

# San Marcos Salamander Propagation Refinement

USFWS Staff

# San Marcos Salamander Reproduction

- Gonads evaluated by Tupa & Davis 1976
  - ★ Males mature at 35 mm TL
- Water quality effects on reproduction and growth (Najvar 2001, Thesis; Najvar & Fries 2007)
  - ★ Separated by gravid or not
  - ★ 24 pair observed for 10 months
  - ★ 7 clutches of eggs
- Flow preferences in regards to tank position (Fries 2002)
- Cohabitation preferences (Thaker et al 2010)



# San Marcos Salamander Reproduction

- ◎ Opportunistic
- ◎ For a fully functioning refugia, need to be able to reliably reproduce the species
  - ✦ Estimate of numbers that can be produced
  - ✦ Estimate of time it would take to produce for reintroduction
  - ✦ Need to know the effort involved to be able to reproduce large numbers for reintroduction



# Objectives

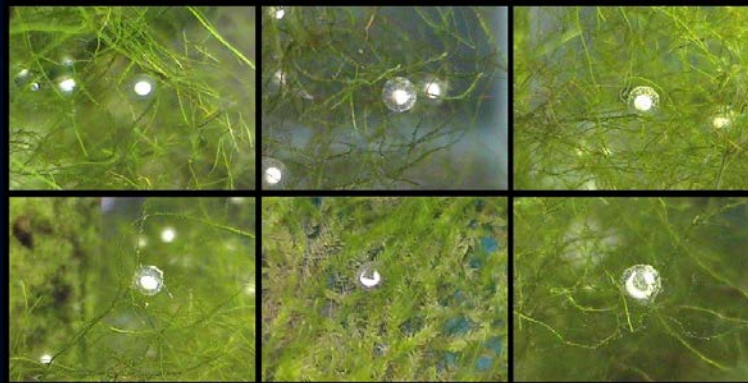
The main goal of this research is to test if reproduction can be reliably triggered by the separation/combine technique.

1. Average time to courtship behavior once combined
2. Average days to oviposition to occur after sexes combined
3. Average clutch size
4. Survival rate to hatch of eggs
5. Document egg developmental stages
6. Test for differences between pairwise vs group mating



# Expected Benefits to Refugia

- ⦿ Potential reliable reproduction technique
- ⦿ Quantifying egg production and survival
- ⦿ Documenting egg development



Barton Springs salamander eggs



# Separation Trigger

- Non-invasive methodology that has worked with Barton Springs salamanders

- Steps:

1. Separate the sexes completely
2. Introduce with physical separation
3. Combine pairs or groups



Barton Springs salamanders displaying courtship behavior.

# Candling (Gillette & Peterson 2001)





# Separation

⦿ First: males and females in different tanks systems

✦ No shared water

✦ One month



78 individuals

Male Tank System

Female Tank System



78 individuals



# Separation

⊙ Second: males and females in same larger tank, but no physical access to each other

- ✦ Shared water so pheromones can circulate

  - Males have mental glands (Sever 1985)

- ✦ Can see through perforated divider

- ✦ Three tank systems

- ✦ Two week separation



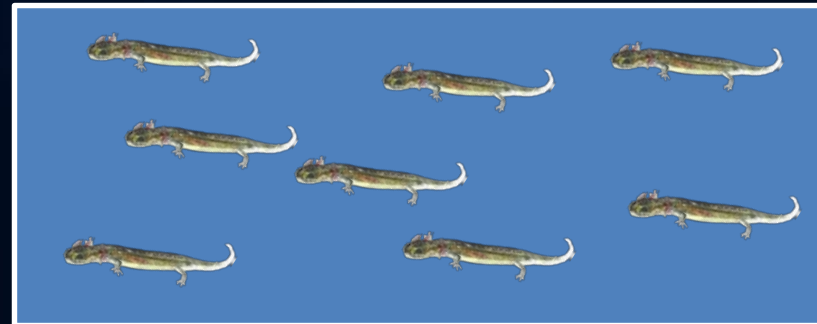
# Combining

- ⦿ Pairs and group tanks

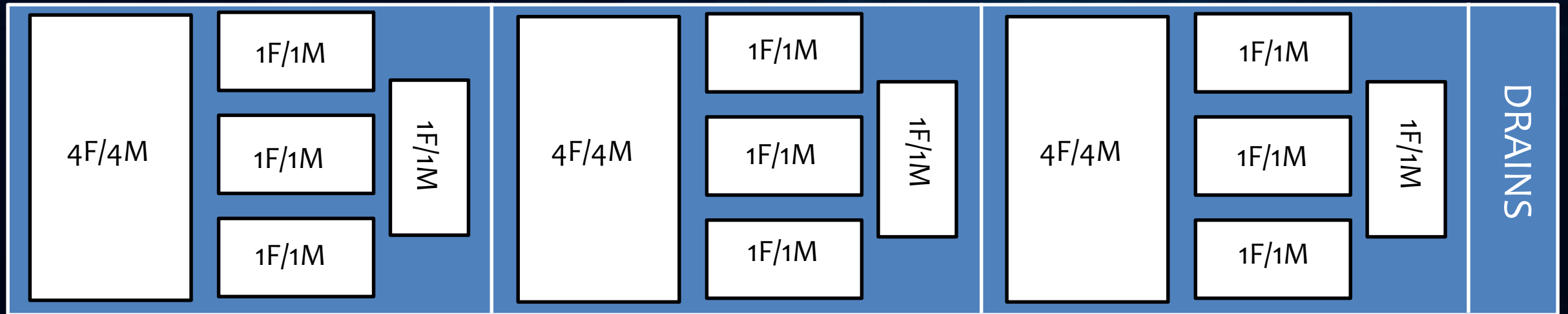
- ✦ Group tanks four females, four males

