

# Cerulean Warbler demography and population structure

## **Contributors**

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and contributed

# Simple population model

$$\lambda = S_a + f * (S_j)$$

$\lambda$  = finite population growth rate

$S_a$  = annual adult survival

$S_j$  = annual juvenile survival

$f$  = annual fecundity

Fecundity is related to...

- number of young per successful nest
- number of nesting attempts
- number of broods possible in one season
- nesting success
- renesting rate
- pairing rate

$\lambda > 1$  increasing

$\lambda = 1$  stable

$\lambda < 1$  decreasing

# Modeling assumptions

- 100% pairing success
- immigration = emigration
- constant nesting success, number of young per successful brood, and annual adult survival
- all individuals breed in their first breeding season after hatch year
- no age or sex-related differences in parameters

# Modeling inputs/scenarios

	Low	Medium	High
Nest success	0.2	0.4	0.6
Brood size	3	3.4	3.75
Adult survival	0.54	0.59	0.64
Renest probability	0.8	0.9	1.0
Max. attempts	2	3	4
Juvenile survival ratio	0.4	0.5	0.7

# Sources of field data

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Site	Years	Nests Included in Analysis	Birds Banded
Ontario- Queen's Univ. Biological Station <sup>a</sup>	1995-2002	175	132
Tennessee- Cumberland Mountains <sup>b</sup>	1996-99, 2005-2006	92	36
Mississippi Alluvial Valley <sup>c</sup>	1992-2005	82	119
Indiana- Big Oaks NWR <sup>d</sup>	2002-2005	93	45
Michigan <sup>e</sup>	2003-2006	53	14

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<sup>a</sup> Oliarnyk and Robertson (1996), Jones et al. (2001), Jones et al. (2004), and Jones, Robertson, and Barg, unpublished data

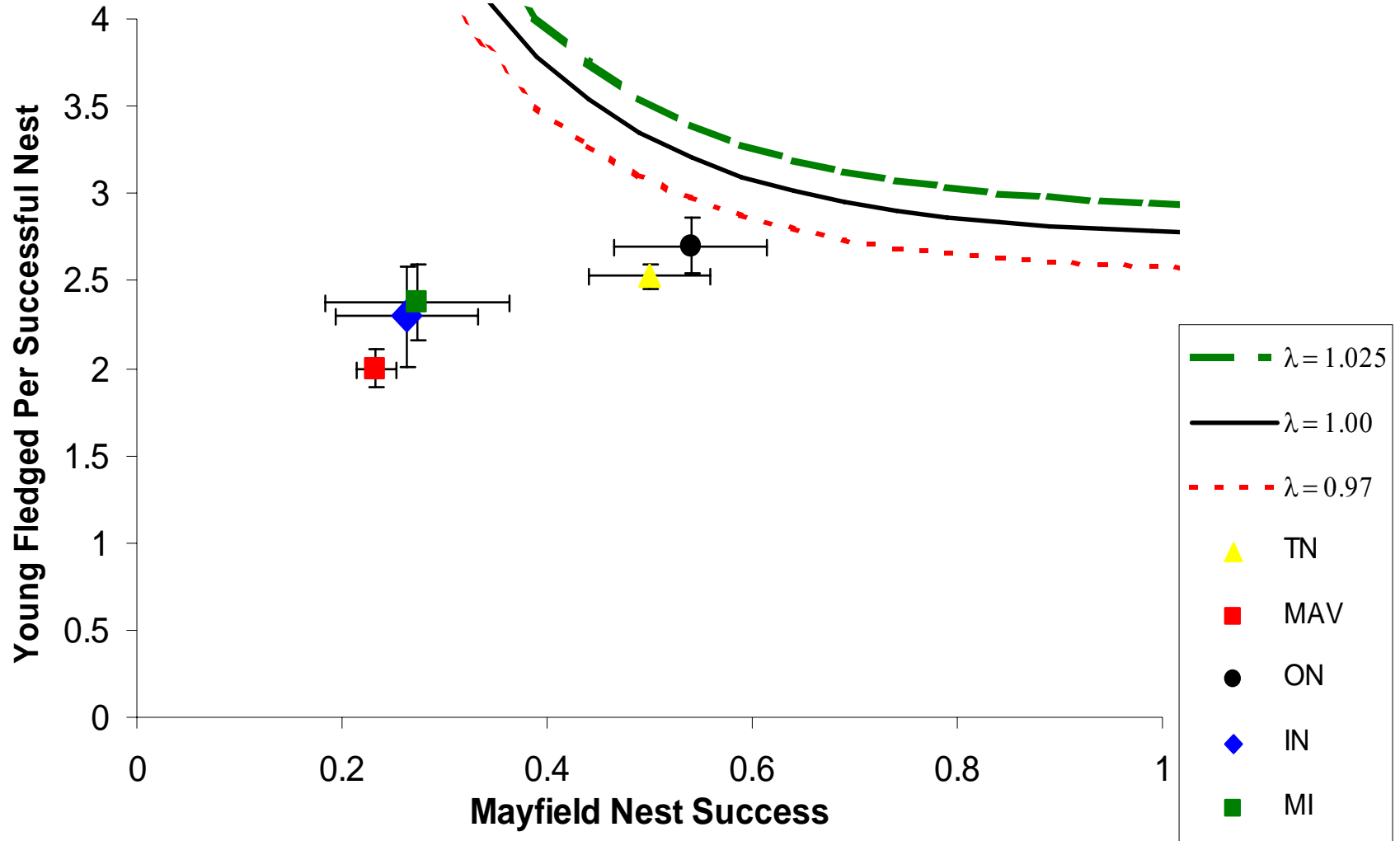
<sup>b</sup> Nicholson (2004), Buehler and Beachy, unpublished data

