

Comparing the accuracy of egg candling and egg floatation to estimate the hatching date of northern bobwhite clutches

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Natural Resources Management

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Historical

- Candling
 - Used a flame
 - Flashlight
 - Floating
- Both were described by Westerskov in 1950
 - Individual species followed for both techniques
 - Pheasants
 - Starlings
 - Ducks
 - Quail



Descriptions

- Candling

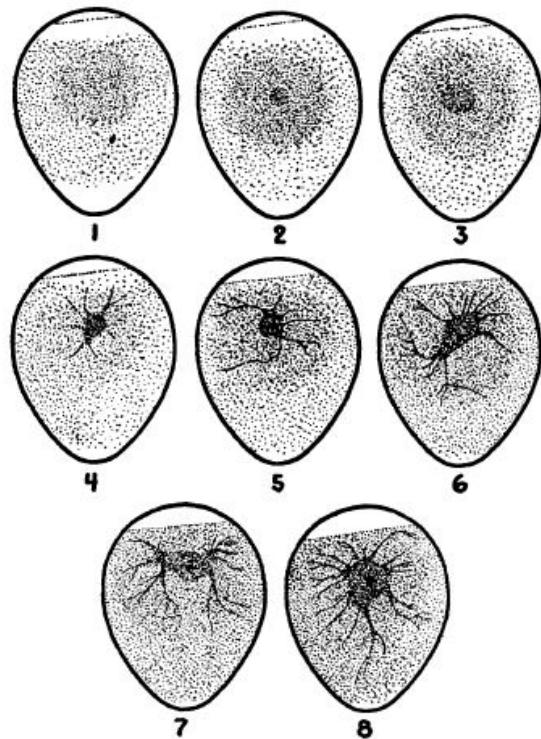


FIG. 5. Candled pheasant eggs during the first week of incubation. From the ninth day the egg is dark and opaque.

- Floating

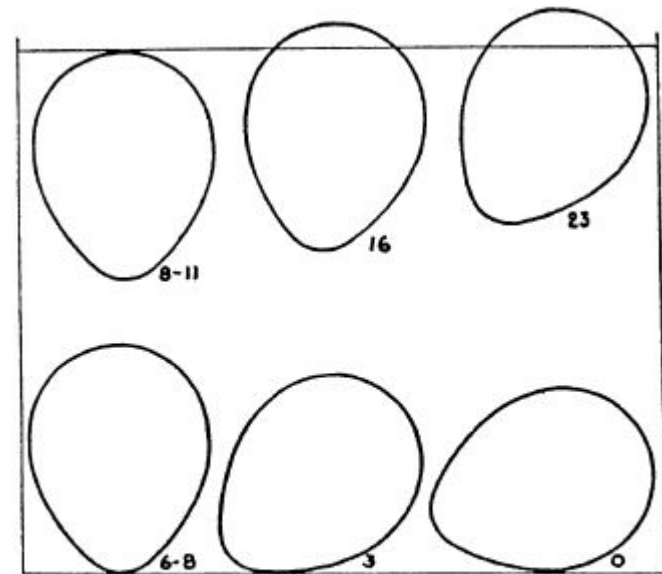


FIG. 1. The change in position of an incubated pheasant egg when put in water. Numbers indicate day of incubation.

Westerskov 1950

Why?

- Quail are extensively studied
- Early stage of life – knowledge is lacking
- Accuracy
- Time sensitive
- Currently, we don't have the information on the method accuracy as it relates to the actual hatch date.



Objectives

- Determine the accuracy of each estimation technique
- Researcher accuracy based on the available techniques
- Does uses of these techniques cause abandonment



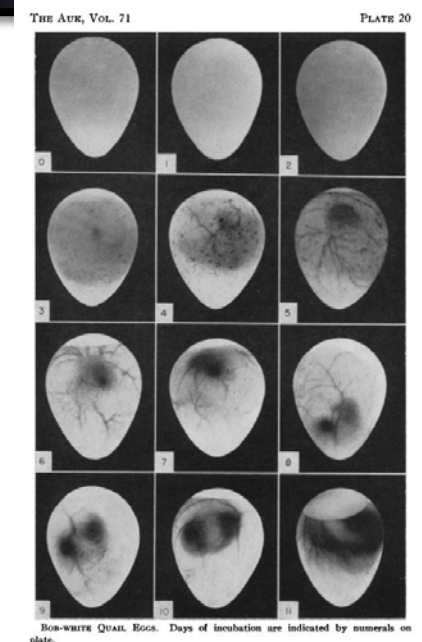
Methods: Field

- VHF hens (6666 Ranch; Guthrie, TX)
- Monitored 2X week (homing)
 - 4X week
- Nests were located (hen feeding)
- Close to estimated hatch date: daily
- Work > 50m from nest
- Based on a 24day incubation
- 2 observers (5+ yrs)



