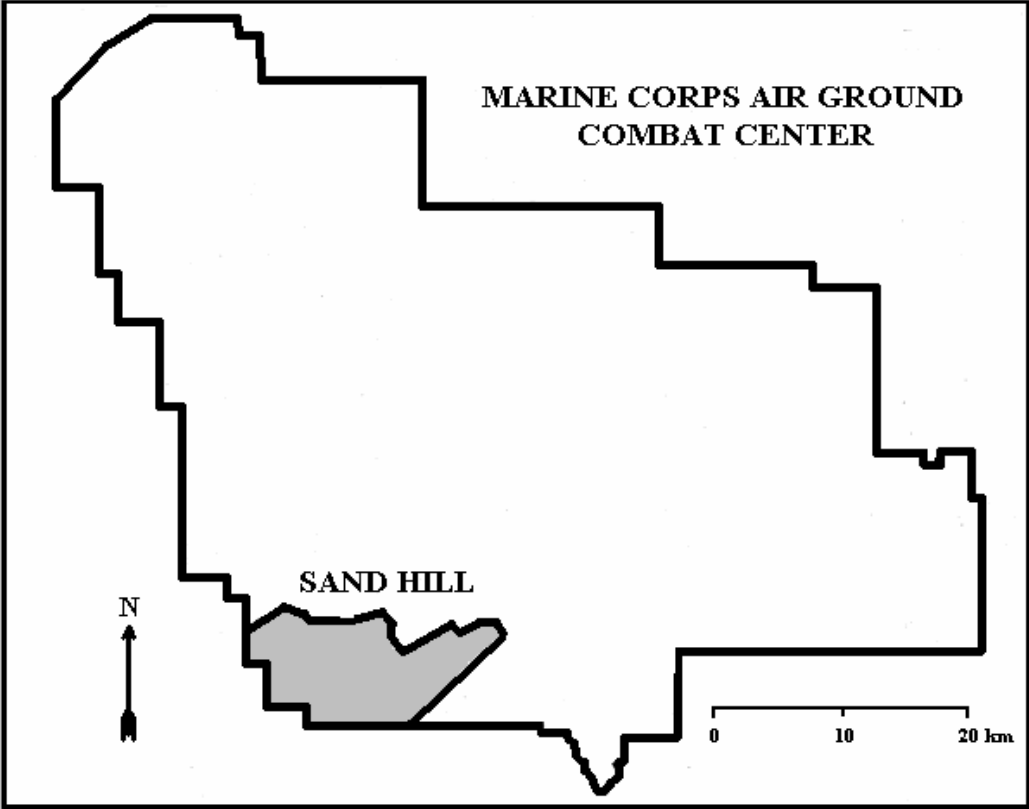
- Long-lived
- Delayed onset of maturity
- Iteroparity throughout maturity

- **Chelonian Survivorship Follows a Type III survivorship curve**



Primary Objectives

- **Estimate Survivorship During Early Life History Stages**
- **Monitor Reproductive Output of Female Tortoises**



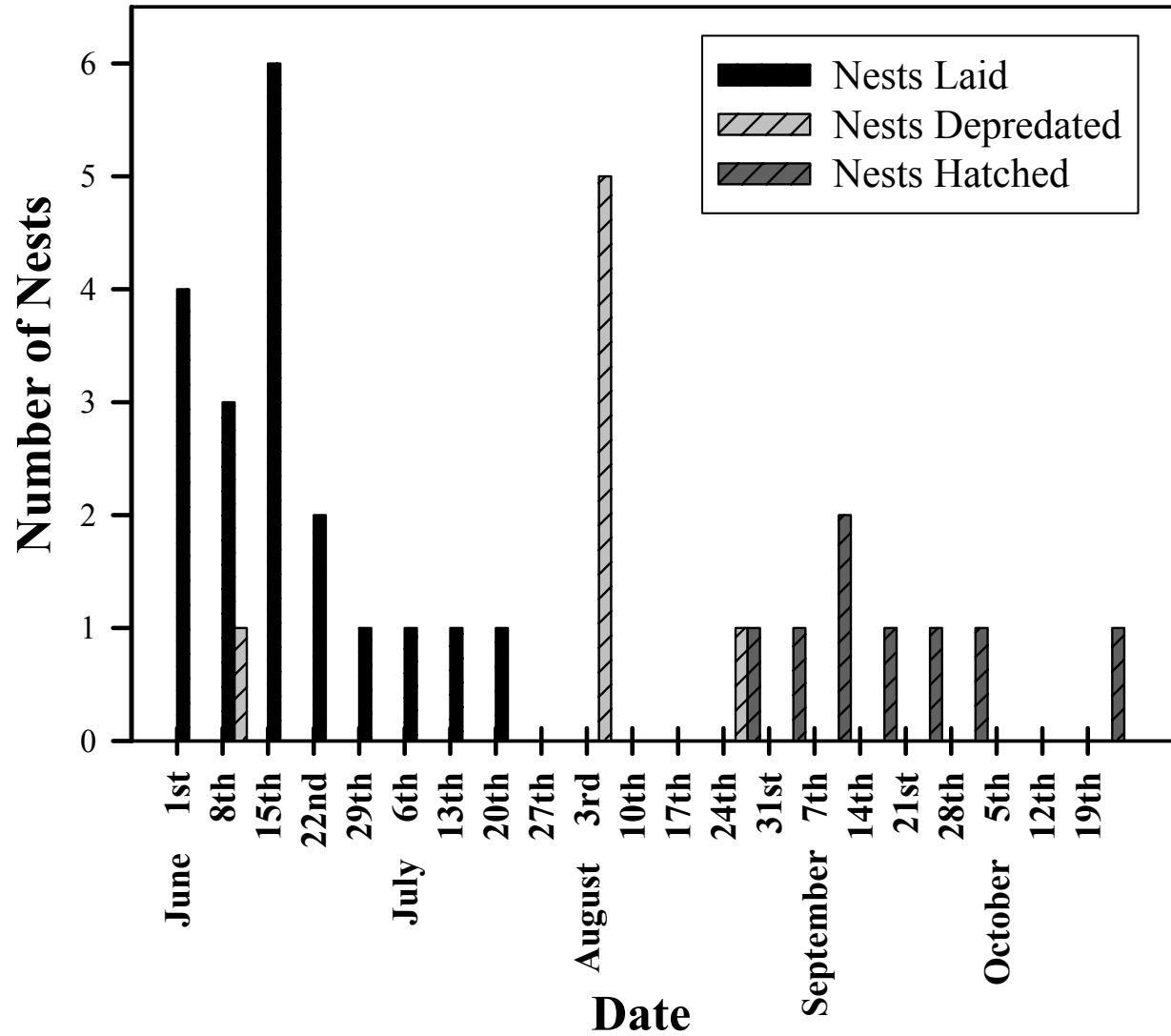
Methodology

- **Radio-transmitter Attachment**
- **Radiographic Analyses**
- **Nest Location**
- **Hatchling Capture and Monitoring**