<sup>c</sup> Hamel, unpublished data

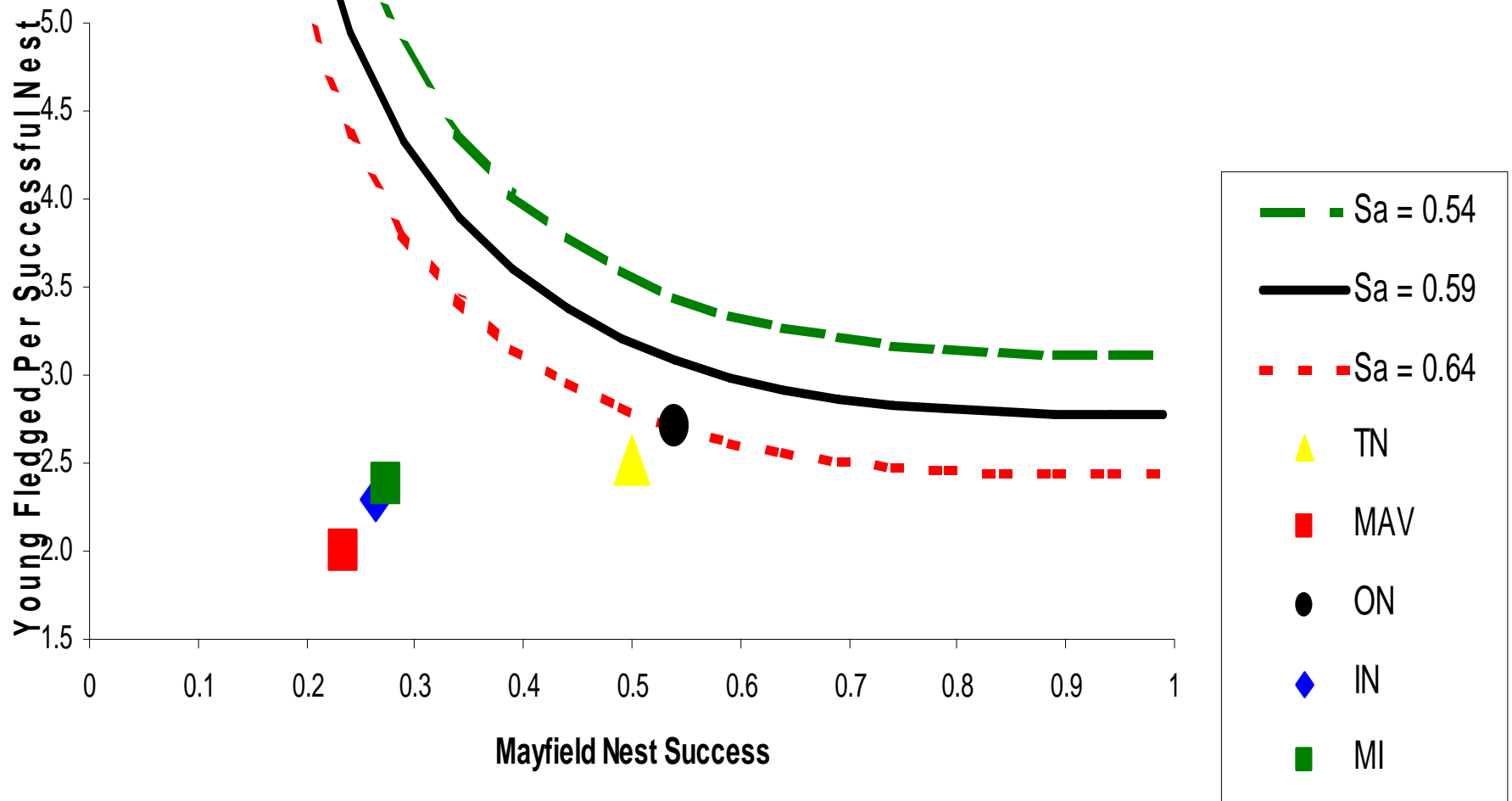
<sup>d</sup> Robb, Roth, Varble, Islam, and Buehler, unpublished data

