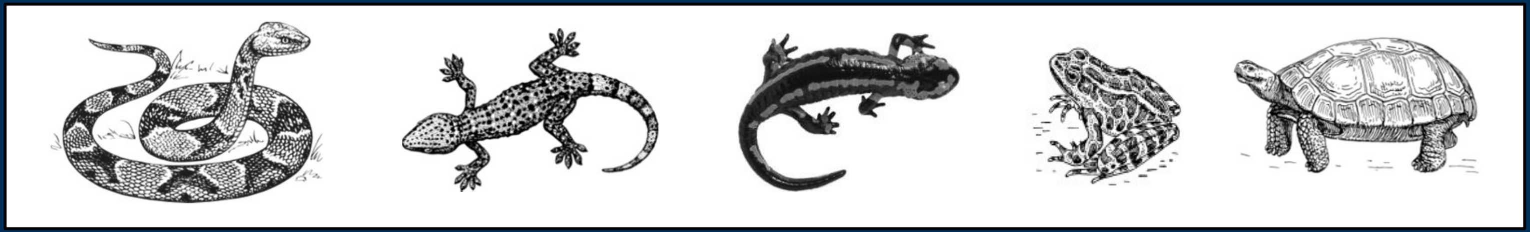
Camera Traps for Amphibians and Reptiles

USGS Road Ecology Studies



U.S. Department of the Interior
U.S. Geological Survey

Passive IR Cameras

- **Great for medium and large mammals**
  - Inventories
  - Wildlife movement
  - Abundance
  - Occupancy
  - Behavior

- **Not so great for Herps**
  - Temperature differential
  - Movement speed
- **Attempts to Increase Sensitivity:**
  - High rates of false triggers
  - High variability in detection rates among cameras
  - Cost and time prohibitive to sort images

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New Camera Trap

PLOS | ONE

RESEARCH ARTICLE

An improved camera trap for amphibians, reptiles, small mammals, and large invertebrates

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OPEN ACCESS

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Competing interests: The authors have declared that no competing interests exist.

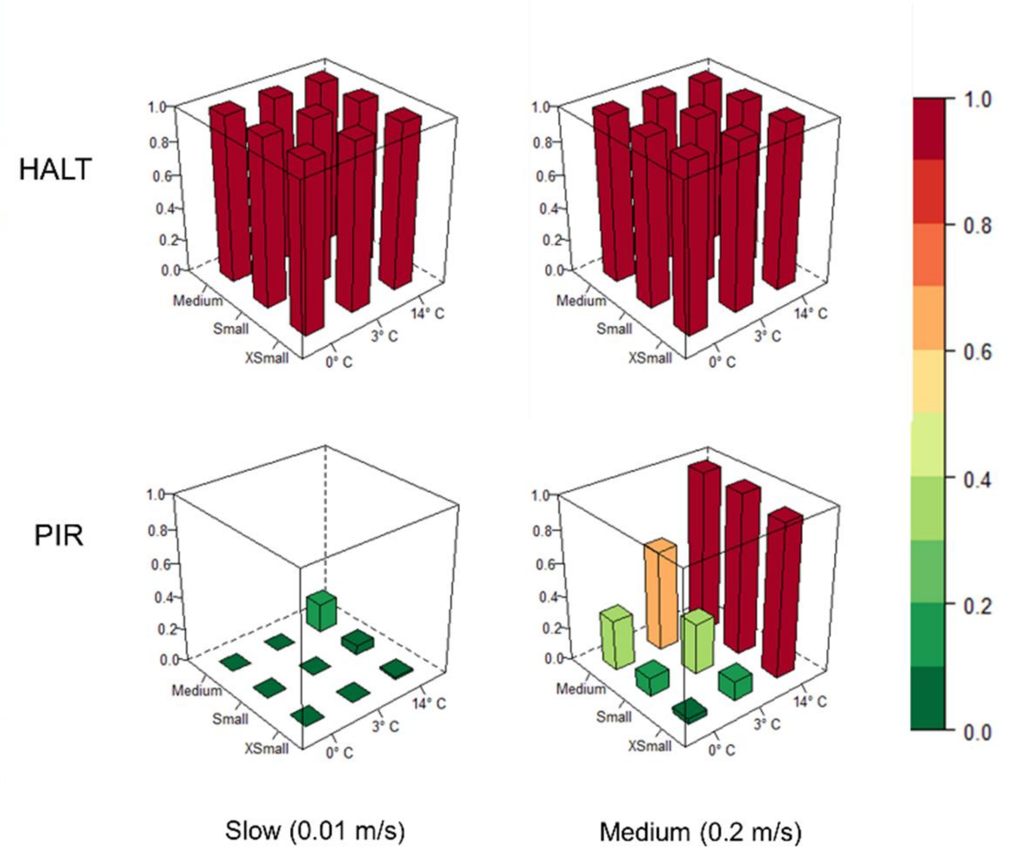
Abstract

Camera traps are valuable sampling tools commonly used to inventory and monitor wildli communities but are challenged to reliably sample small animals. We introduce a novel active camera trap system enabling the reliable and efficient use of wildlife cameras for sa pling small animals, particularly reptiles, amphibians, small mammals and large invertebrates. It surpasses the detection ability of commonly used passive infrared (PIR) camer for this application and eliminates problems such as high rates of false triggers and high v iability in detection rates among cameras and study locations. Our system, which employ HALT trigger, is capable of coupling to digital PIR cameras and is designed for detecting small animals traversing small tunnels, narrow trails, small clearings and along walls or d fencing.