Field: Candling

- Mini- MagLite©LED(97 lumens)
 - Removed the lens
- Dark green towel
- Candled each egg in the clutch
- Hanson 1954



Hanson 1954

Field: Floating

- 100 ml glass beaker
- Ambient temp water
- All eggs were floated first to reduce any bias
- Westerskov 1950

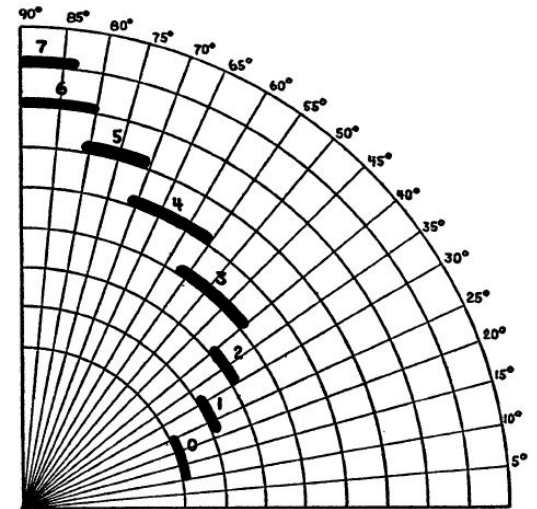


FIG. 2. Increase in egg-angle in pheasant eggs tested in water during the first week of incubation. Large numbers indicate day of incubation.

Westerskov 1950

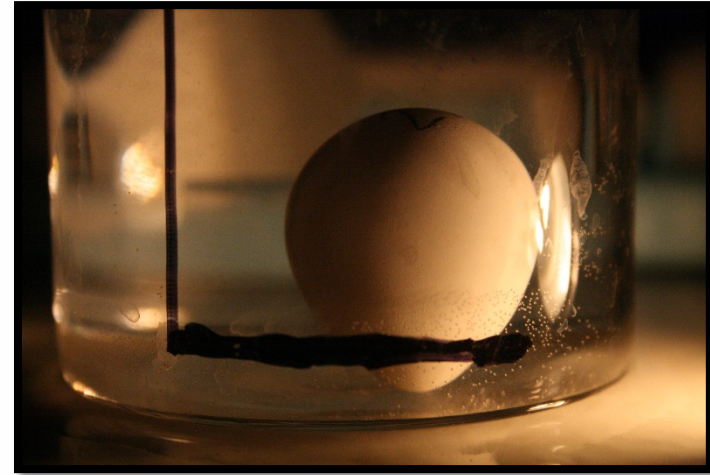
Methods: Lab (TTU)

- 110 pen raised bobwhite eggs
 - Randomized groups of eggs
 - 5-15 egg groups
 - Staggered
- Commercial incubator
 - 37C w/ 55% humidity
- 3 novice observers (individually)
- Same estimation techniques used
 - Hanson 1954 (candle)
 - Westerskov 1950 (floating)



Methods: Stats

- Julian dates
- [true hatch date – estimated hatch date]
 - 24 day incubation period
- [float-candle]
- Linear regression
 - Accuracy of each estimation method



