Kiwikiu productivity: nest survival and annual reproductive success

Hanawi Natural Area Reserve, East Maui, Hawaii

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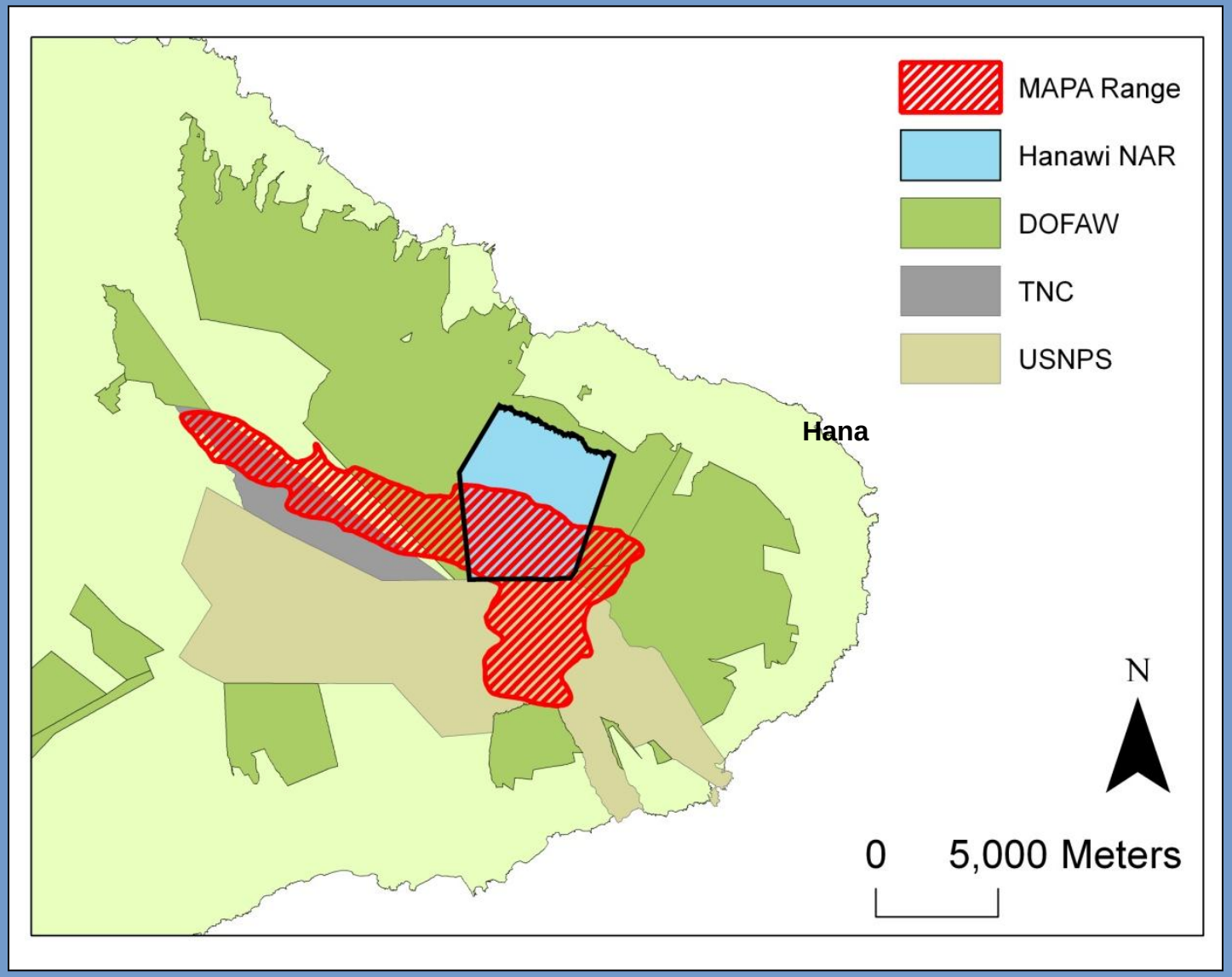
Kiwikiu, Maui Parrotbill (*Pseudonestor xanthophrys*, MAPA)

- Critically Endangered (IUCN)
- Population: 502 ± 116 (Hawaii Forest Bird Surveys)
- Statistically stable