Introduction

Camera traps are valuable sampling tools commonly used by ecologists and conservationist inventory and monitor wildlife communities [1–6], estimate occupancy and abundance [1, 3, 4], and monitor animal behavior [1, 7], especially for rare, threatened, and endangered species [2, 8, 9]. Most digital game and trail cameras use a passive infrared (PIR) sensor for their trigger in order to capture images. The PIR sensor is a pyroelectric device designed to detect mammals based on a combination of heat and motion [9–13]. The PIR sensor responds to thermal emissions (radiation) within wavelengths ranging from 8 μm to 14 μm, which is the average range an endothermic mammal radiates [10, 11, 14]. It is the comparative change in infrared emissions between an object and its background, differentiated between thermally sensitive crystals inside the PIR sensor that triggers detection [11]. The majority of these cameras also allow researchers to adjust operational parameters (i.e. trigger sensitivity, photo quantity, delay between pictures, time-lapse, etc.) and capture metadata such as date, time and temperature [9, 12].

Typically an animal must be 2.7°C warmer than its surrounding environment, and moving across a PIR sensor's field of view, to trigger a detection [9, 15]. However, ectothermic animals



Hobbs Active Light Trigger (HALT)

- **Active Light- Near Infrared**
  - Pre-aligned fixed beam on threshold. Image capture upon broken beam
  - Place along barrier fencing, narrow trail, underpasses

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ROAD MITIGATION FOR REPTILE AND AMPHIBIANS IN CALIFORNIA

Caltrans

WTI
Western Transportation INSTITUTE

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In collaboration with

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U.S. Department of the Interior
U.S. Geological Survey

Landscape Ecol
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CrossMark

RESEARCH ARTICLE

An objective road risk assessment method for multiple species: ranking 166 reptiles and amphibians in California

Cheryl S. Brehme · Stacie A. Hathaway · Robert N. Fisher

Received: 10 July 2017 / Accepted: 26 March 2018

Abstract

Context Transportation and wildlife agencies may consider the need for barrier structures and safe wildlife road-crossings to maintain the long-term viability of wildlife populations. In order to prioritize these efforts, it is important to identify species that are most at risk of extirpation from road-related impacts.
Purpose Our goal was to identify reptiles and amphibians in California at highest risk from road mortality and fragmentation. With over 160 species and a lack of species-specific research data, we developed an objective risk assessment method based upon road ecology science.
Methods Risk scoring was based upon a suite of life history and space-use characteristics associated with negative road effects applied in a hierarchical manner from individuals to species. We evaluated risk to both aquatic and terrestrial connectivity and calculated buffer distances to encompass 95% of population-level movements. We ranked species into five relative categories of road-related risk (very-high to very-low) based upon 20% increments of all species scores.
Results All chelonids, 72% of snakes, 50% of anurans, 18% of lizards and 17% of salamander species in California were ranked at high or very-high risk from negative road impacts. Results were largely consistent with local and global scientific literature in identifying high risk species and groups.
Conclusions This comparative risk assessment method provides a science-based framework to identify species at highest risk from road impacts. The results can inform regional-scale road mitigation planning and prioritization efforts and threat assessments for special-status species. We believe this approach is applicable to numerous landscapes and taxonomic groups.

Keywords Reptile · Amphibian · Road mortality · Habitat fragmentation · Road ecology · Risk assessment

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s10980-018-0640-1) contains supplementary material, which is available to authorized users.

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Introduction

There have been many attempts to better characterize and quantify threat criteria in order to classify species at higher risk of extinction at state, national, and global levels (Congress 1973 (U.S. Endangered Species Act); Mace et al. 2008; Hobday et al. 2011; Thomson et al. 2016; IUCN 2017). Roads are a significant threat to wildlife populations (e.g., Forman et al. 2003;

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AMPHIBIAN AND REPTILE HIGHWAY CROSSINGS

State of the practice, gap analysis and decision support tool

A Literature Review

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A report prepared for the

State of California, Department of Transportation
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June 2017

Information Gaps

- **Tunnel spacing needs for migratory species?**
    - Fabrice G.W.A. Ottburg and Edgar A. van der Grift*
- **Does it matter what barrier fencing is used (opacity)?**
- **Do turn-arounds work?**
- **What types of jump-outs are most effective?**
- **Are wildlife tunnels effective for herpetofauna? (existing or new design)**