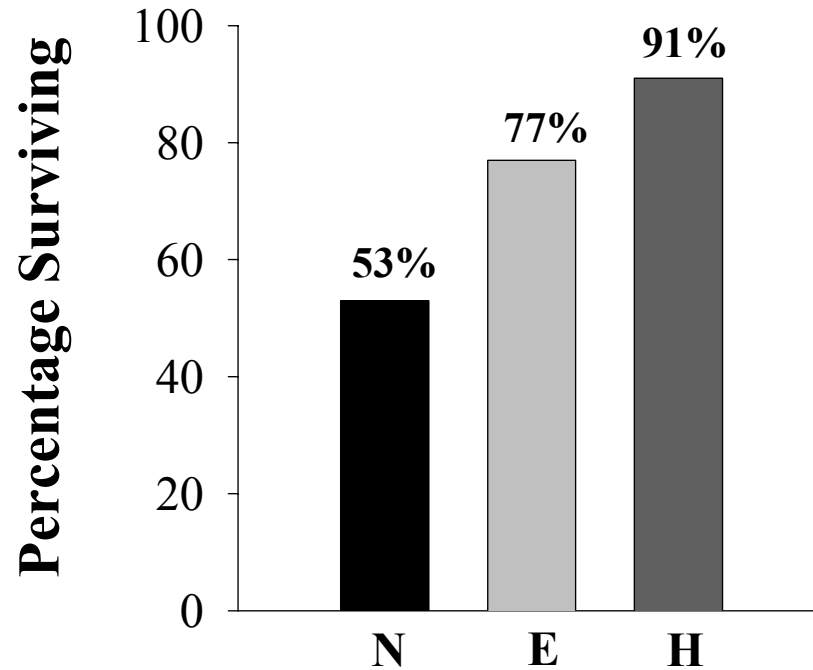
Results

- **Field Season Timeline**
- **Stage-Based Survivorship**
- **Female Reproductive Output**
- **Nest and Egg Characteristics**
- **Hatchling Metrics and Dispersal**

Field Season Timeline

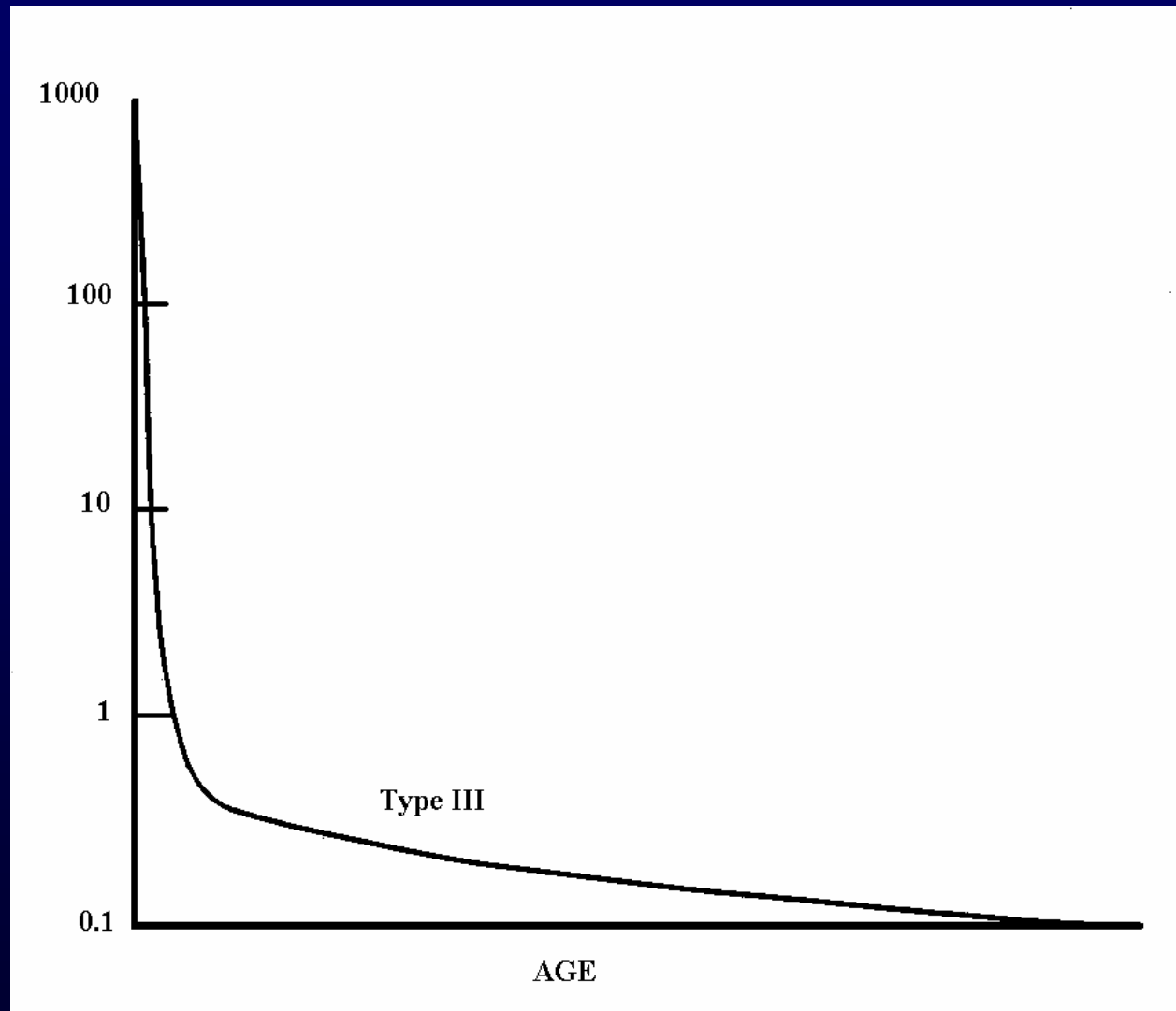


Stage-Based Survivorship



- N** Nest Survivorship (n=17)
- E** Egg Hatching Success (n=39)
- H** Hatchling Survivorship (n=11)