<sup>e</sup> Rogers (2006), and Rogers, unpublished data

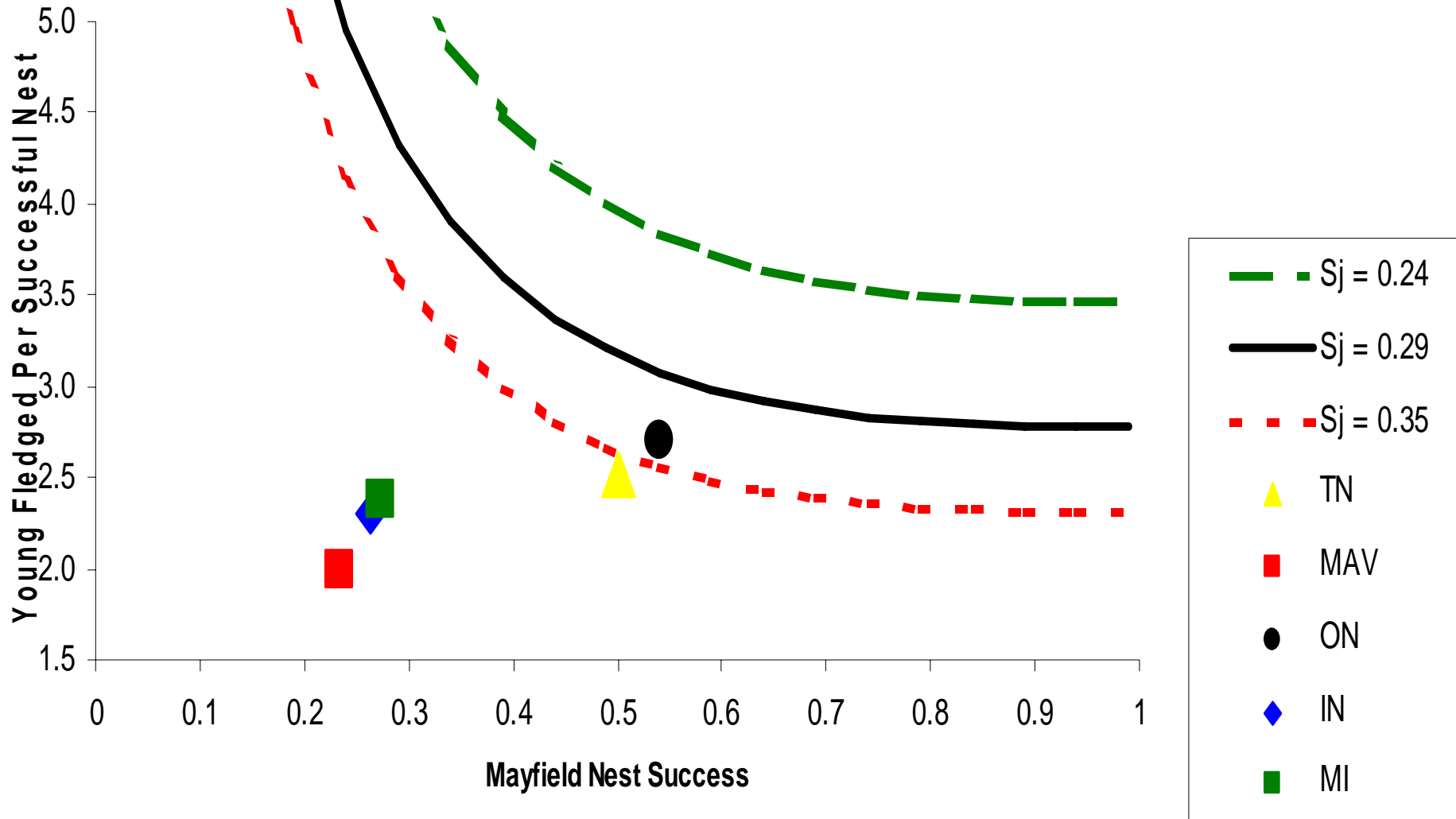