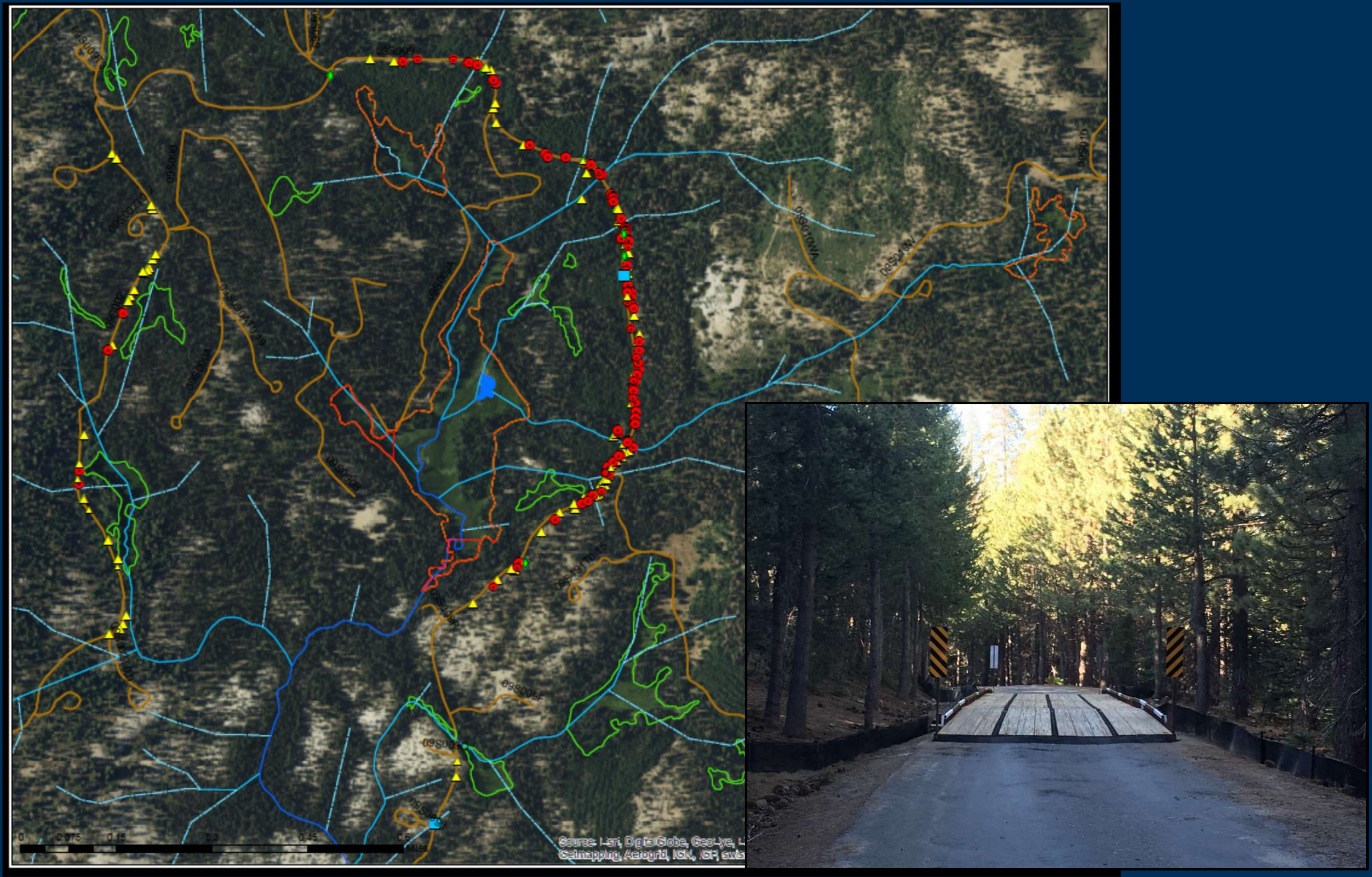
Stanford Study- CA Tiger Salamander


01/09


01/09/2018 14:29

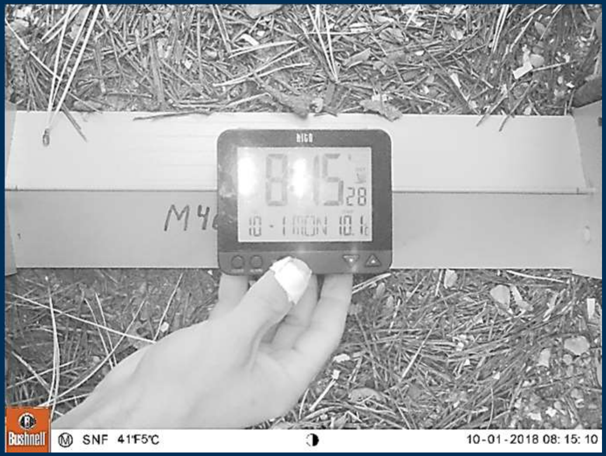
Stanford, CA

Sierra Study- Yosemite Toad



Data Management/ Analysis

- Enter photos into modified Colorado Photo Database (C. Rochester, B. Idrizaj, T. Matsuda)
  - Time stamp
  - Species ID
  - Direction of movement
  - Camera Station