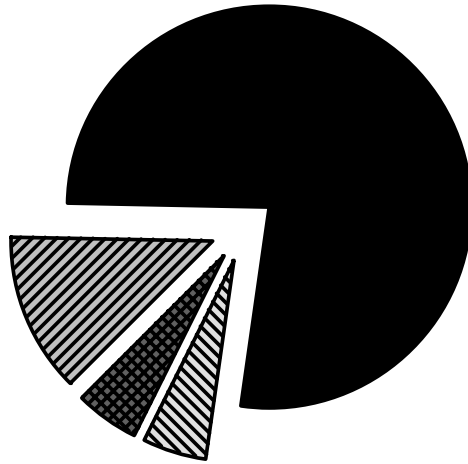
■ Similar Trends, But Different Scales



Nest Mortality

- 47% of nests were depredated
- Most Nests destroyed during a one week period
- Kit Foxes Implicated by circumstantial evidence

Hatching Success of Tortoise Eggs (n=39) from Surviving Nests (n=9)

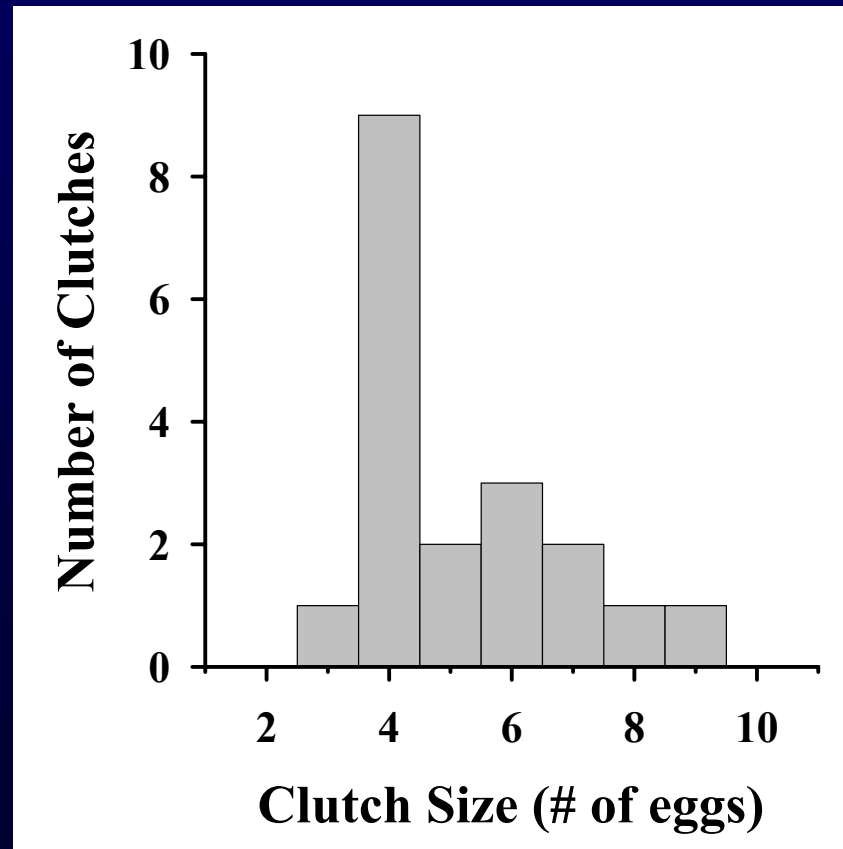


	Hatched and Emerged 77%
	Failed to Hatch 13%
	Eggs Broken in Nest 5%
	Hatchlings Trapped in Nest 5%

