

# Survival Estimates of Wild & Captive-released Puaiohi, an endangered Hawaiian Thrush



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# Puaiohi

- “Small Kauai Thrush”
- Endemic to Kauai
- Fewer than 1000 birds
- Listed as endangered in 1967
- Captive breeding, 1995
- 14 releases of 222 birds, 1997-2012



# Objectives

- Estimate survival of wild Puaiohi by sex, age
- Estimate survival of released Puaiohi by age
- Investigate effect of chronic malaria infection on survival



Dead?

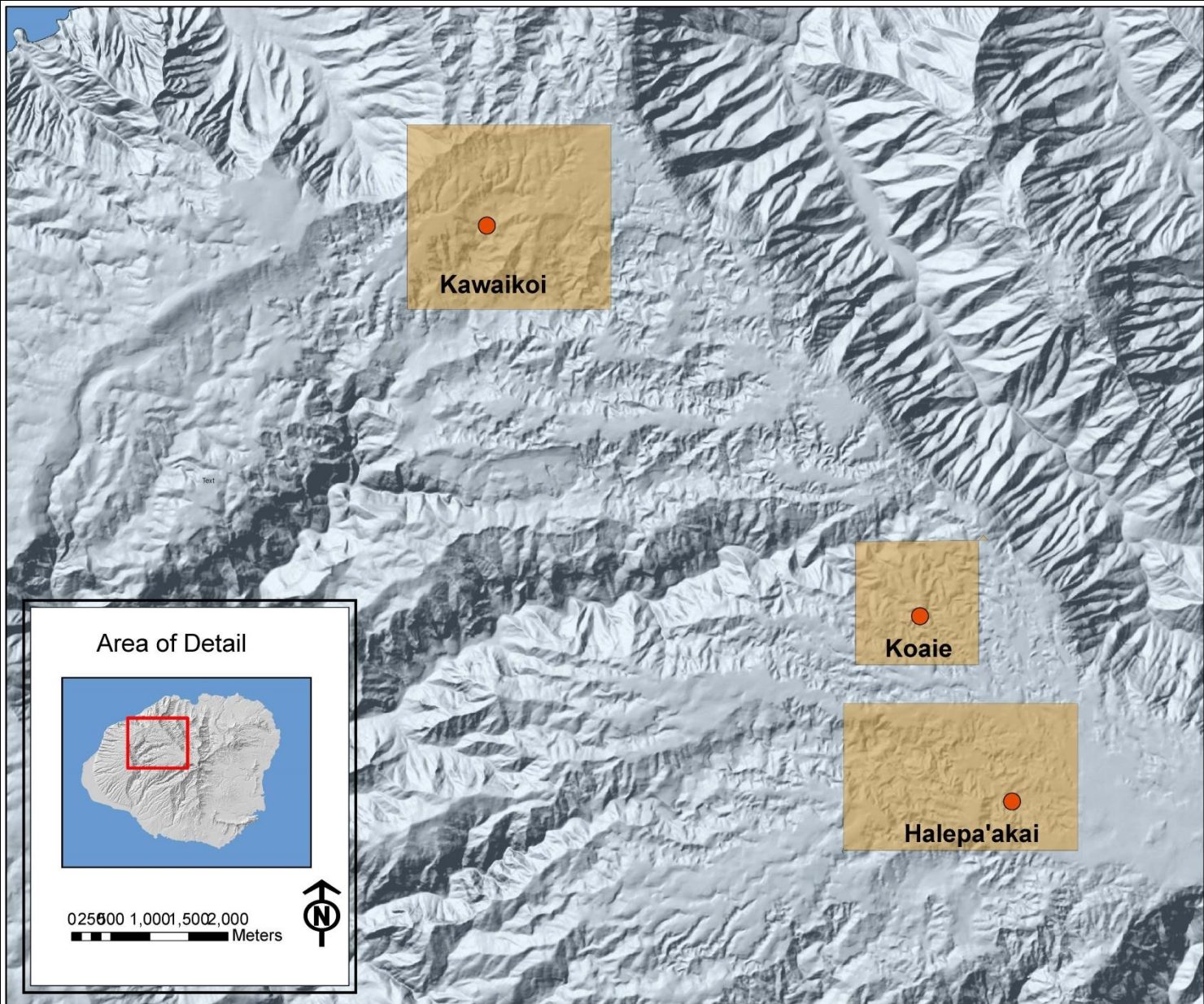


Or alive?