- Individual ID using i3s software (B. Idrizaj, T. Matsuda)

Individual ID- Example Yosemite Toad

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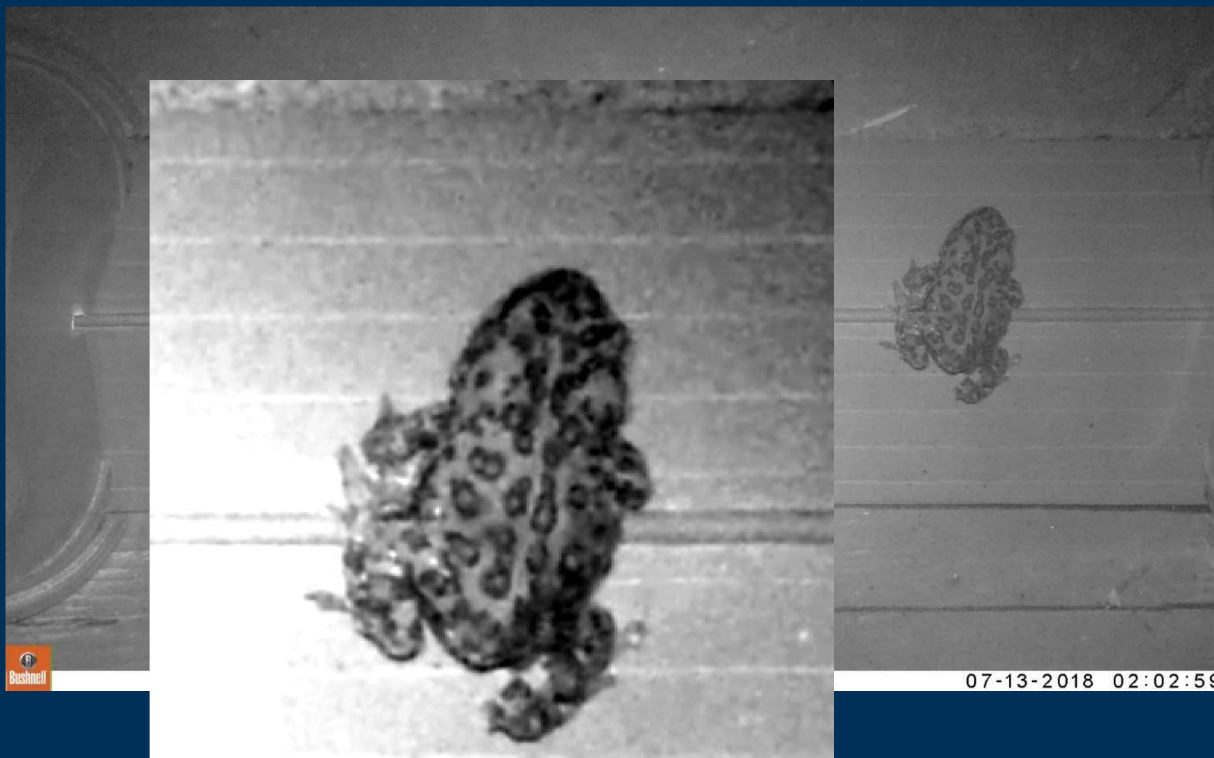
Individual ID- Example Yosemite Toad