Female Reproductive Output

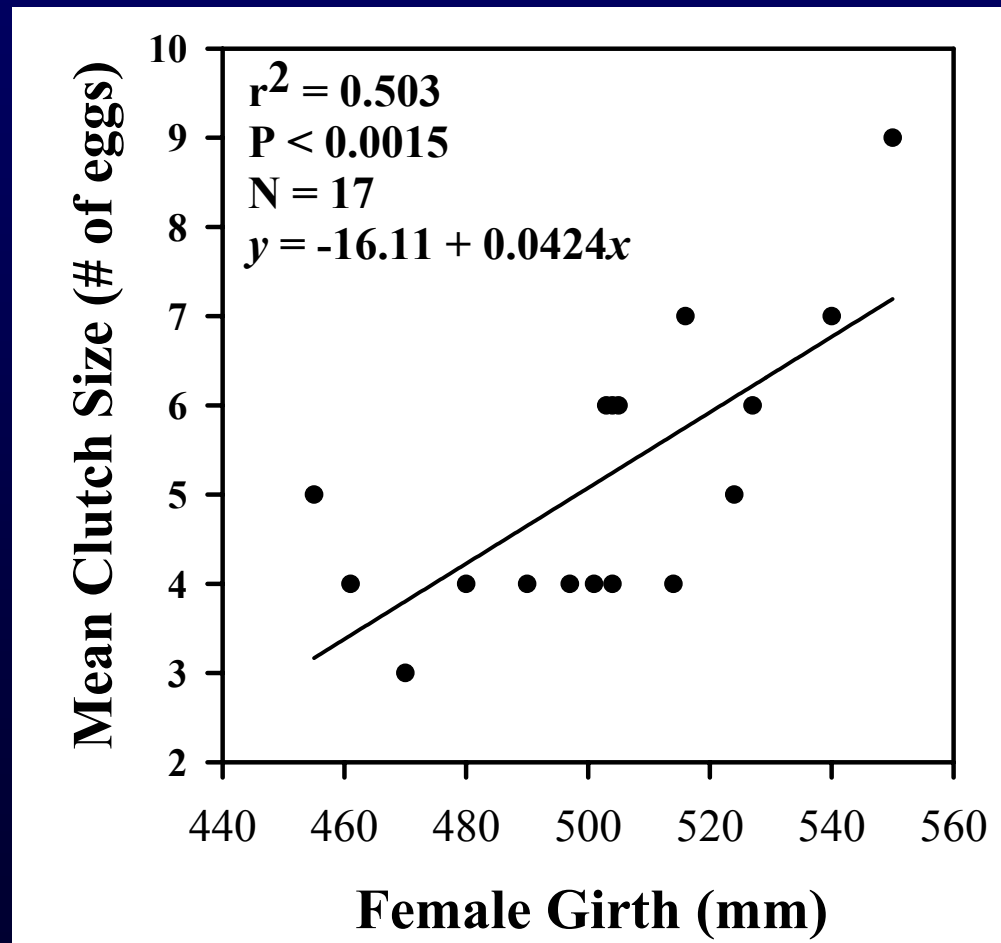
- Clutch Size Distribution

- ◆ Mean clutch size = 5.2 eggs



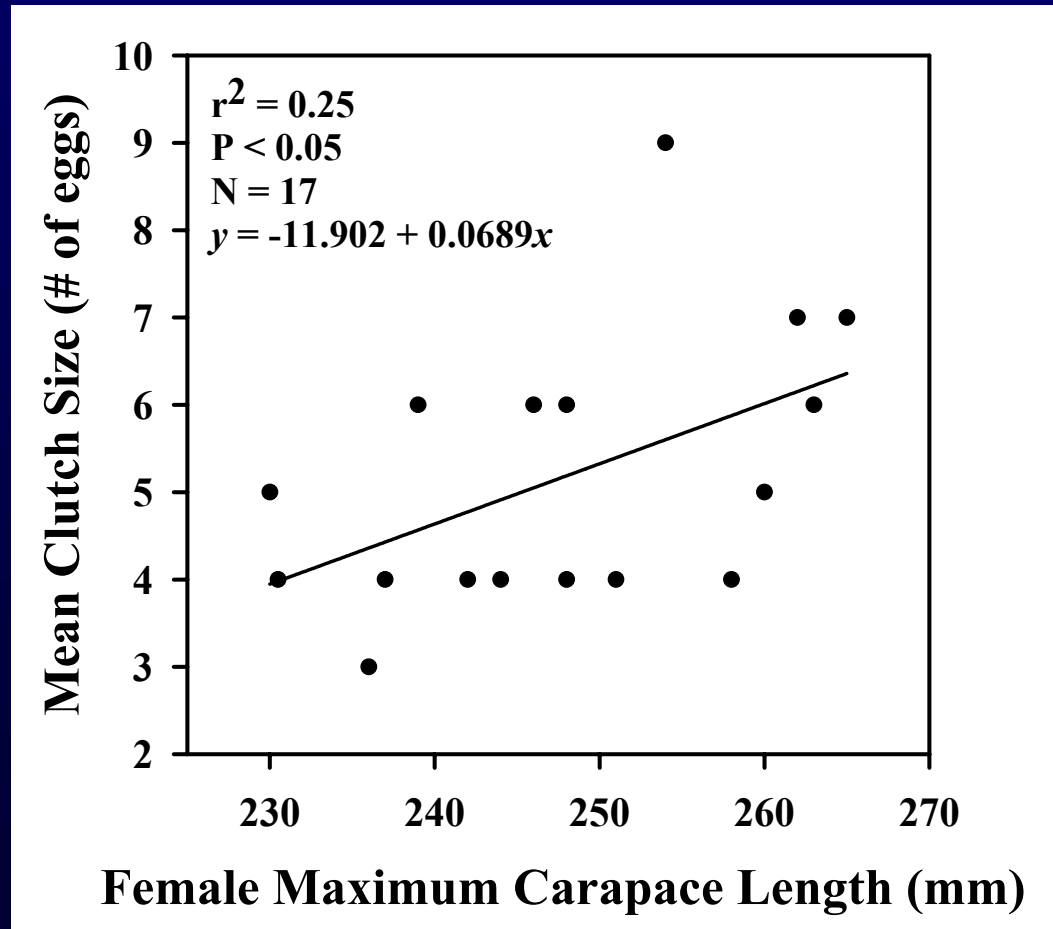
Regression of Clutch Size on Female Girth

- 23.6 mm increase in girth = one egg increase in clutch size



Regression of Clutch Size on MCL

- 14.5 mm increase in MCL = one egg increase in clutch size

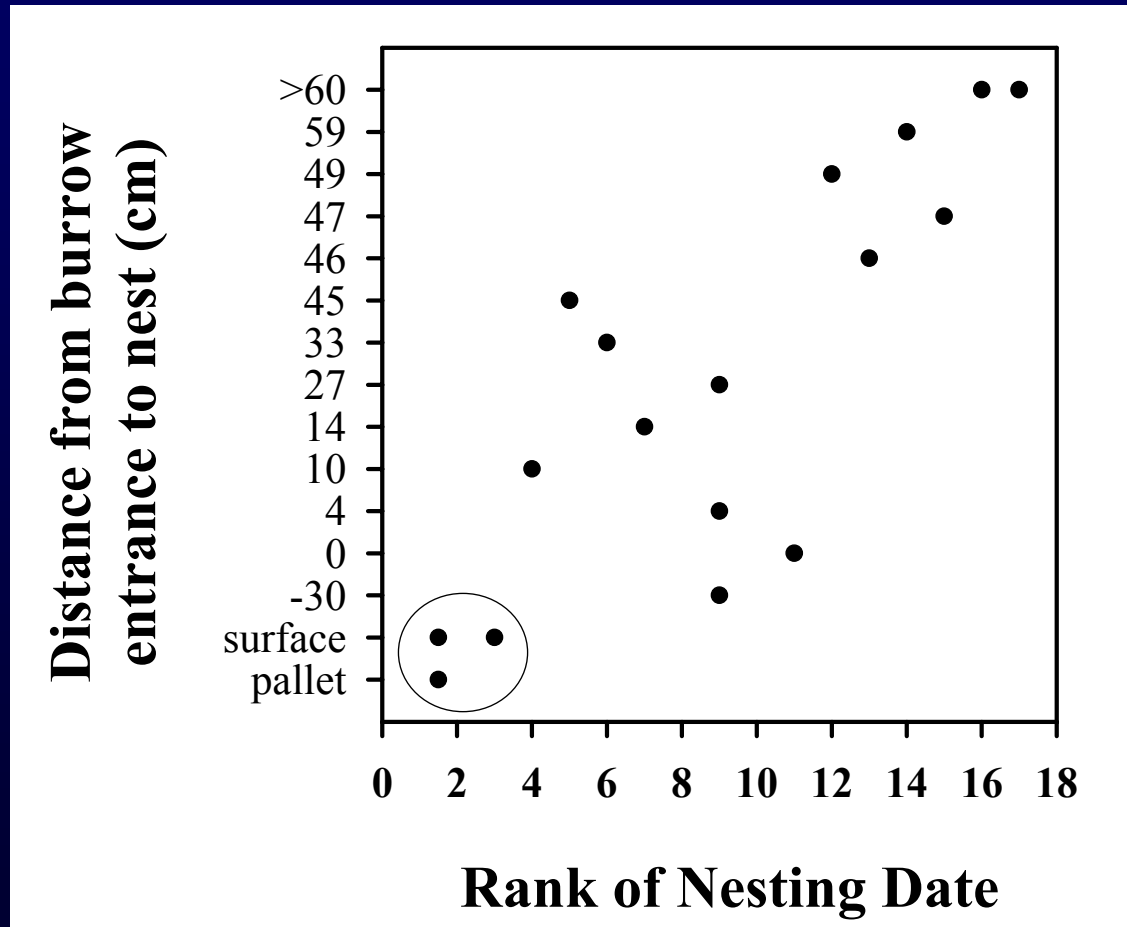


Nest and Egg Characteristics

- 82% of nests were associated with burrows
- Other nesting sites
 - ◆ one laid within a tortoise pallet
 - ◆ two laid beneath *Larrea tridentata*