# Study Areas

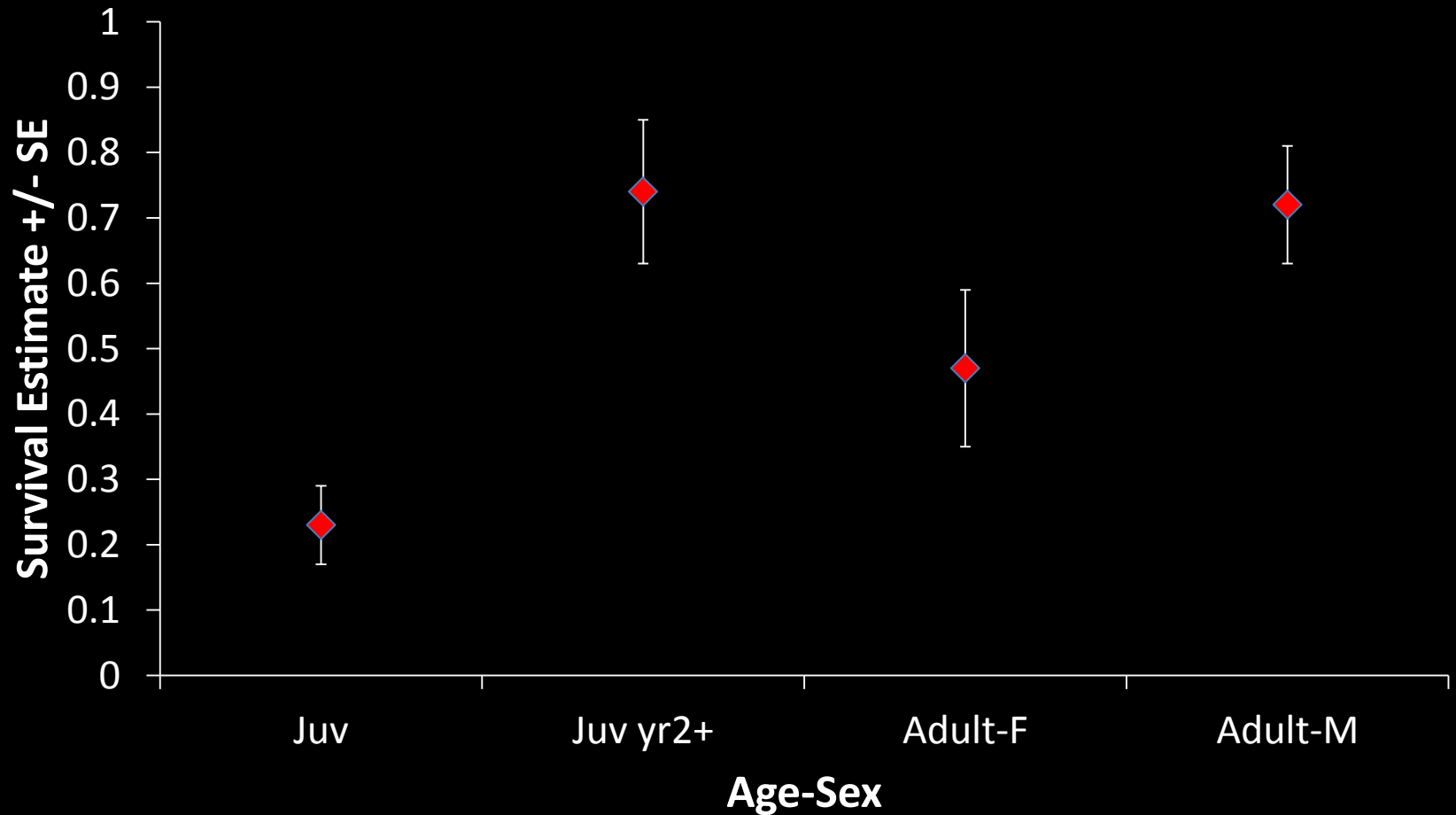


# Methods

- 2005-2011
- Birds marked with unique color band combinations , sexed, aged
  - 87 wild birds
  - 124 released birds
- Resighted during Mar-June breeding season or fall release
- Analyzed in program MARK