Maui Parrotbill Range on East Maui



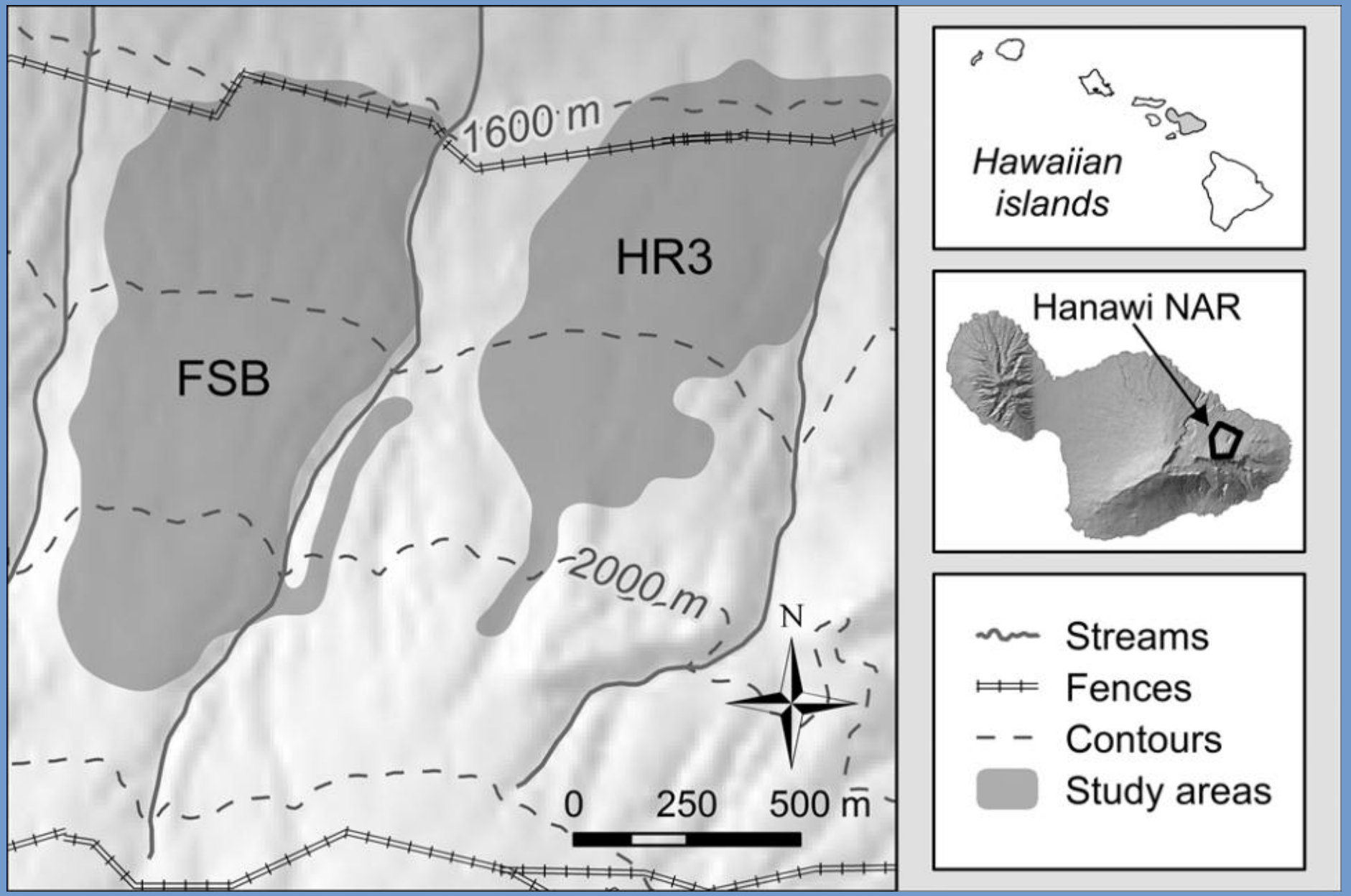
Kiwikiu Life History

- Insectivorous
- Territorial
- Monogamous
- 1 egg clutch
- Long juvenile dependency
- Nest in ohia (*Metrosideros polymorpha*)
- Re-nest only after failure

Purpose

- Use nest success and annual reproductive success (ARS) to estimate productivity for Kiwikiu
- Accurate productivity estimates aid in population modeling and management

Study Area


1600 m
HR3
FSB
2000 m
N
0
250
500 m
Hawaiian islands
Hanawi NAR
Streams
Fences
Contours
Study areas

Methods: Nest Success

- January to June 2006-2011
- Nests monitored daily
- Success: fledged chick
- Failure: no activity after 3+hours
- Data pooled across years

Methods: Nest Success

- Mayfield Estimator
  - Number of days nests were observed and exposed to threats of failure
  - Exposure days defined as first day nest was active
  - Construction not included
- Did not differentiate between incubation and nestling survival.

Identification of Birds

- Identified individuals and breeding pairs by color band resights.
- 130 of 212 adults birds were marked
- Of 106 pairs, 88% had one individual banded

Methods: Annual Reproductive Success

- Identified and located adults and noted the presence of juveniles
- ARS = # of pairs with an offspring ÷ total # of pairs

Nest Success Results

- Monitored 22 active nests
  - HR3: 18, FSB: 4
  - 15 failed

- Total exposure days= 338.5
- Daily survival probability= 0.956
- Nest survival probability= 20%

ARS Results

Site	Range of Pairs Annually	Total # of Pairs	Total # of Pairs w/ HY	% Success
FSB	11-19	63	27	42.86%
HR3	8-16	43	22	51.16%
Total	**21-35**	**106**	**56**	**46.23%**

Trend towards difference in productivity across years between sites

$\chi^2=6.53$, $k=3$, $P=0.10$

Population Model

- Calculated rate of population growth (λ)
  - $\lambda = PA + PJ\beta$
- Vetter et al. 2012
  - adult survival (PA)= 84 ± 0.04 %
  - juvenile survival (PJ)= 76 ± 0.09 %
  - average productivity (β)

- **Nest success: λ = 0.99 ± 0.08 (decline)**
- **ARS: λ = 1.19 ± 0.06 (increase)**

Discussion: Nest Success

- Nest success underestimated productivity
- Small sample size
- Locating nests is challenging
  - Re-nest, long breeding season, hard terrain
- Predict decline in population which is unlikely

Discussion: ARS

- Uses a larger subset of population
  - Easier to find pairs with loud calling juveniles
- Productivity consistently higher at HR3
  - Predator reduction grid covers 62% of area

Conclusions

- Based on ARS, Parrotbill are stable in core area
- Expand demographic monitoring to support better management

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