

A Preliminary Forensic
Entomology Study
in Interior Alaska, USA

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Capstone Study
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Forensic Entomology

- Applies knowledge of arthropods to help solve criminal cases
- Can help to identify suspects
- Narrows down estimation of the Post Mortem Interval (PMI - "time since death") using various insects and knowledge of the duration of their developmental instars



Why is this important ?

- Unstudied topic in Alaska
- Species in Alaska may differ from species of the lower 48 US states
- Important to know which Alaskan species are associated with decomposing corpses
- Solving crimes



Why is this important ?

Forensically

- PMI - Post Mortem Interval
- Relocation of corpse
- Victims lifestyle



Decomposition Stages

- Fresh - 1 - 3 days
- Bloat - 3 - 5 days
- Active decay - 8 -10 days
- Advanced decay -10 - 60 days
- Dry remains - 60+ days



<https://biosocal.com/what-are-the-stages-of-human-decomposition/>

Methods

- 1 pig, cut in half = 2 carrion sites

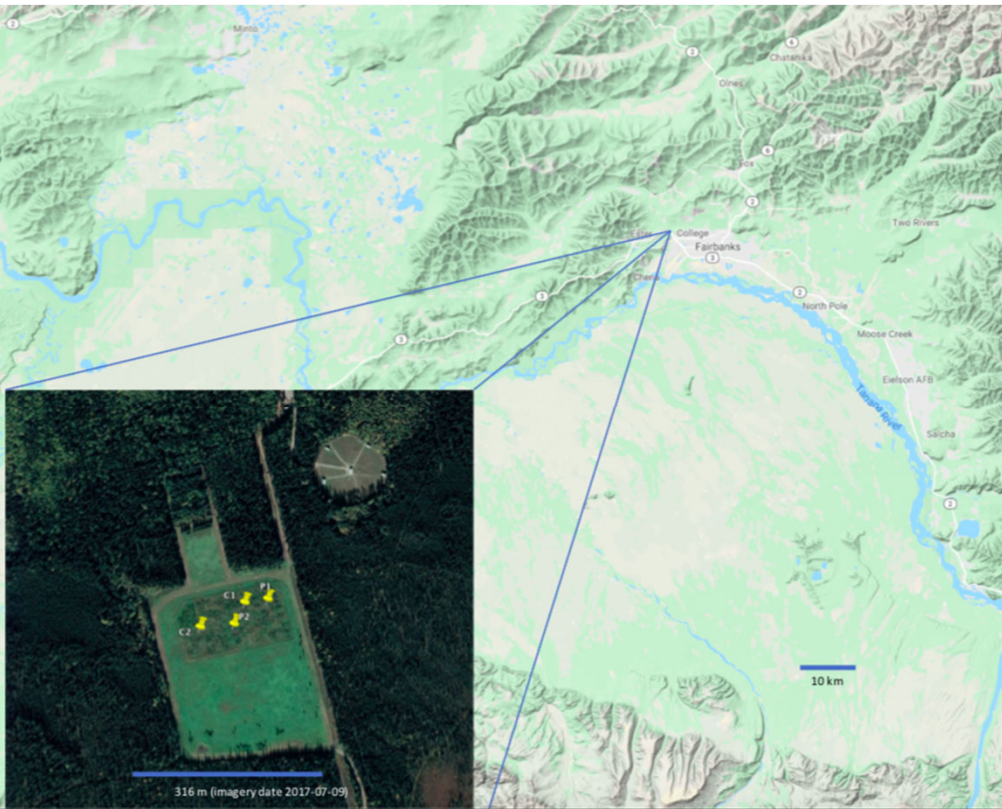
Why a pig?