# Results-Wild Birds

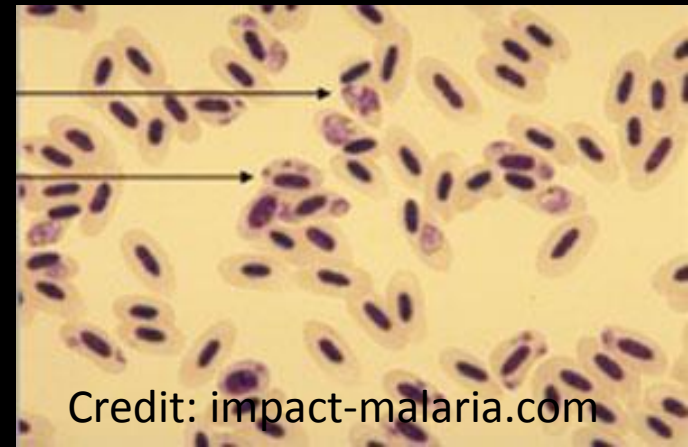


- Oldest birds in study: 6 years



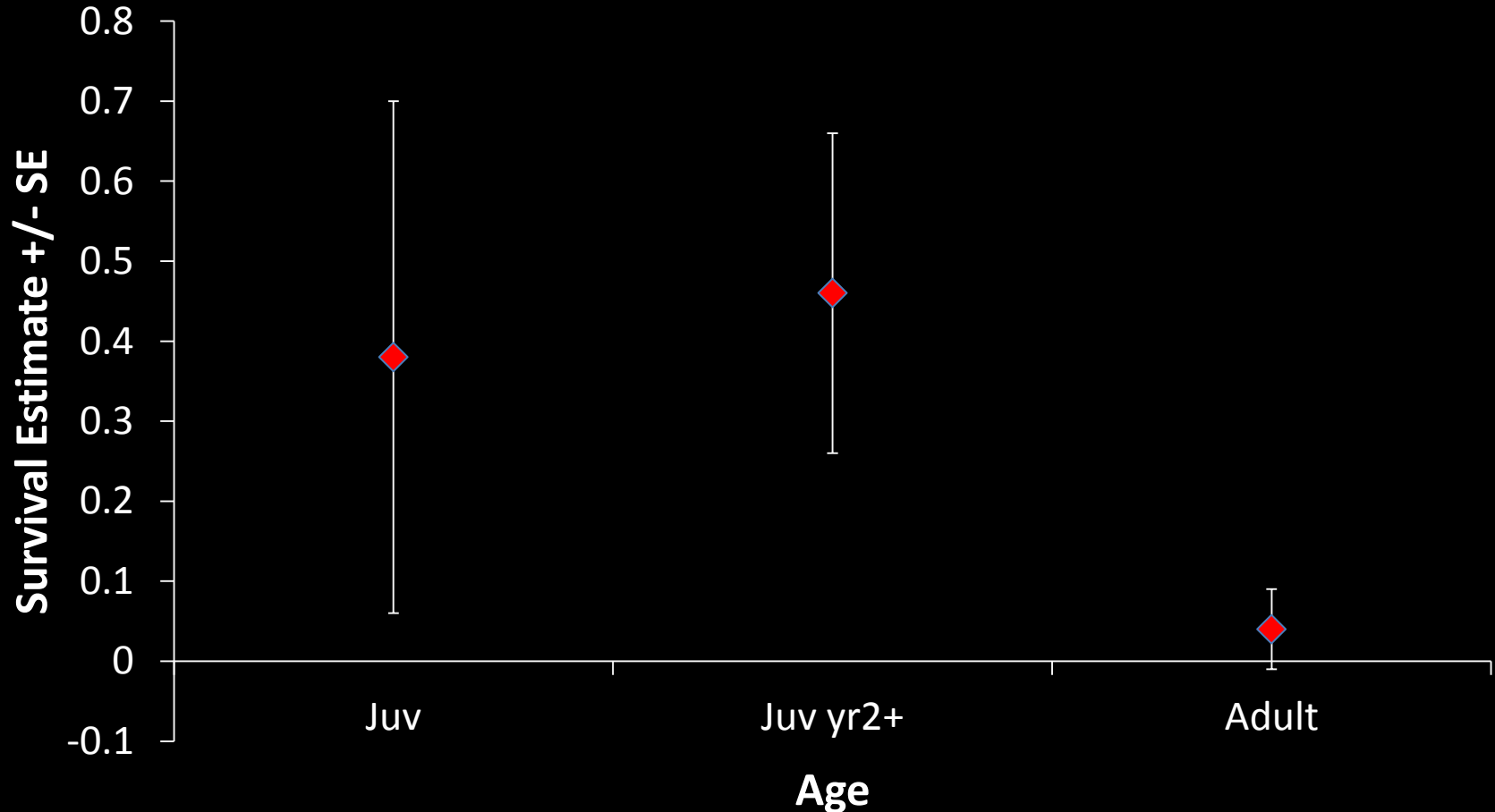
# Malaria

- 3/36 Puaiohi nestlings (8%) tested positive
  - 2/3 diseased juveniles were resighted (67%)
  - 7/33 healthy juveniles were resighted (21%)
- 6/16 adult Puaiohi (37%) tested positive
  - 3/6 diseased adults were resighted (50%)
  - 4/10 healthy birds were resighted (40%)
- Chronic malaria infection does not appear to diminish survival probability



Credit: [impact-malaria.com](http://impact-malaria.com)

# Results-Captive Released Birds



- only 8 of 124 (7%) captive birds resighted after release



# Conclusions-Wild Birds

- Low female survival
  - Likely due to rat predation of females on nests
  - No evidence of female dispersal post-nest failure
- Very low juvenile survival
  - Recruitment may limit population growth.



# Conclusions-Captive Released Birds

- Overall, survival was low and variable
  - Released captive released birds have had minimal impact on Puaiohi population
- Very low survival of birds released as adults
  - Any future release cohorts should contain only HY birds



Credit: Mike Teruya