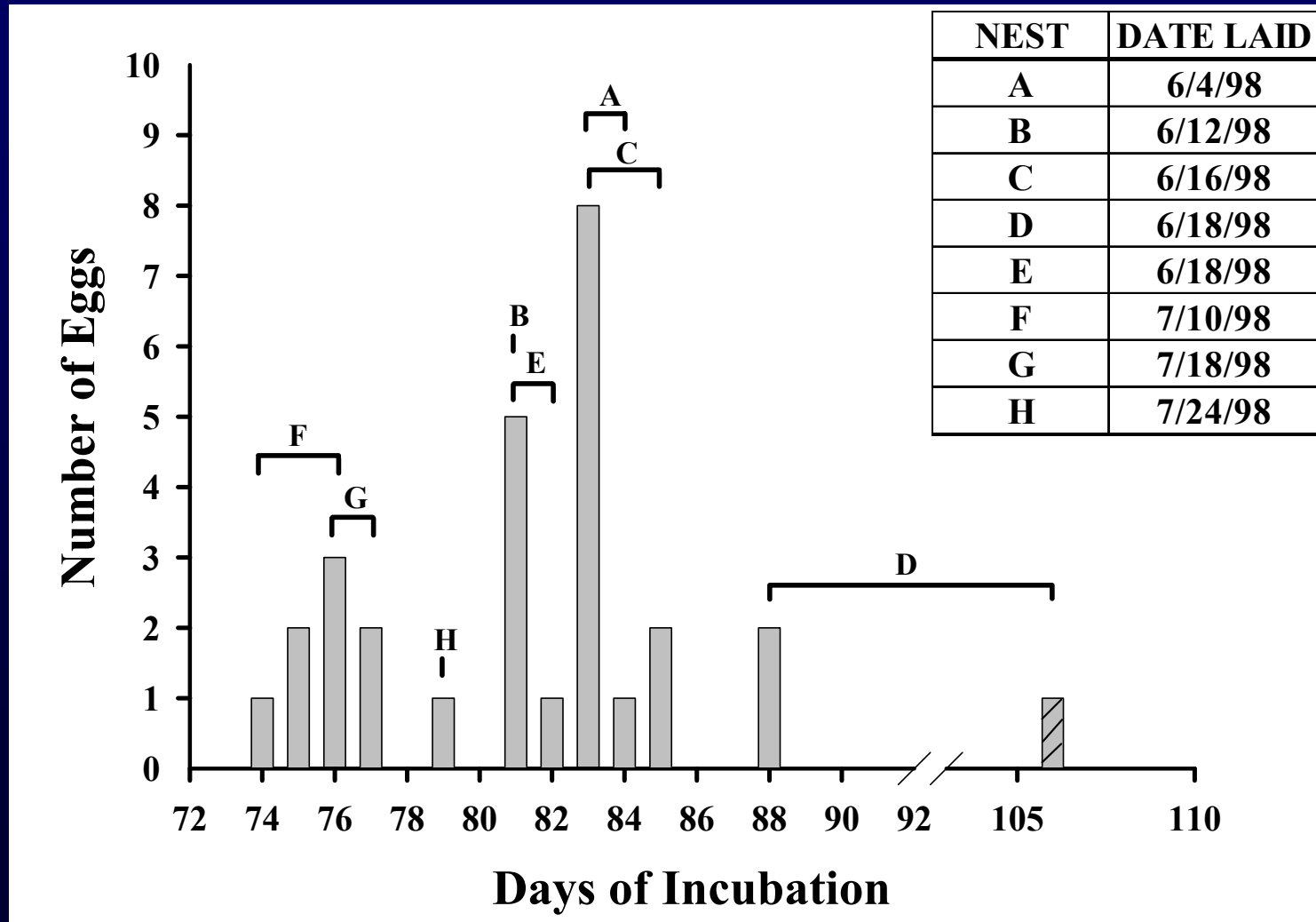
Nest Location as Function of Oviposition Date

- Spearman's Rank Correlation $r = 0.6807$ $P < 0.01$



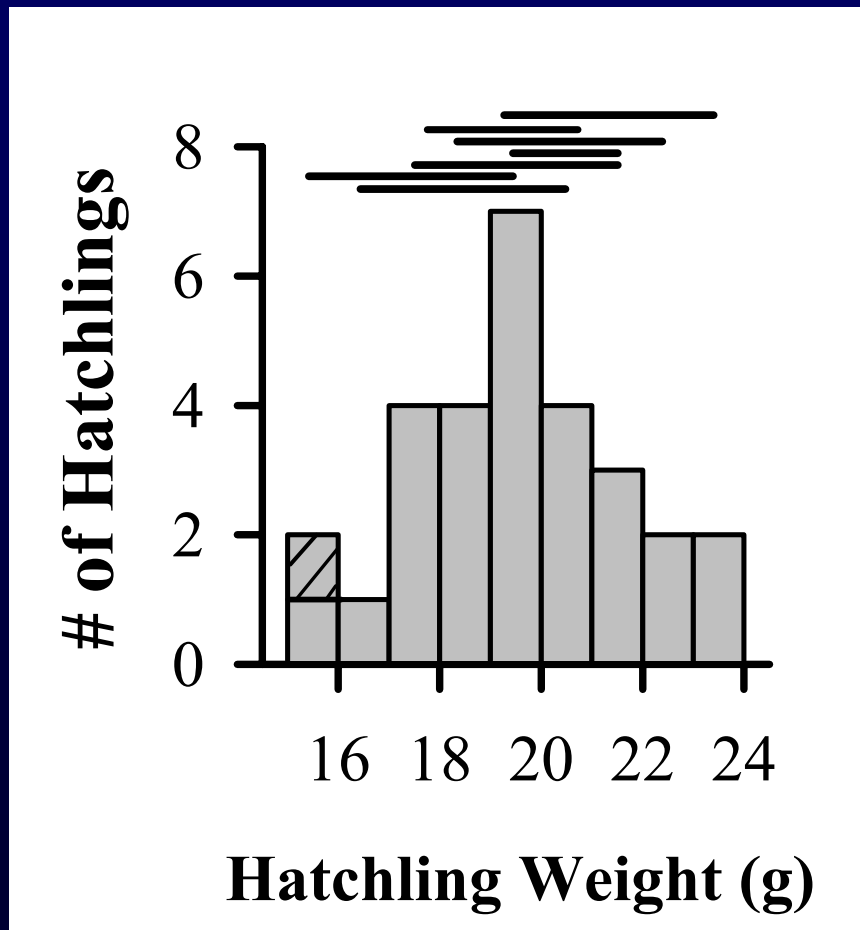
Incubation Time for Eggs in Natural Nests