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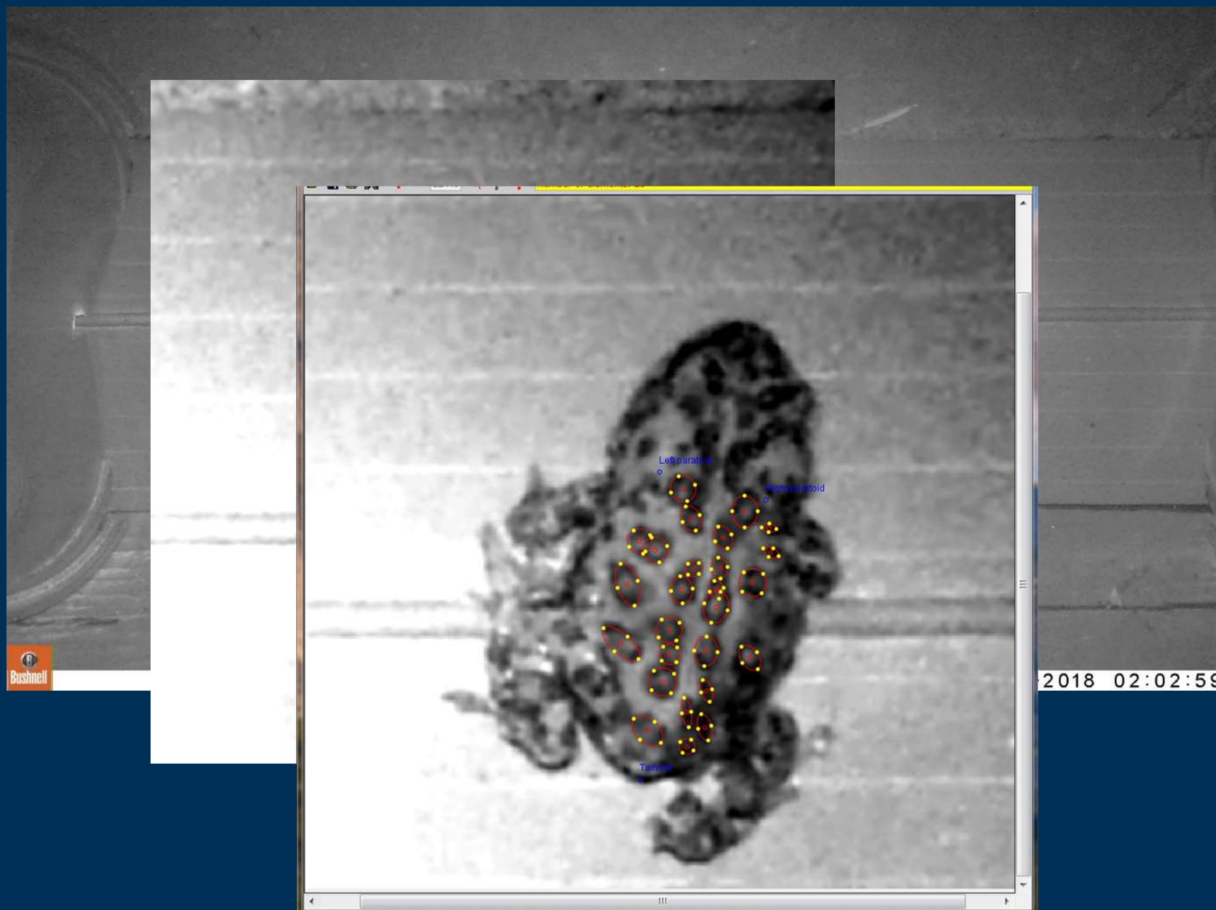