# Management & Research Implications

- Rodent control near nests (and beyond?)
- Determine causes of juvenile mortality post-independence/release
- Predator aversion training for captive-bred birds
- Habitat restoration may improve survival



# KAUAI FOREST BIRD RECOVERY PROJECT



# Mahalo!



- HI Div. of Forestry and Wildlife
- US Fish and Wildlife Service
- Pacific Cooperative Studies Unit
- Carter Atkinson, USGS
- KFBRP staff and field crews,  
especially T. Savre, L. Behnke, B.  
Heindl, and L. Solomon



# Results-Wild Birds

Model	AICc	$\Delta$ AICc	AICc Weight
$\phi_{\text{age}} p_{\cdot}$	187.2042	0	0.45012
$\phi_{\text{age+sex}} p_{\cdot}$	187.9946	0.7904	0.30318
$\phi_{\text{age}} p_{\text{age}}$	189.055	1.8508	0.17842
$\phi_{\text{age+sex}} p_{\text{sex}}$	191.5872	4.383	0.0503
$\phi_{\cdot} p_{\cdot}$	203.9643	16.7601	0.0001

# Results-Captive Bred Birds

Model	QAICc	$\Delta$ QAICc	AICc Weights
$\phi_{\text{age}} p_{\cdot}$	50.9067	0	0.31648
$\phi_{\text{age+t}} p_{\cdot}$	51.0456	0.1389	0.29525
$\phi_{\cdot} p_{\cdot}$	52.3321	1.4254	0.15518
$\phi_{\text{age+t}} p_t$	53.1666	2.2599	0.10224
$\phi_{\text{age+sex}} p_{\cdot}$	53.8863	2.9796	0.07134
$\phi_{\text{age+t}} p_{\text{age+t}}$	54.249	3.3423	0.05951