- Mean = 80.9 days



Hatchling Metrics and Dispersal

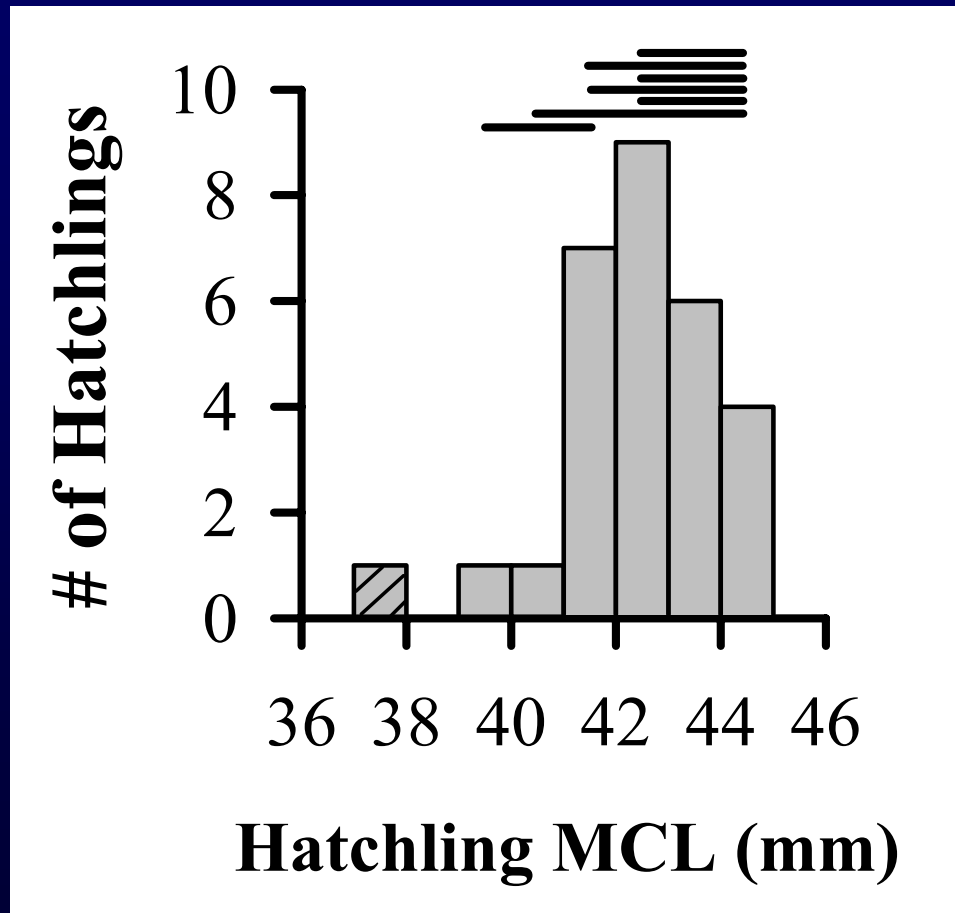
- Weight Distribution



Mean Weight = 19.6 g

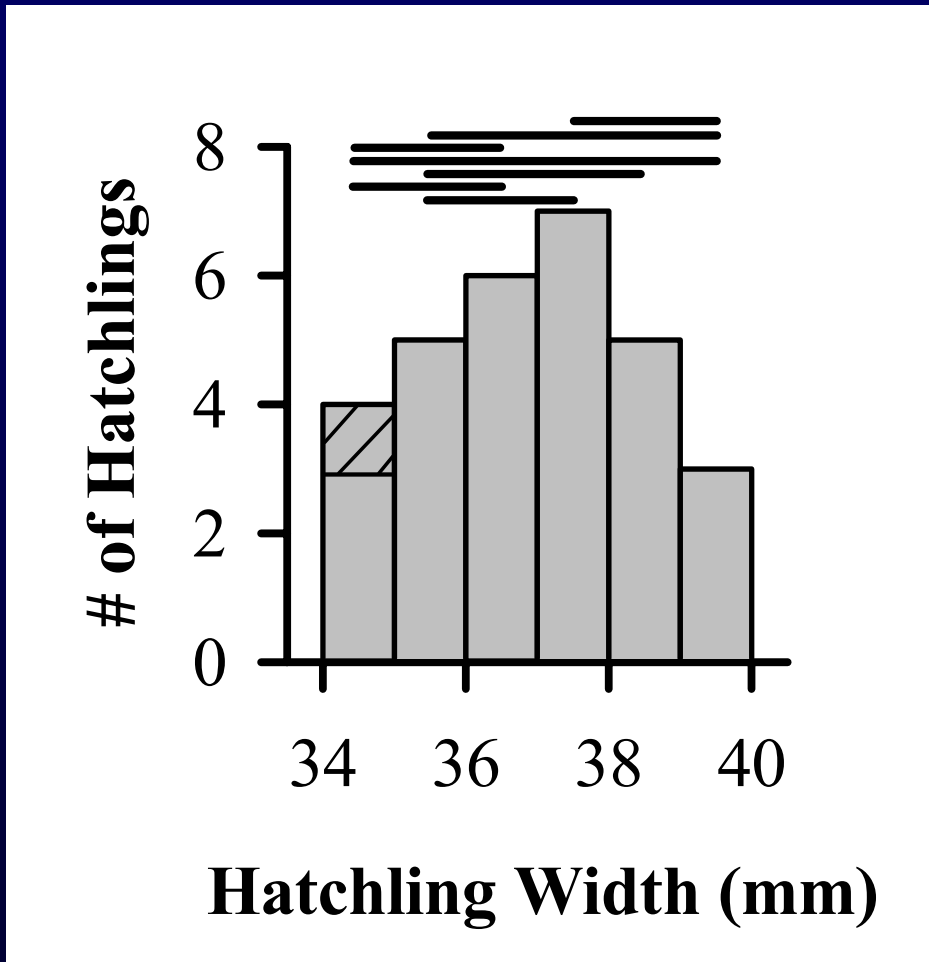
Sd_{we} = 2.04

■ Hatchling Maximum Carapace Length Distribution



Mean MCL = 42.5 mm
Sd_{MCL} = 1.27

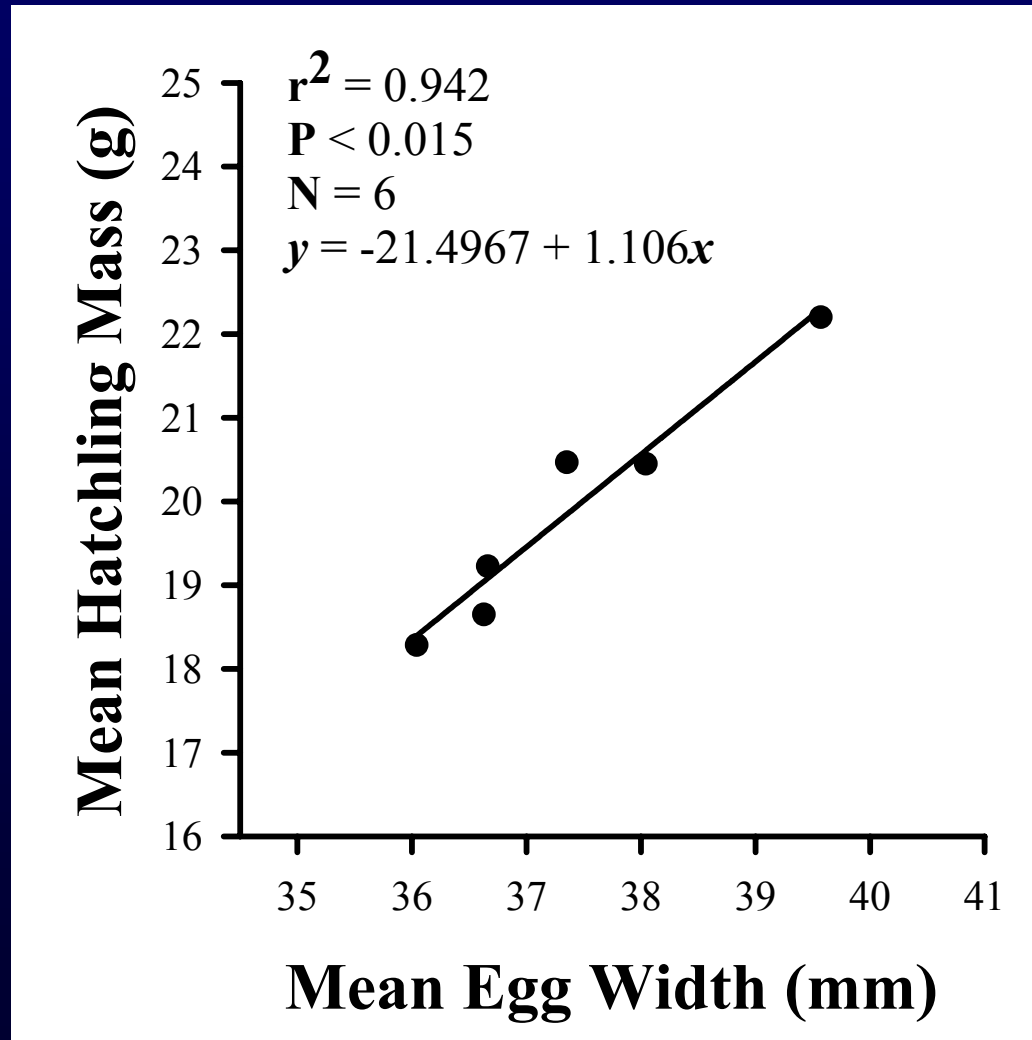
■ Hatchling Width Distribution