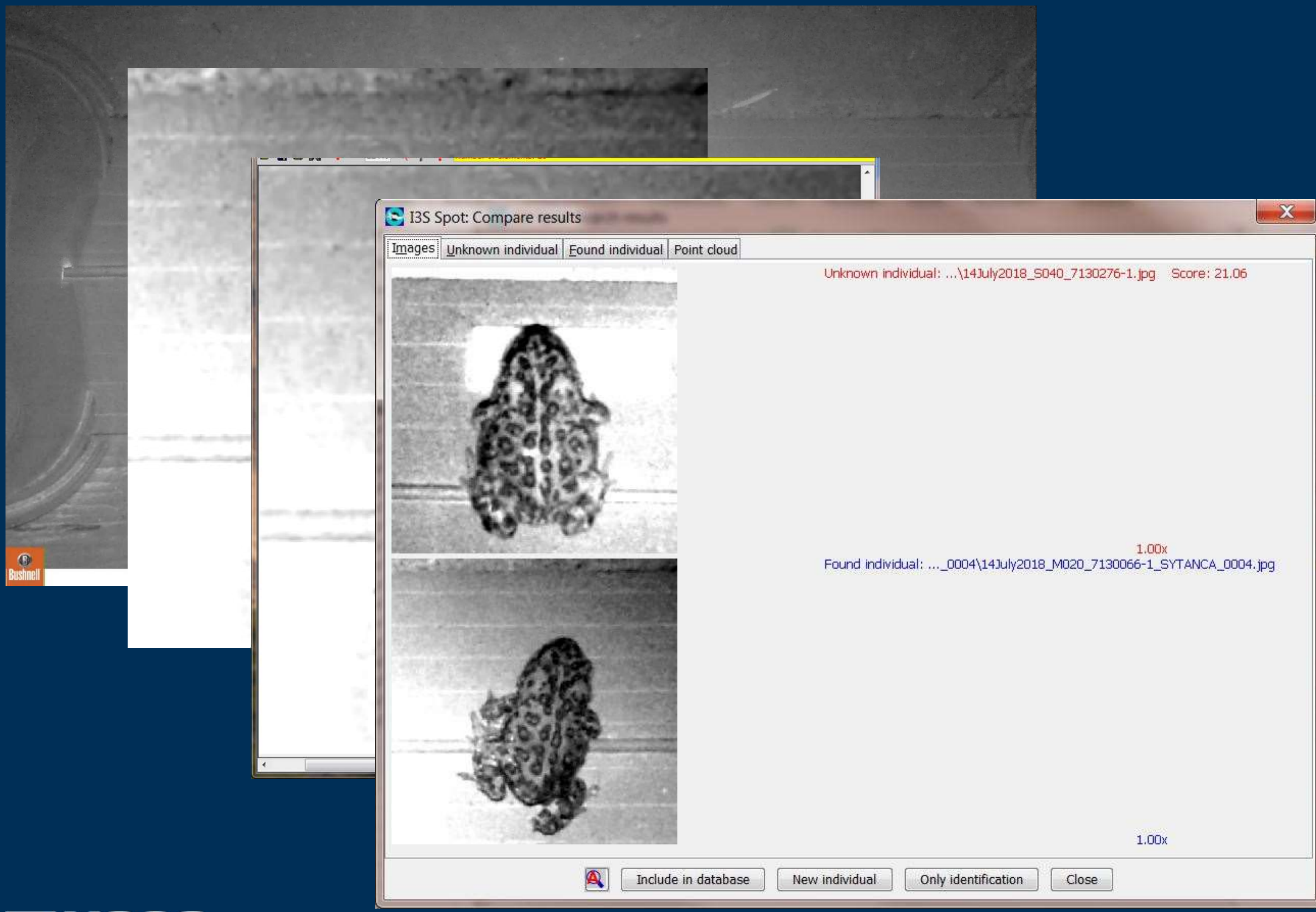
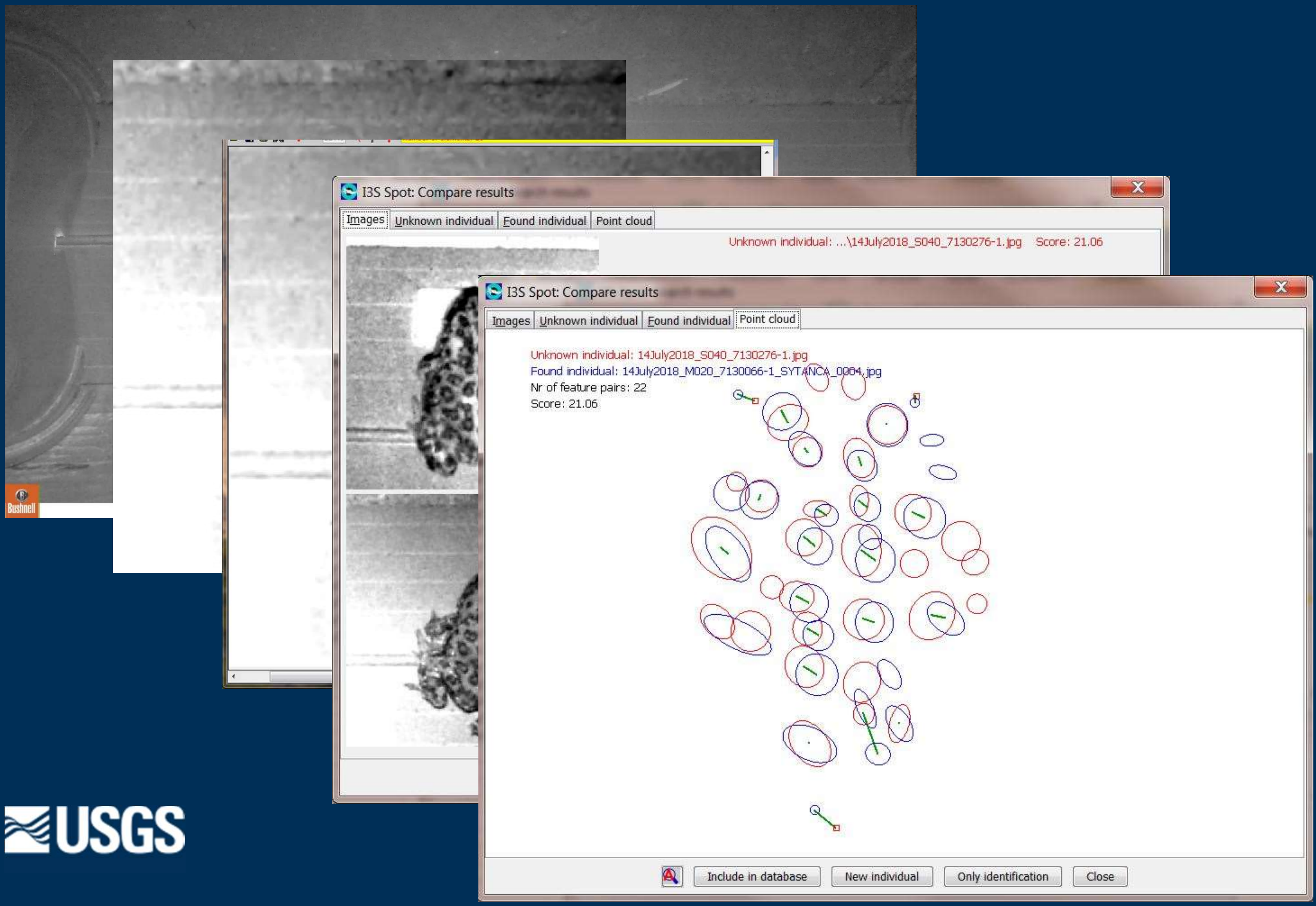
Individual ID- Example Yosemite Toad