- Readily available
- Similar to humans
 - hairiness
 - Muscle and fat composition



<https://www.quora.com/What-are-the-various-stages-of-decomposition-of-a-human-body>

Methods



Where :

UAF - Fenced in Campus T-field

Code	Latitude	Longitude
P1	64.871305°N	147.863849°W
C1	64.871244°N	147.864722°W
P2	64.870865°N	147.865126°W
C2	64.870833°N	147.866389°W

Methods

Field

- 4 pitfall traps
- 2 Pig halves
 - Caged
 - Fenced in T-Field
- Emptied traps weekly
 - Using filter cloths



Methods

Laboratory

- UAM Insect Collection
- Prepared museum specimens
- Identified using traditional methods
- Also tried DNA barcoding 4 specimens



DNA Barcoding

Lifescanner

- Makes identifying to species easier
- Easy to use
- Available to the public (\$40 for 4 vials)
- App format
- Results come to your cell phone



Target Taxa - Silphidae

"Large Carrion & Burying beetles"

- Attracted to carrion for reproduction and food source
- Well known forensically important taxon



SN: JSC084355Nic
pw: 5.7 mm, male, *Nicrophorus investigator*



Target Taxa - Staphylinidae

“Rove beetles”

- Species-rich predators
- Indicators of season of death and possible corpse relocation
- Focused on large-bodied rove beetles ($\geq 9\text{mm}$) - all subfamily Staphylininae



Target Taxa - Carabidae

“ Ground beetles ”

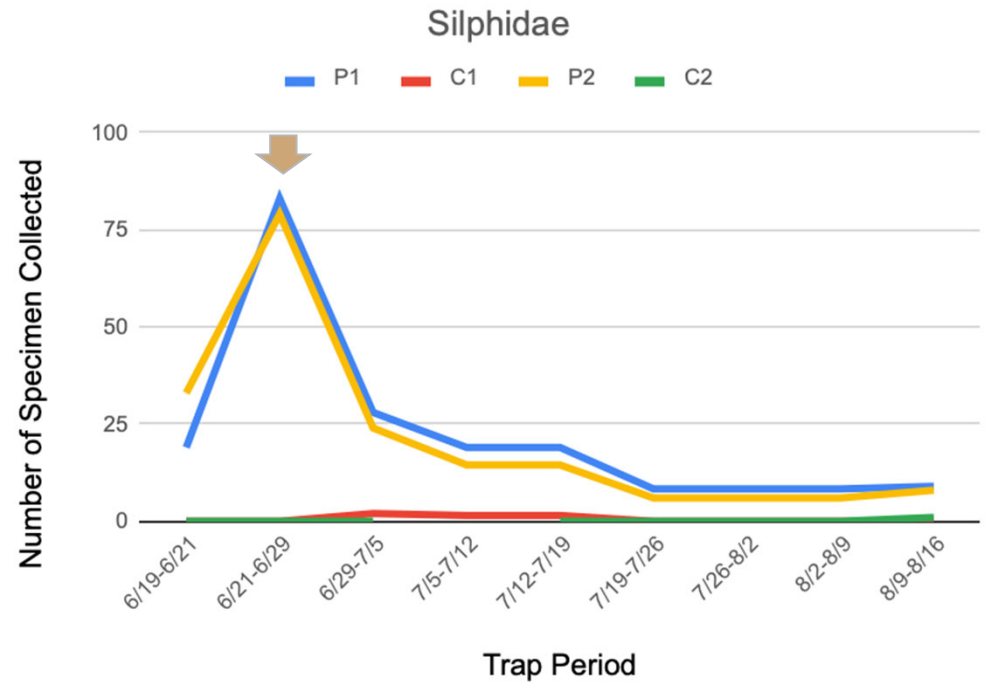
- Species-rich predators
- Can alter the developmental succession on a corpse
- Curious to see relationship to corpse decomposition
 - Prediction: greater abundance in earlier successional stages - prey on carrion insects
 - not strongly tied to carcasses