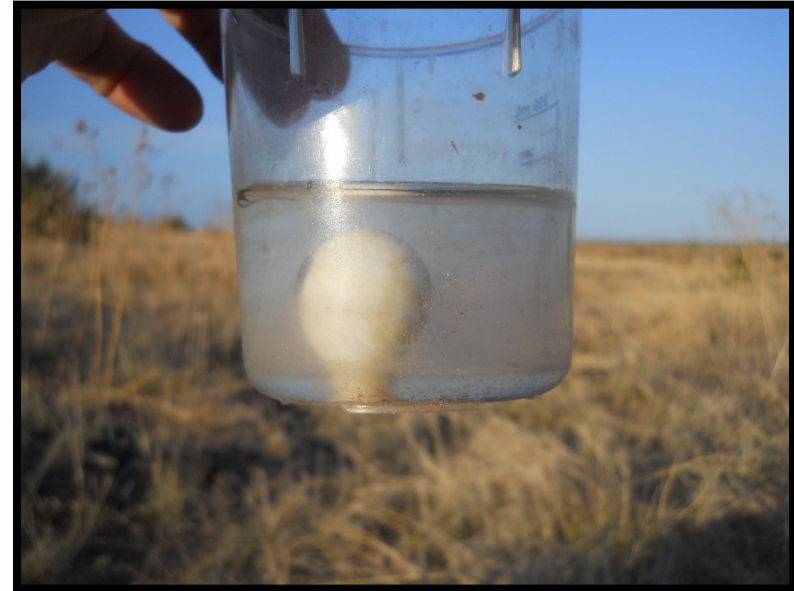
Results: Field

- Floating and candling
 - Slight overestimation for newly found nest
 - Candling: $1.21 \text{ d} \pm 0.92$
 - $\beta = 0.43, t = 3.75, \text{p-value} = 0.001$
 - Floating: $0.89 \text{ d} \pm 0.97$
 - $\beta = 0.53, t = 4.79, \text{p-value} = 0.001$
 - $\text{SE} = 1.07 \text{ d}$
 - ($n = 47; R^2 = 0.993; \text{p-value} = <0.001$)
 - Close to within a 24hr period

