Goal of the Lecture

To familiarize students with common techniques used to capture, measure, and mark amphibians.

Reading Assignments: See Website

1) TAMP Protocol
2) Burton et al. (2007)

Lecture Structure

Amphibian Sampling

I. What is your Objective?

II. Sampling Methods

III. Sampling Designs

IV. Measuring & Marking
**What is your Objective?**

(1) **Species Occurrence**

Post-metamorphs: Larvae:
- Call Surveys
- Cover Boards
- PVC Tubes
- Area Searches
- Minnow Traps
- Dip Netting

(2) **Relative Abundance, Recruitment, Movement**

Post-metamorphs: Larvae:
- Above Plus
- Pitfall Sampling
- Above Plus
- Seine Netting
- Enclosure Sampling

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**Call Surveys**

http://www.state.tn.us/twra/tamp/frprotoc.html

Begin: ≥ 30 minutes after sunset  End: 1:00 a.m.

Duration: 5 minutes

Abundance: (by Species)
- 0 = none heard
- 1 = individuals can be counted
- 2 = calls overlap but individuals can be distinguished
- 3 = calls overlap and individuals cannot be distinguished (full chorus)

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**Call Survey Duration**

Burton et al. (2007)
Amphibian Sampling
Pitfall Trapping

- Movement
- Interception
- Redirected Movement
- Capture

Drift Fence and Pitfall Designs
Straight-line Arrays

- 3-Fence
- 4-Fence
- Y-Array
- X-Array

Pitfall Traps
X-Array

Forested Sites
Drift Fence and Pitfall Designs
Continuous and Partial Drift Fences

Complete

Partial

Assume:
Random Directional Dispersal

Immigration/Emigration & Diel Movements

Goal:
• Estimate Population Size and Composition
• Estimate Directional Movement

Drift Fence and Pitfalls
Materials and Costs

• Fence ($0.35-$1.50 per meter)
  Aluminum Flashing
  Hardware Cloth
  Plastic/Cloth Erosion Fence

• Pitfalls ($2.50-$5.00 per bucket)
  Plastic Buckets (8- or 19-liter) w/ Lids
  #10 Tin Cans (2 fastened = 8-liter)

• Shade Covers/Sponges ($0.25-$1.50 per bucket)
  Wood or Pegboard Planks with Legs
  Synthetic Foam or Sponges

24" stakes

Drift Fence and Pitfalls
Installation

Fence Placement: Stratified Random or 5 m above anticipated HWL
Pitfall Placement: Every 10 m and Adjacent to Fence

• Hoe, Mattock, or Ditch Witch ($150/day)
• 12-inch Auger ($75/day)
• Shovels, 3-5 lb Sledges, Tape Measure, Flags ($100)
• Personnel (4 people: 300 m/1-2 days [$250/day])
Drift Fence and Pitfalls
Installation

STEP 1: Measure and Distribute Materials

STEP 2: Dig Holes and Install Buckets (top flush w/ ground)

STEP 3: Remove Vegetation and Dig Trench (3-5 inches)

STEP 4: Install Fence

STEP 5: Bury Fence

Continuous Drift Fence
Completely Set Up
Drift Fence and Pitfalls

Maintenance

$200/month

Censor

Buckets

Weather

• Precipitation
• Wind
• Sun

Animals

• Livestock
• Rodents

Drift Fence and Pitfalls

Operation

Pitfalls should be checked daily (before 1200 hrs)
Reduce Probability of Predation (snakes, raccoons), Desiccation, Drowning, or Ammonia Toxicity

Processing time is capture frequency dependent
15 minutes (0 captures) to 15 hours (14K) for 350 m

Processing should be continuous
Reduce Probability of Density-Induced Movement

Handling can enhance desiccation
Rehydrate prior to release

Closing Buckets (sample alternate days)
Reduce probability of immediate recapture
Increases temporal independence

Drift Fence and Pitfalls

Considerations

Pitfalls: Yes or No?

Research Question (Are pitfalls necessary?)
System/Terrain (Is it realistic?)
Funding (What are the costs & benefits?)

Species-specific Biases

Differential Capture Rates
Climbing, Jumping, Digging Ability
Differential Trespass
Can be quantified
Location of Fence and Pitfalls
Dip and Seine Netting

Dip Nets

Seines
- Mesh size and width
  - 1.5 to 7 mm and 1 to 1.5 m wide
  - Larger and small sizes can be used
- Seine parallel to shore (2 m)
- Quarter-haul into shore

Minnow Traps and Enclosures

Larval Sampling Schematic
Putting it All Together

Sampling Design

Standardization & Sampling Frequency

Amphibian Marking Techniques

• Species, Age, and Gender
• Snout-vent Length (SVL)
• Weight (50, 100, 250 g Pesola®)
• Abnormalities
  • Malformations, Tumors, Sores, Parasites

Biological Processing

General Information
Malformations

- Hypotheses
  - Genetic
    - 1-5% Malformation rate
  - UV-B rays
  - Chemical Pollution
  - Trematodes

Mass Marking Techniques

Batch

- Florescent Elastomers
  - Injectable Liquid Elastomer (4 colors)
  - $5/1000 (1000 individuals)
- Florescent Dyes
  - Water resistant Dyes
  - Powder and Shake-and-Bake
  - Ultraviolet Light Sensitive
  - $12/lb (1lb/100 individuals)
- Toe Clipping
  - Mass-mark or uniquely ca. 2,000 individuals
  - Rapid and Inexpensive

Steps

STEP 1: Sterilization
- 0.01% Chlorhexidine diacetate

STEP 2: Clip
- First Joint of Toe

STEP 3: Stop Bleeding
- Silver Nitrate Sticks

STEP 4: Store DNA
- Ice Bath
- Store <-70°C
Individual Marking Techniques

**Individual-Specific**

- **Coded Wire Tag**
  - Injectable Stainless Steel Tag
  - Etched Binary ID Code
  - 1.1 x 0.25 mm, $15/$6000 wand

- **Alpha-numeric Tag**
  - Injectable Visible Tag
  - Alpha-numeric Code
  - 1.1 x 2.5 mm, $1 each/$100 injector

- **Passive Integrated Transponder (PIT) Tag**
  - Injectable Electromagnetic Tag
  - Transmit ID Code
  - 11.5 x 2.1 mm, 0.06 g
  - $4.50 each / $500 scanner

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**PIT Tagging Protocol**

**Steps**

**STEP 1:** Sterilization *(0.01% Chlorhexidine diacetate)*

Tags, Needles, and Injection Point

**STEP 2:** Injection

Inject Tag Subcutaneously left of Midventral Vein

**STEP 3:** Seal

Seal Puncture Wound w/ Cyanoacrylate or Glue