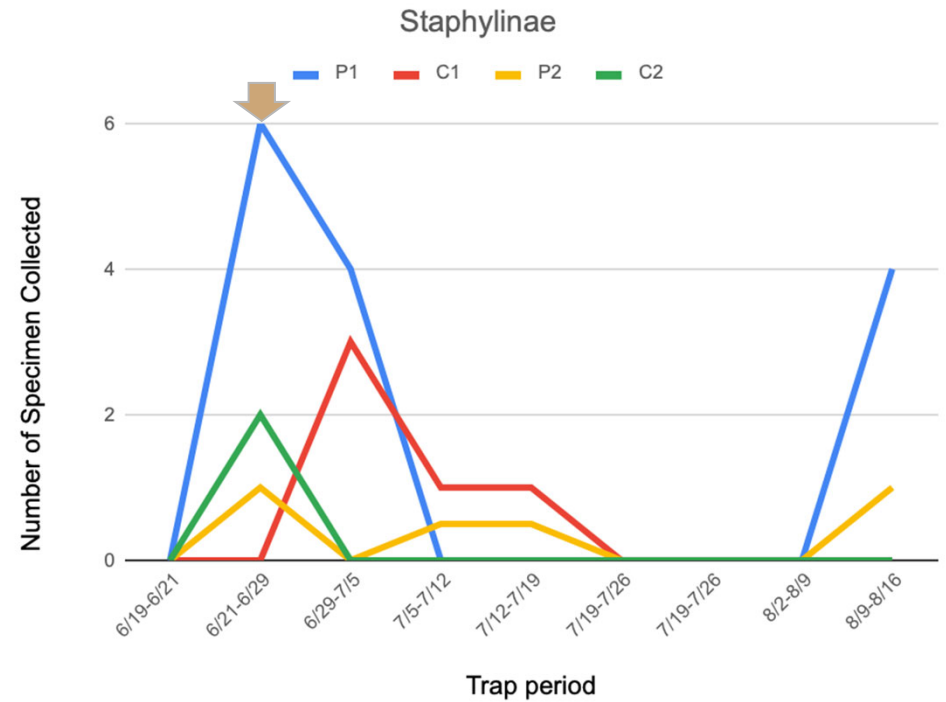
Results - Silphidae



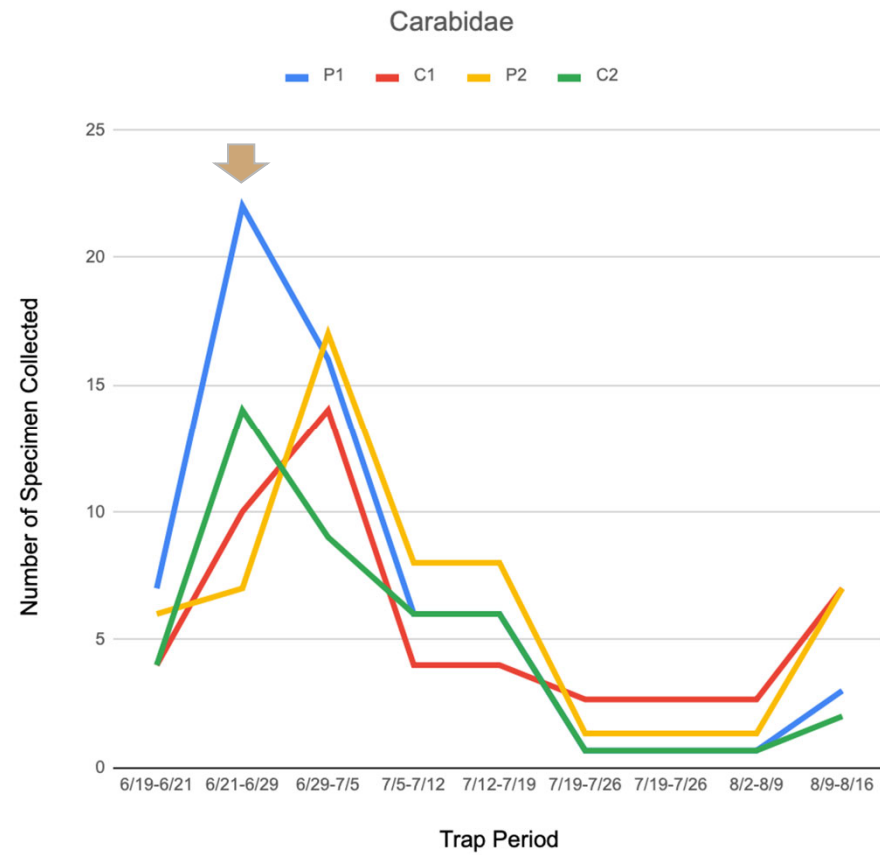
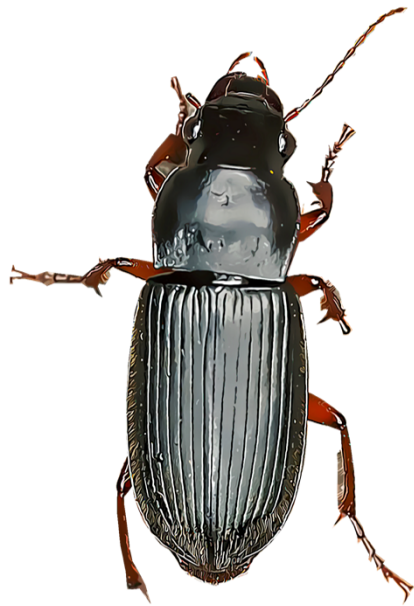
SN: JSC084355Nic
pw: 5.7 mm, male, *Nicrophorus investigator*