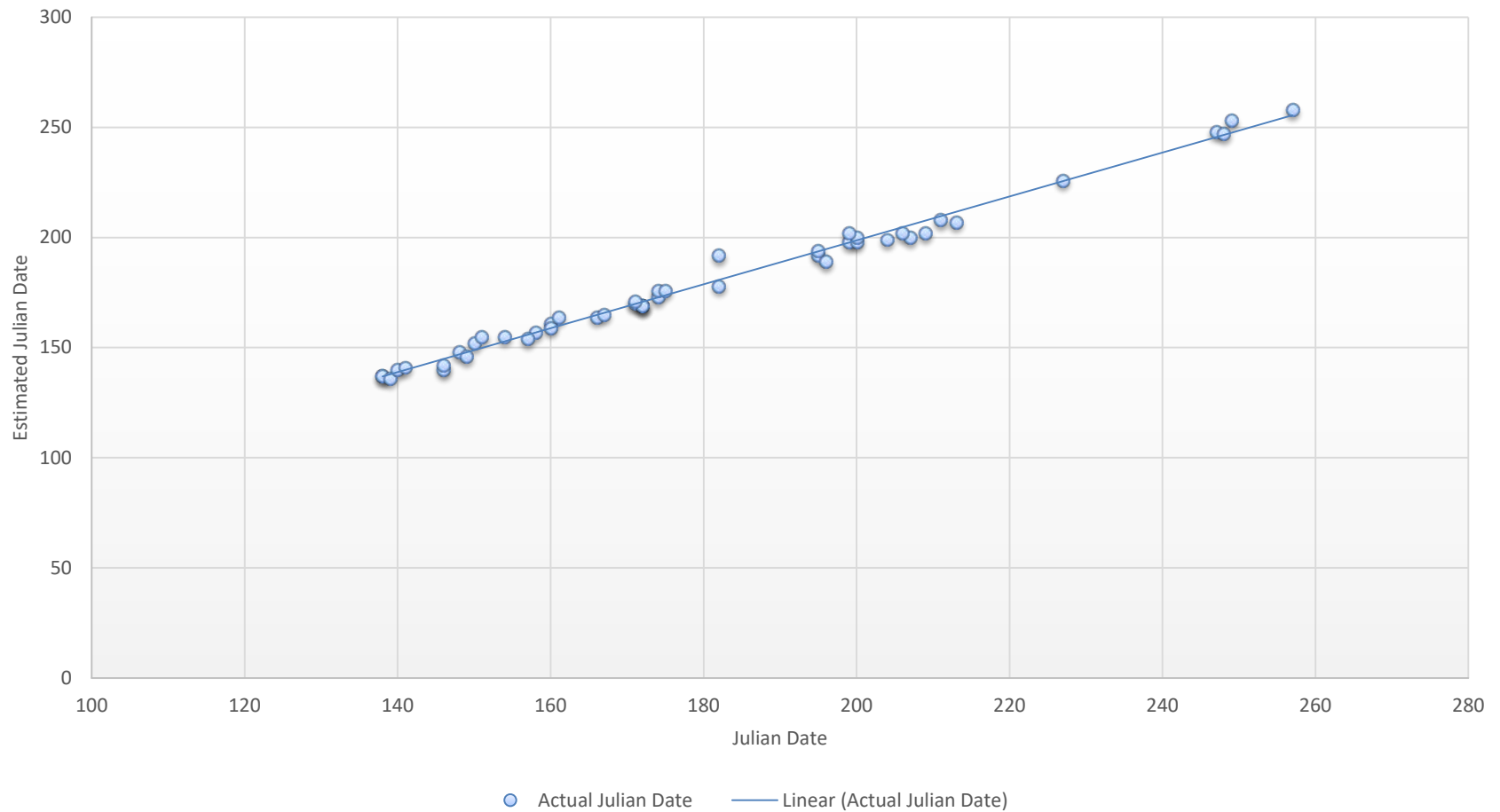


Results: Field

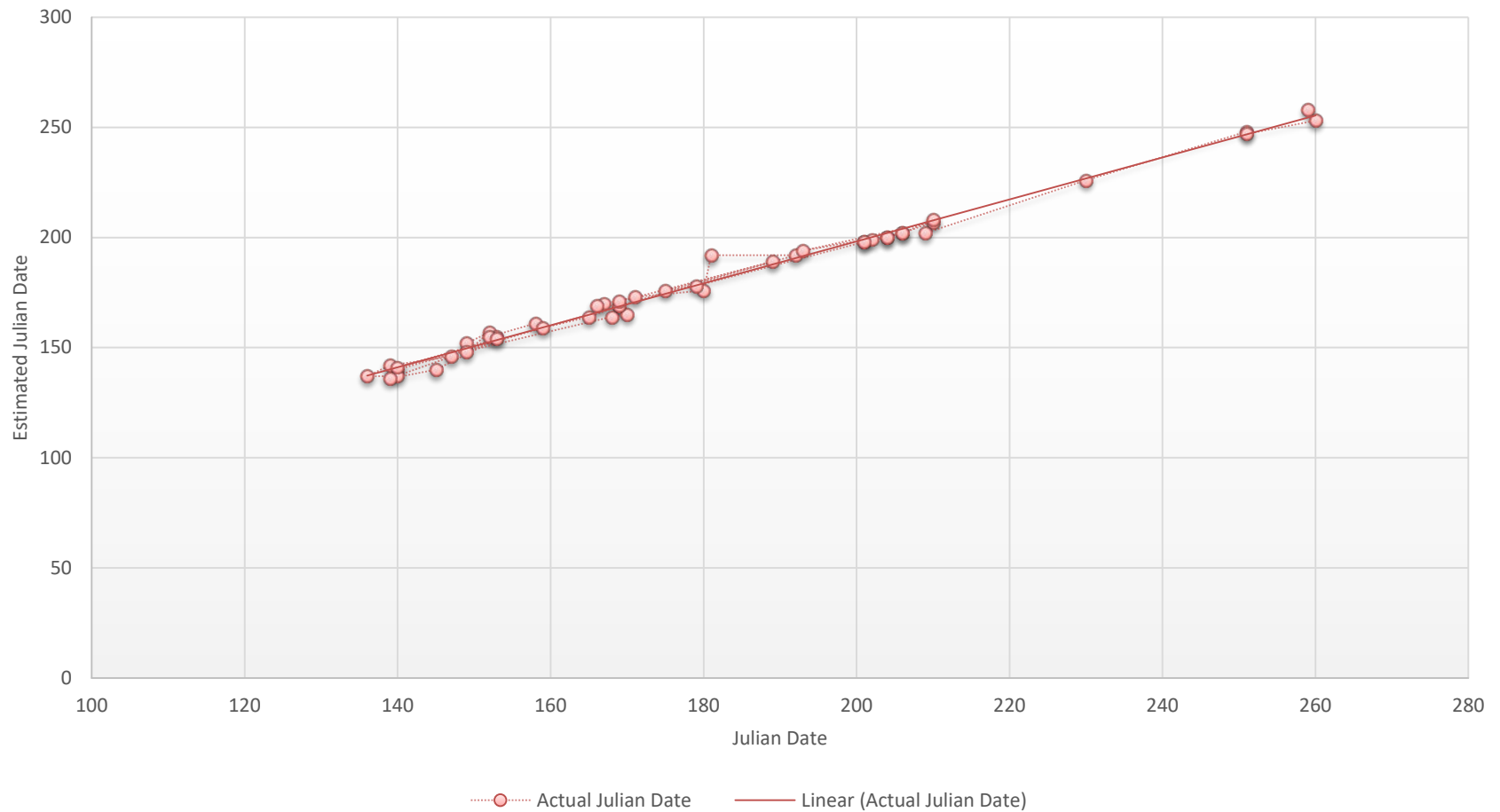
- Candling
 - Was correct 43%
- Floating
 - Was correct 53%
- N=47