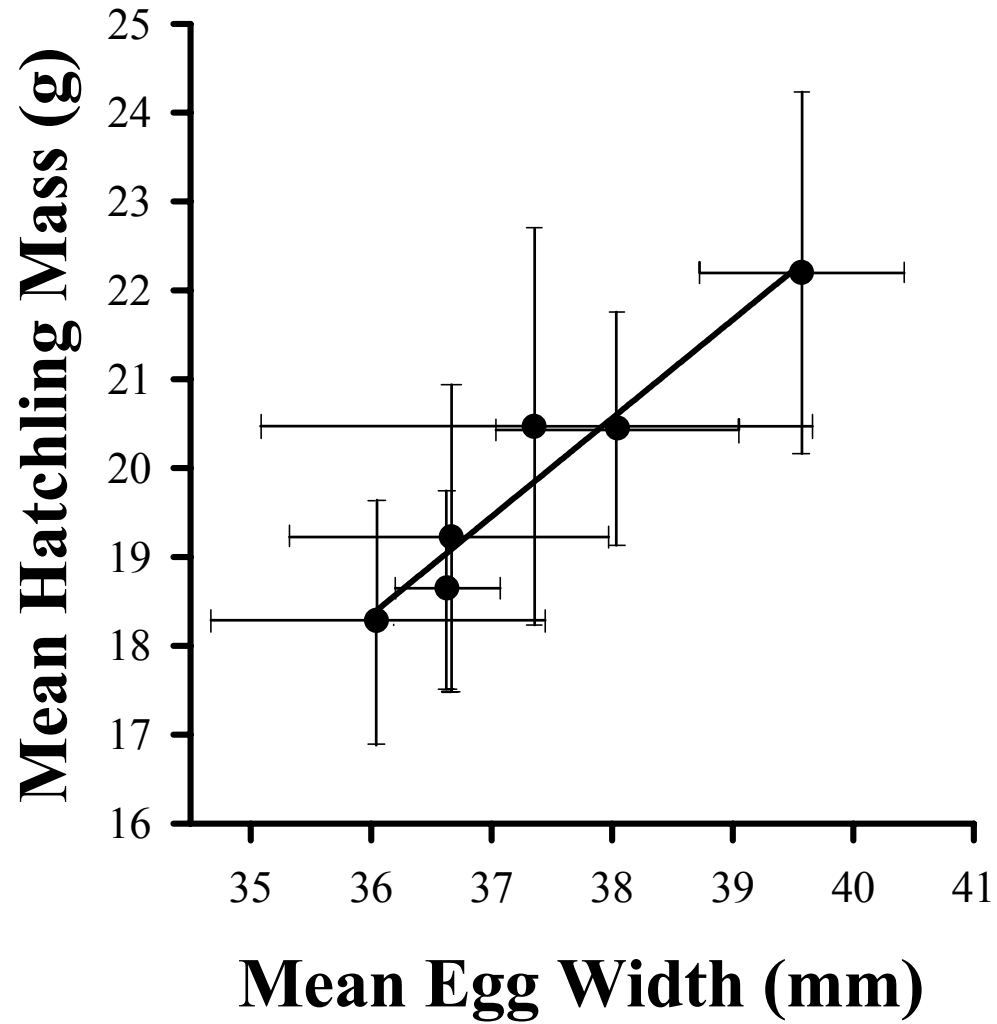


Mean Width = 37.0 mm

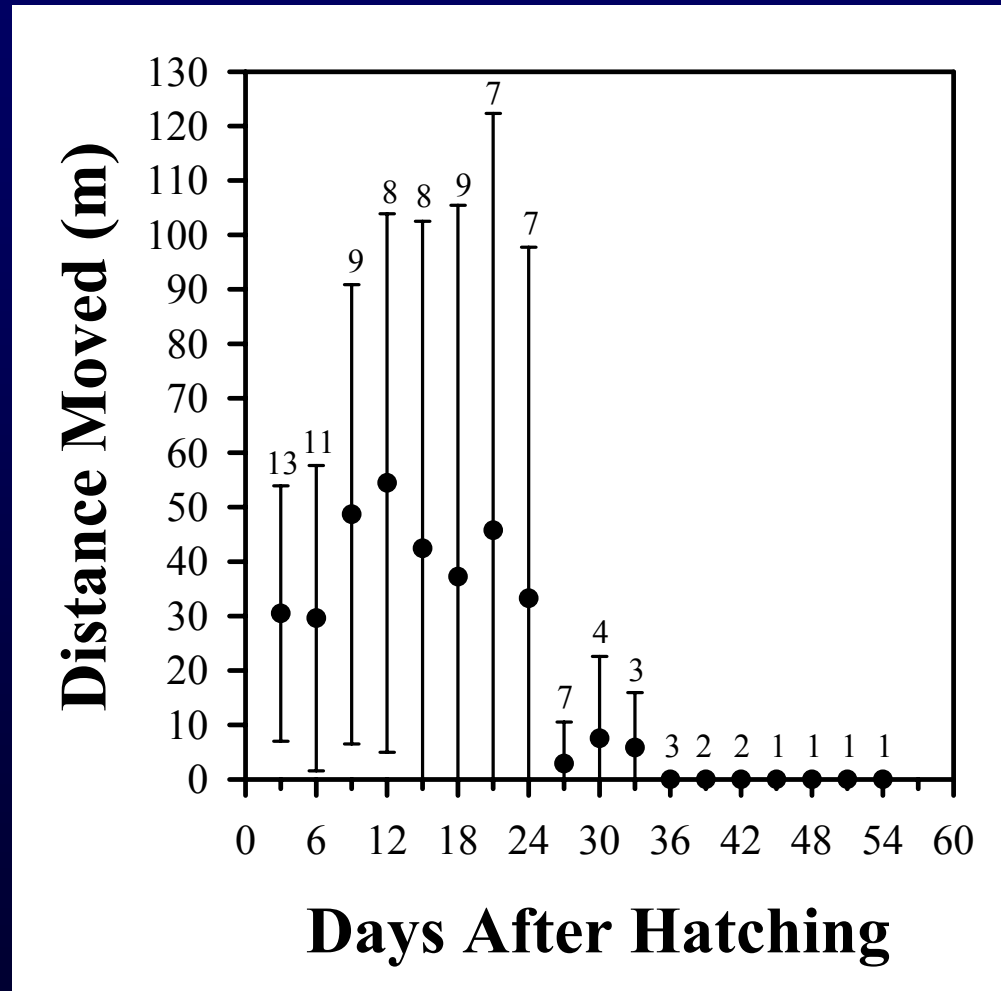
Sd_{wi} = 1.39

Regression of Mean Hatchling Mass on Mean Radiograph Egg Width

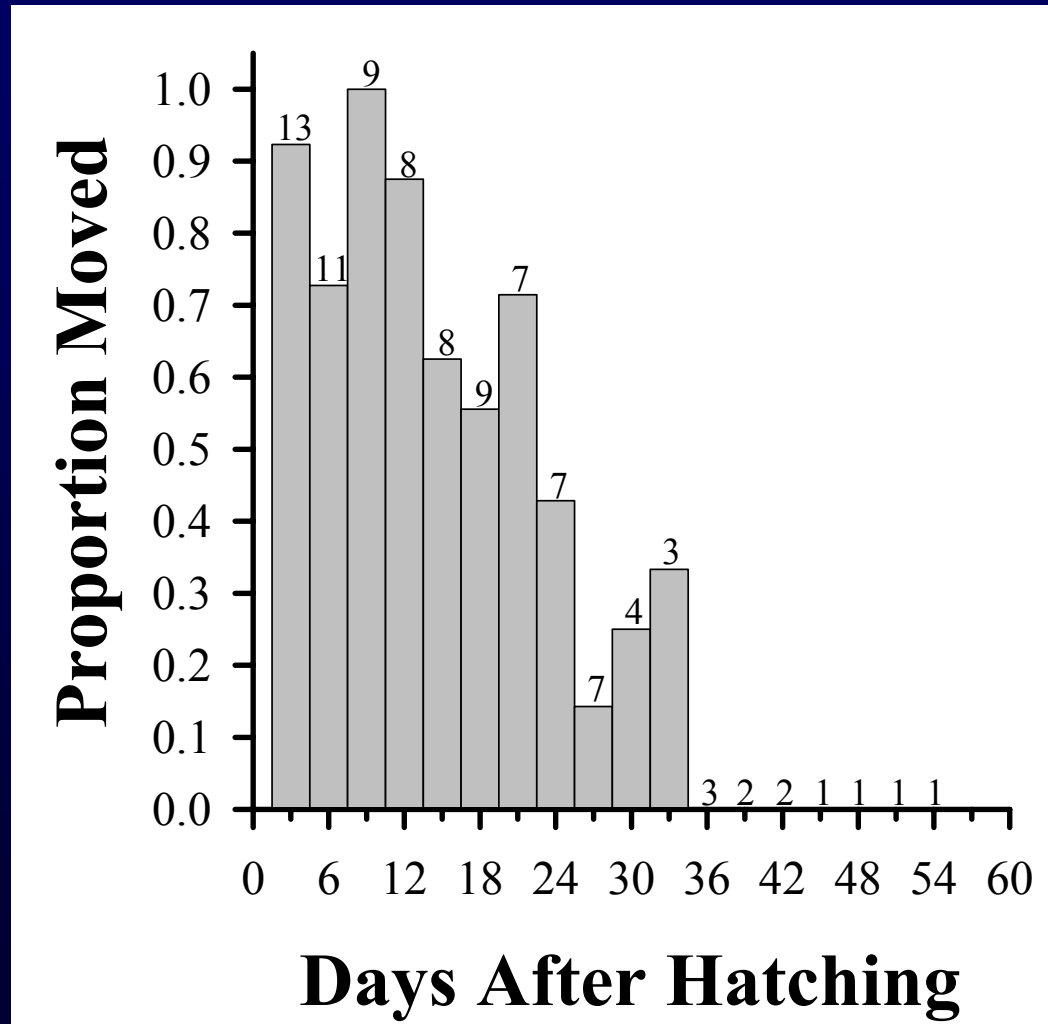




Hatchling Dispersal Distance During Three-Day Intervals After Emergence



Proportion of Hatchlings that Moved During Three-Day Intervals after Emergence



Conclusion

- **Survivorship during early life history stages is higher than expected**
- **Female Girth is a good predictor of clutch size**
- **Most nests are associated with tortoise burrows and nest location changes by oviposition date**
- **Hatchling Dispersal completed in first month after emergence from the nest**

Acknowledgements

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