Results- Staphylinidae



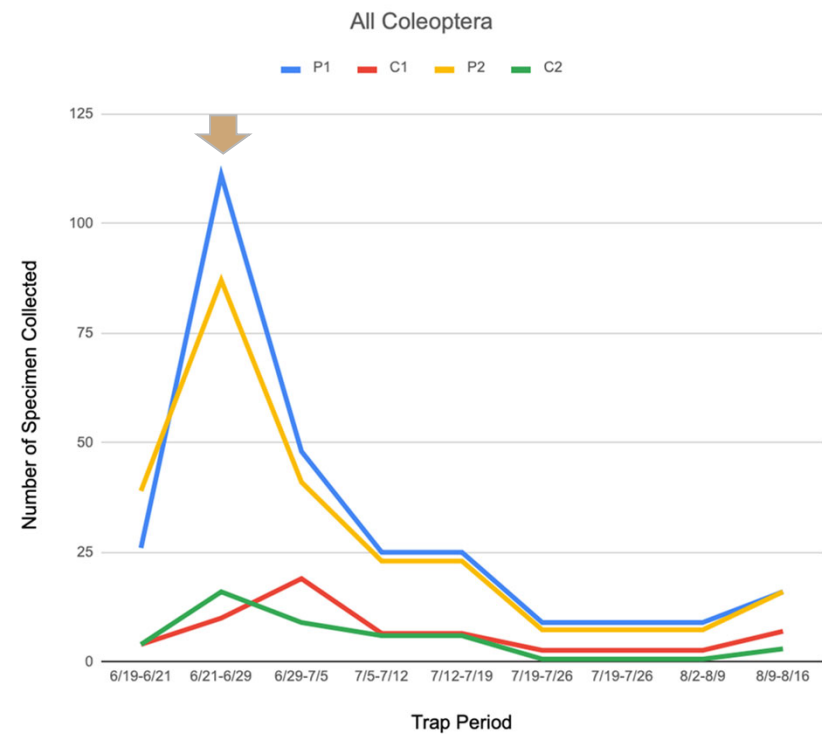
Results - Carabidae



Results - Total of All target Taxa

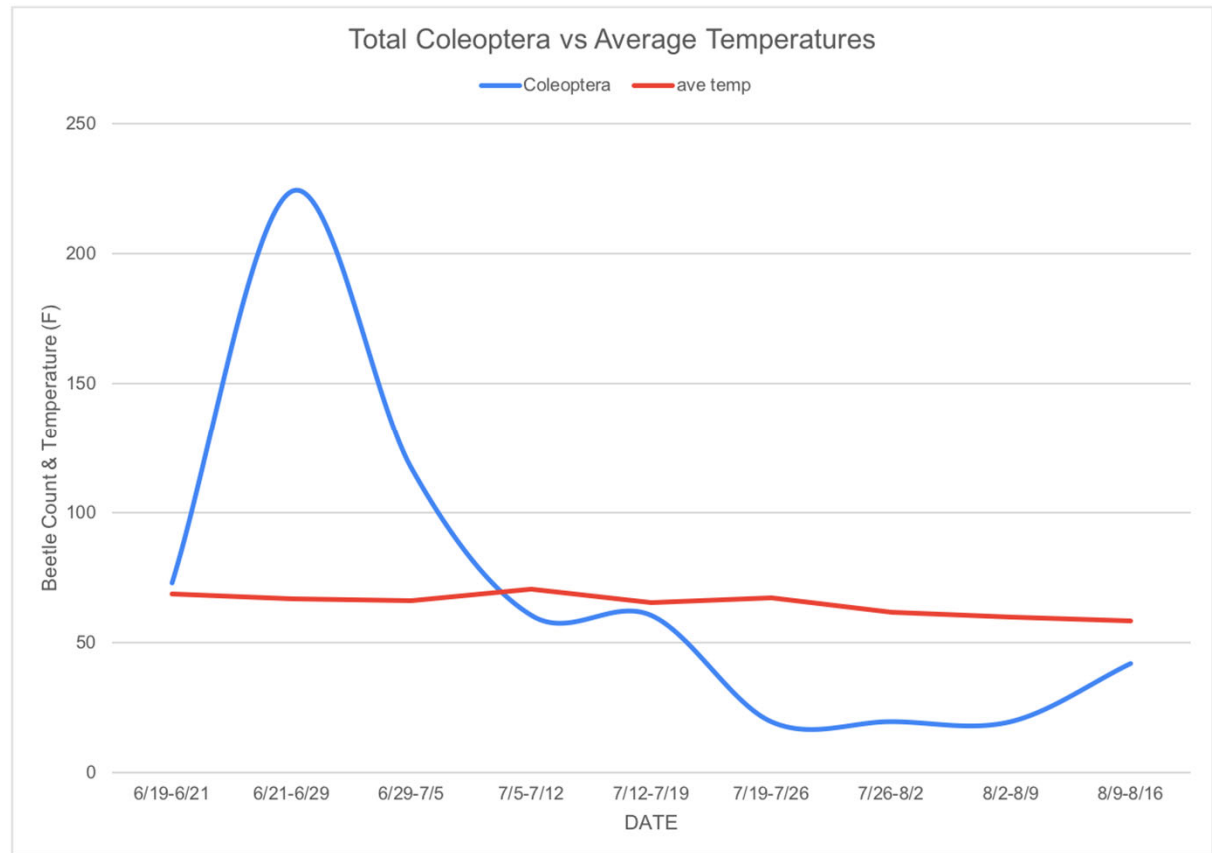


SN: JSC084355Nic
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Temperature

- Average temperatures
 - Weekly averages
 - 58-70°F during study
- No relation to beetle activity



DNA Barcoding

- Life Scanner kits
- 1 accurately identified specimen to species
- Life scanner was helpful but not 100% accurate



Interesting findings

Hemiptera: Psyllidae

Livia sp.

Possibly *Livia opaqua*

Det. C. O'Donnell, USDA

New genus record for
Alaska



Interesting findings

Coleoptera: Staphylinidae

Dinothenarus sp.

Cryptic, undescribed species being
studied by UAM graduate student
Adam Haberski



Conclusion

- Silphidae were the most forensically important group
- 636 Specimens were donated to University of Alaska Museum
- DNA Barcoding can be an important tool in species identification



Acknowledgements

Thank you

Dr. Derek Sikes - (Mentor) - Entomologist at UAF

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May your blessings be as abundant
as the biomass of beetles 🪲



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