Individual ID- Example Yosemite Toad



Individual ID- Example Yosemite Toad



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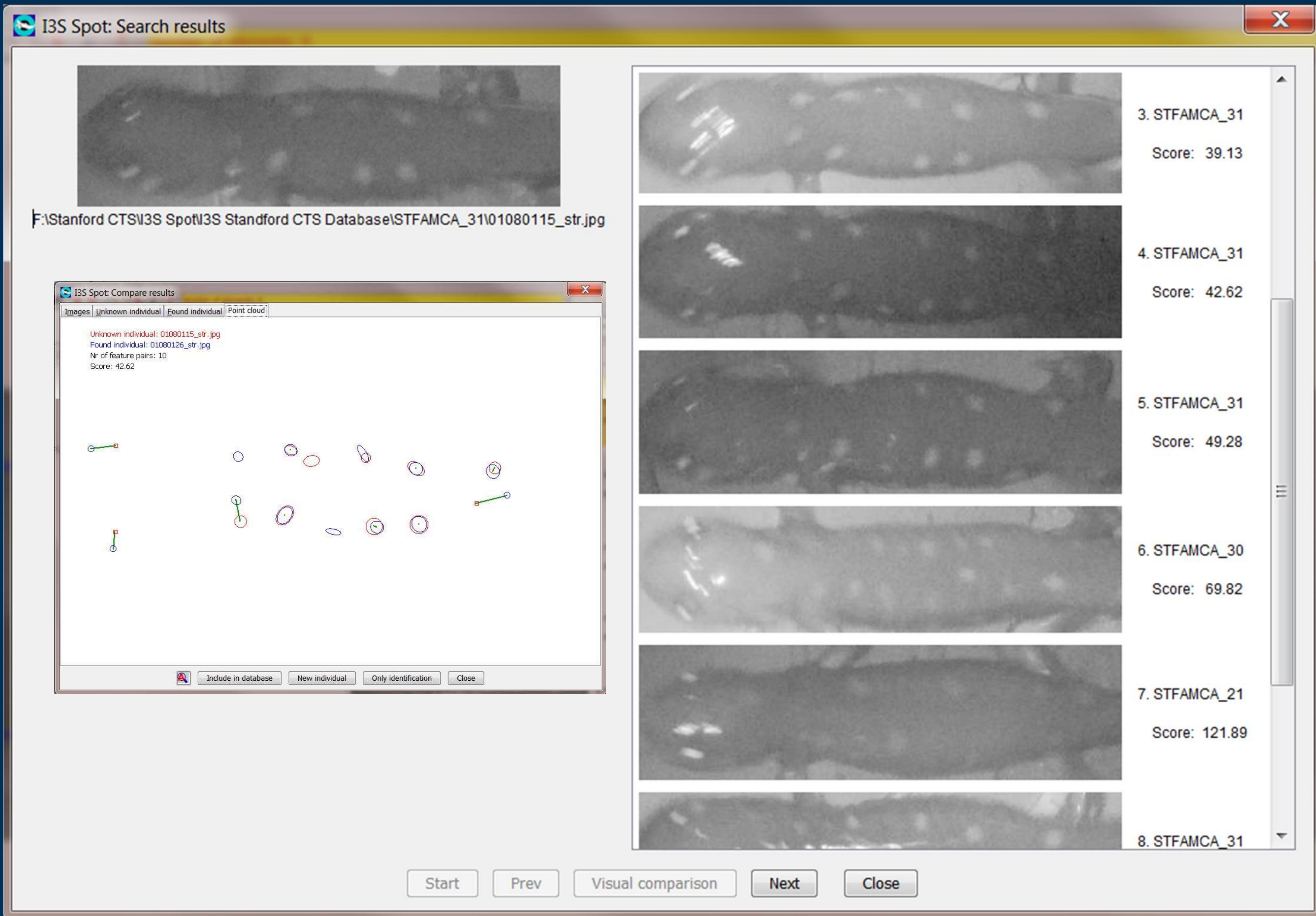
Individual ID- Example CTS