Candling



Floating



Result: Control

- Highly variable: Dependent on the person
- 2 observers estimated the hatch day correctly
 - Floating:
 - observer 1: $\beta = 0.23$, $t = 2.80$, p-value = 0.006
 - observer 2: $\beta = 0.47$, $t = 5.52$, p-value = <0.001
 - Candling:
 - observer 1: $\beta = 0.30$, $t = 4.00$, p-value = 0.006
 - observer 2: $\beta = 0.219$, p-value = <0.010)
- 1 observer was unable to correctly estimate hatch
 - Floating: $\beta = -0.001$, $t = -0.013$, p-value = 0.684
 - Candling: $\beta = 0.043$, $t = 0.40$, p-value = 0.990



Abandonment/Hatchability

- 0.06% of the nest were abandoned
- Causes were
 - 1) weather related
 - 2) predators (snakes?)
 - 3) Livestock (cattle)
- N = 80
 - 80/47 based on number of nest that were not depredated
 - 5 confirmed abandoned



Discussion

- Both methods are viable
- To within a ~day (when all eggs are measured)
- Pros
 - Candling: See fertile eggs
 - Floating: Easy daylight use
- Cons
 - Candling: Need dark area
 - Floating: Cracked eggs/pipping



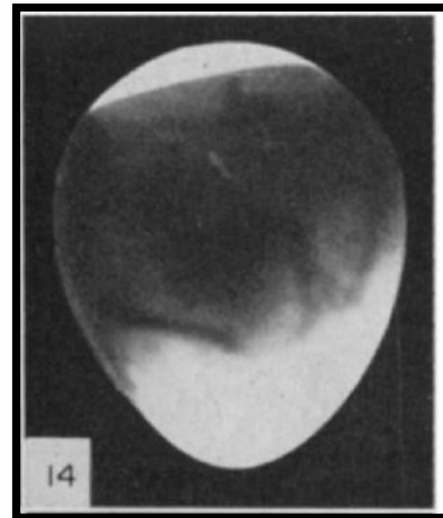
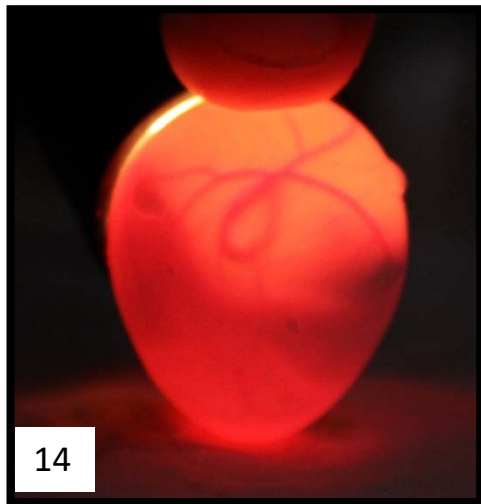
Discussion

- Observer need practice prior to conducting field research
- Training is necessary to prevent early errors



Future

- Working on a manuscript
- HD photos to update the plates
- Better estimates techniques



Acknowledgement

- Quail-Tech Alliance board members
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- Army of technicians and
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Questions