# Demographic analysis

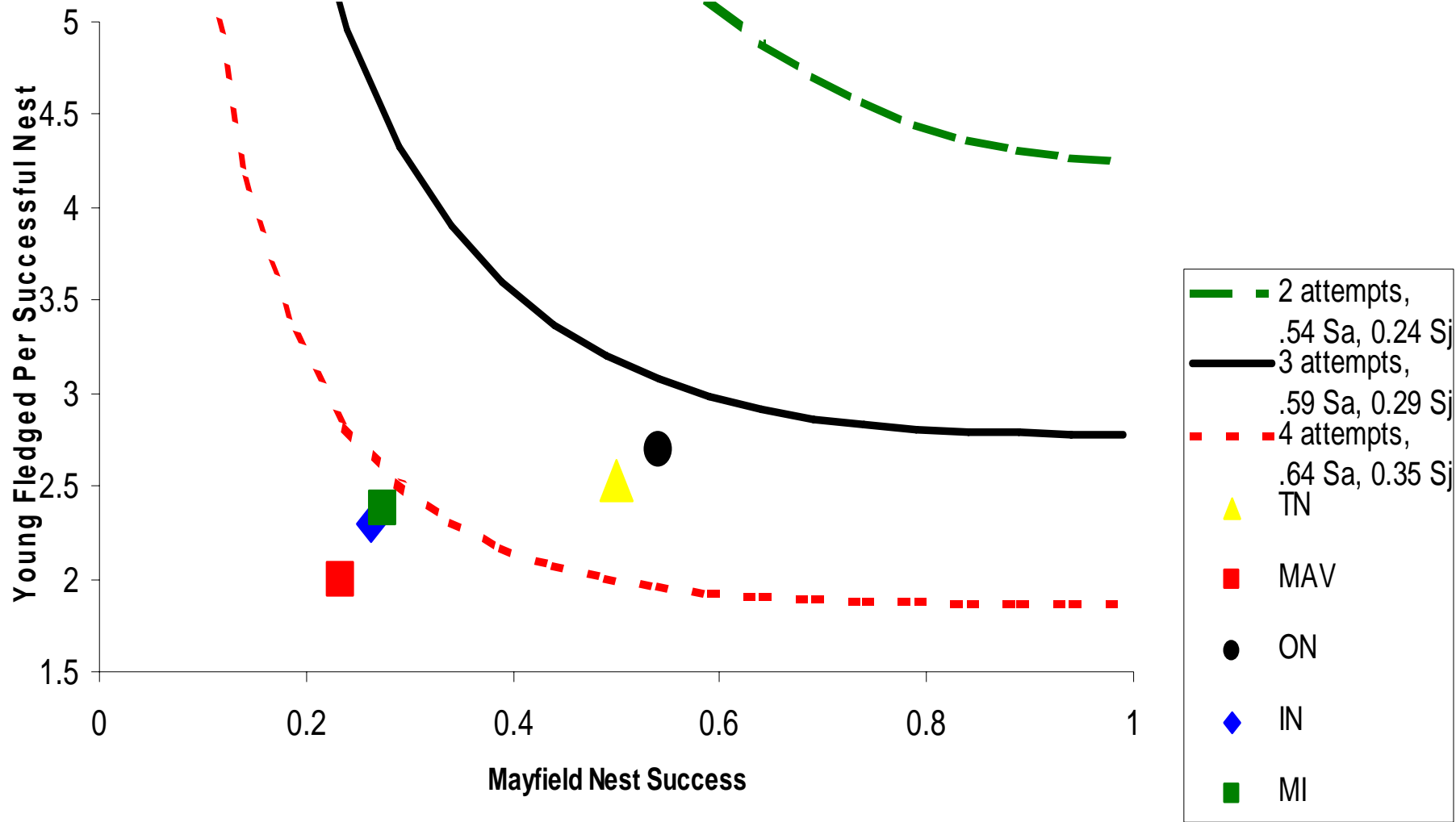


# Adult "survival"