Movement of an Individual: Example CTS

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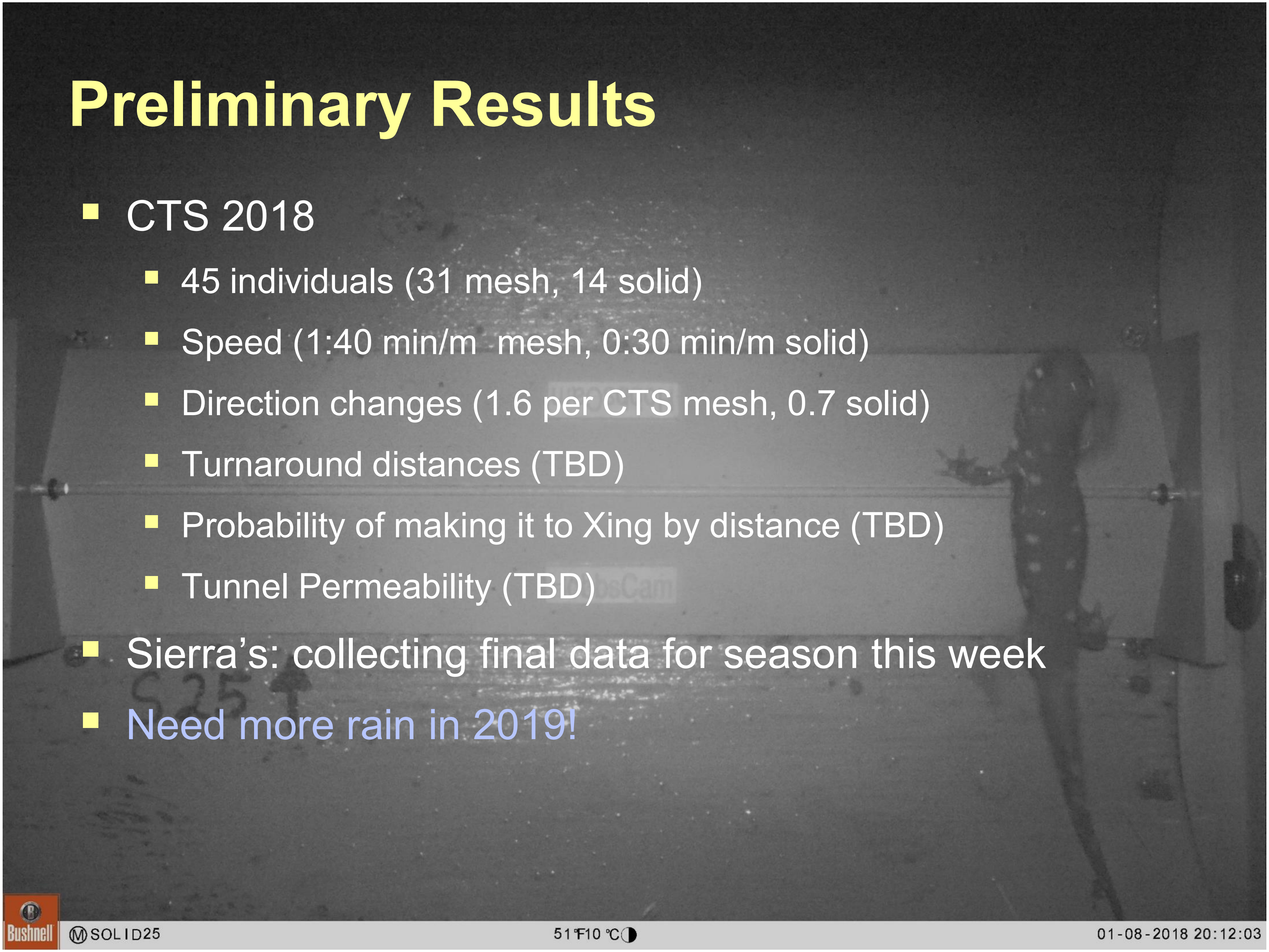
Preliminary Results

- CTS 2018
  - 45 individuals (31 mesh, 14 solid)
  - Speed (1:40 min/m mesh, 0:30 min/m solid)
  - Direction changes (1.6 per CTS mesh, 0.7 solid)
  - Turnaround distances (TBD)
  - Probability of making it to Xing by distance (TBD)
  - Tunnel Permeability (TBD)
- Sierra’s: collecting final data for season this week
- Need more rain in 2019!



Stanford & Sierra Studies

- BACI: Adding Visual Barrier
- Add turnarounds within fenced area

Other/ Future Study Sites/ Species

- San Diego- RJER (Snakes, Lizards)
- (Pacific Pond turtle, Spadefoot toad)
- Mojave Desert (Desert Tortoise, Snakes, Lizards)

HALT cam (Game changer)-Further Development

- Increased resolution for night photos
- Trigger Speed
- Dealing with larger areas (i.e. Setting triggers in tandem—serial)

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Hobbs Ecology

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Thank you!

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