- ⦿ Three tank systems

- ✦ Tanks painted on outside so salamanders can not see into other tanks
- ✦ Well water and re-circulating water



- 12 Single pairs, 3 tanks with 4 pairs (72 total pairs)
- Habitat items for courtship and egg deposition
- Quieter room, less vibrations



# Combining

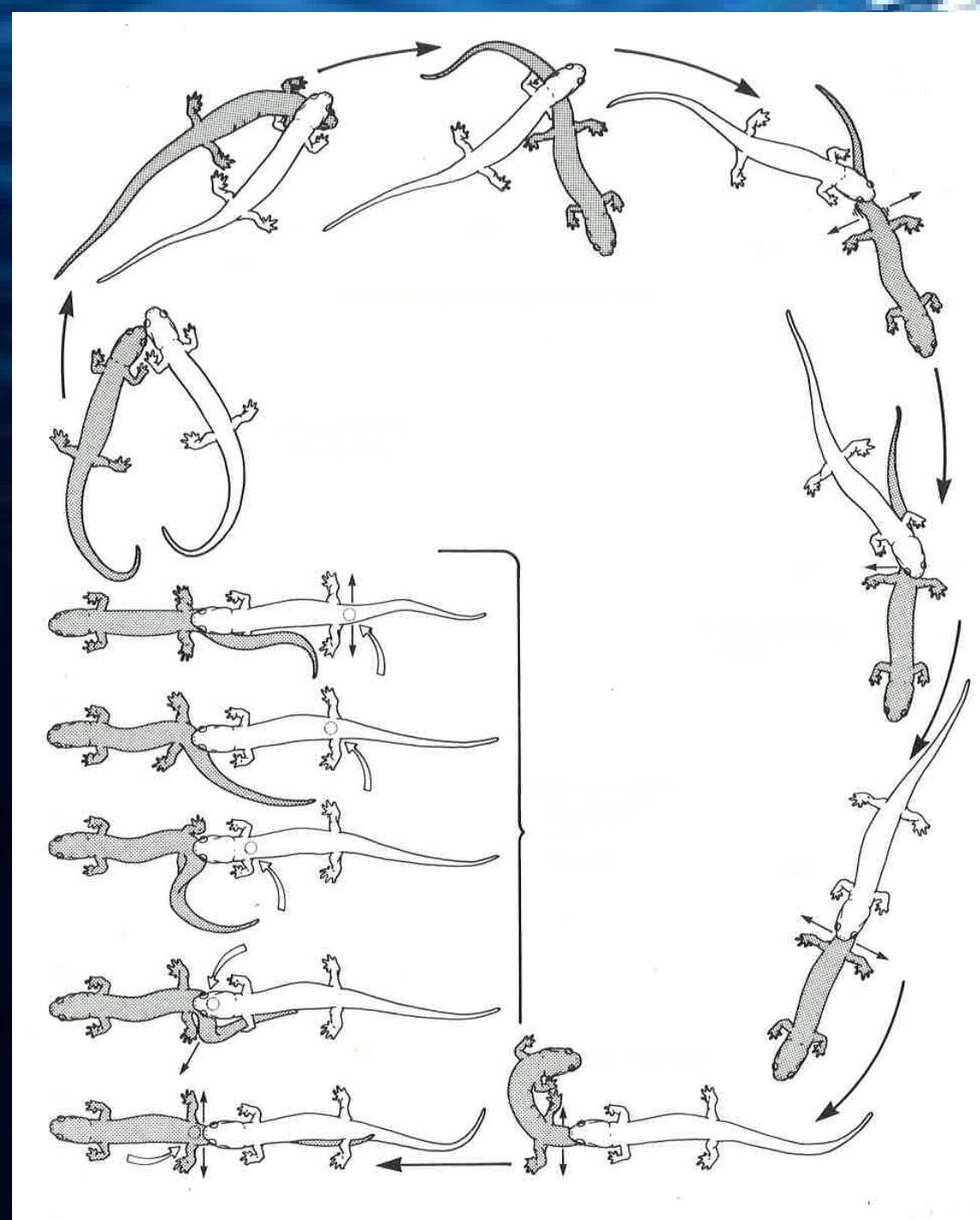
- ⦿ Pairs will be randomly selected
- ⦿ Filmed for courtship behavior analysis





Cheek rubbing

Tail fanning  
and  
Spermatophore  
Deposition



Tail-Straddling  
walk

## Combining

- ⦿ Pairs will be randomly selected
- ⦿ Filmed for courtship behavior analysis
- ⦿ Tanks checked daily for egg oviposition
  - ✦ Eggs removed to nursery system
- ⦿ Trial runs for at least 3 months for adults



## Eggs

- Clutch size documented
- Eggs in individual tanks on nursery system
- Data recorded on visible stage development
- Photograph egg development (time-series)
- Hatch rate calculated



Texas blind salamander eggs

# Expected deliverables

- ⦿ Report to EAA on the results of experiment
- ⦿ Update to *Eurycea* Captive Propagation manual
- ⦿ Journal article





# Comments & Questions