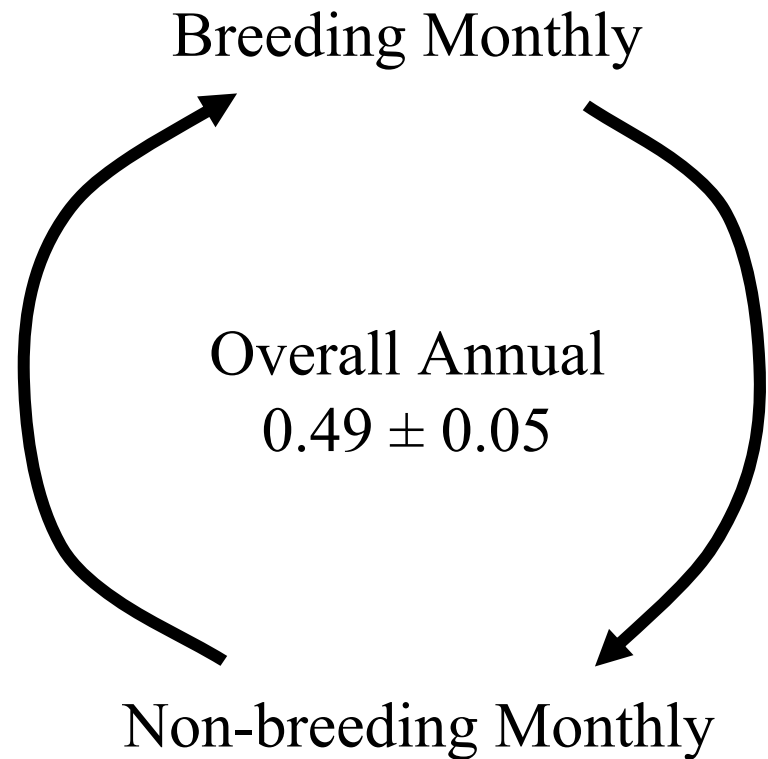


# Juvenile “survival”

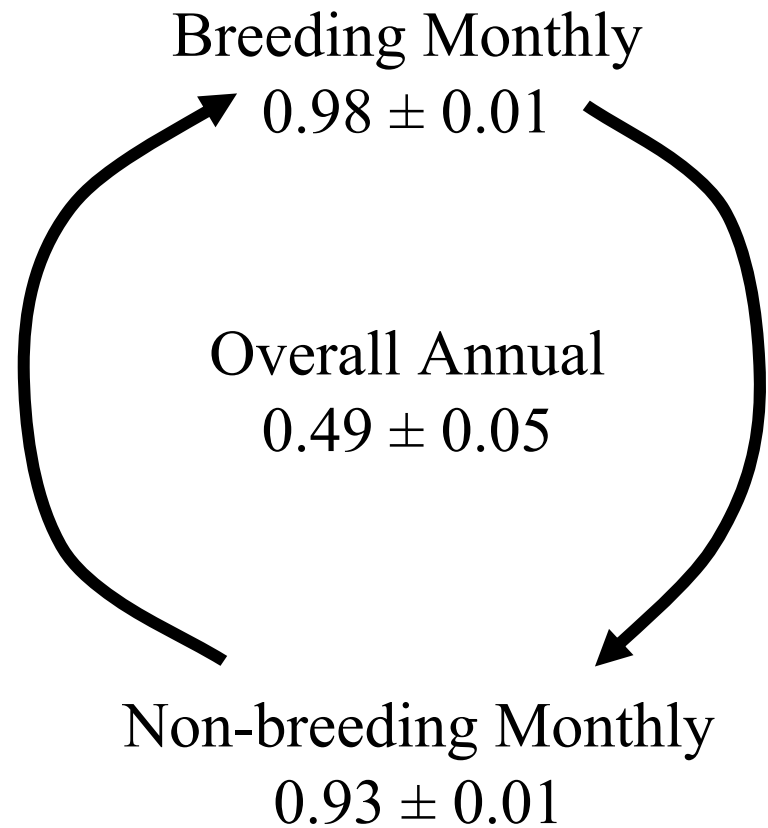




# Annual and monthly survival



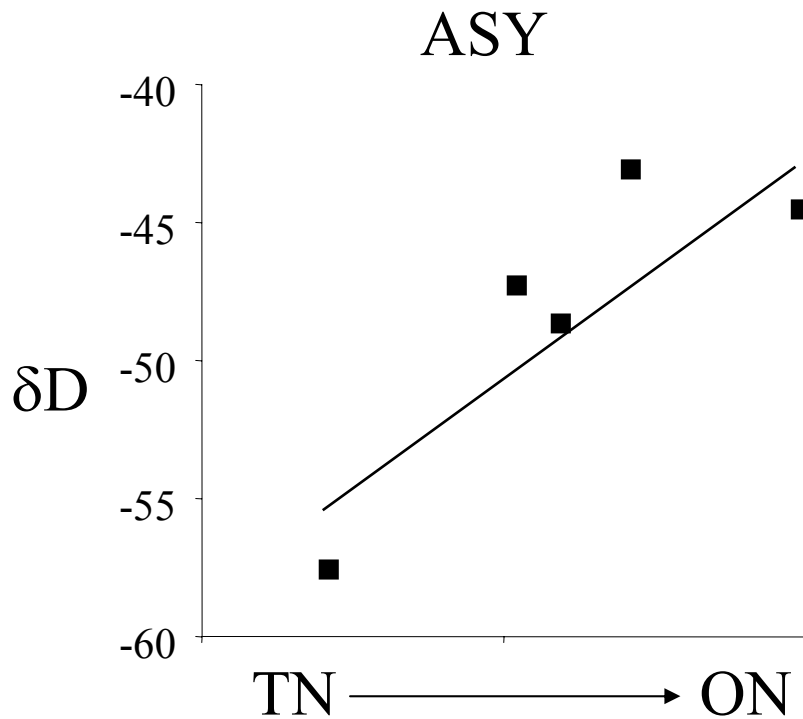
# Annual and monthly survival



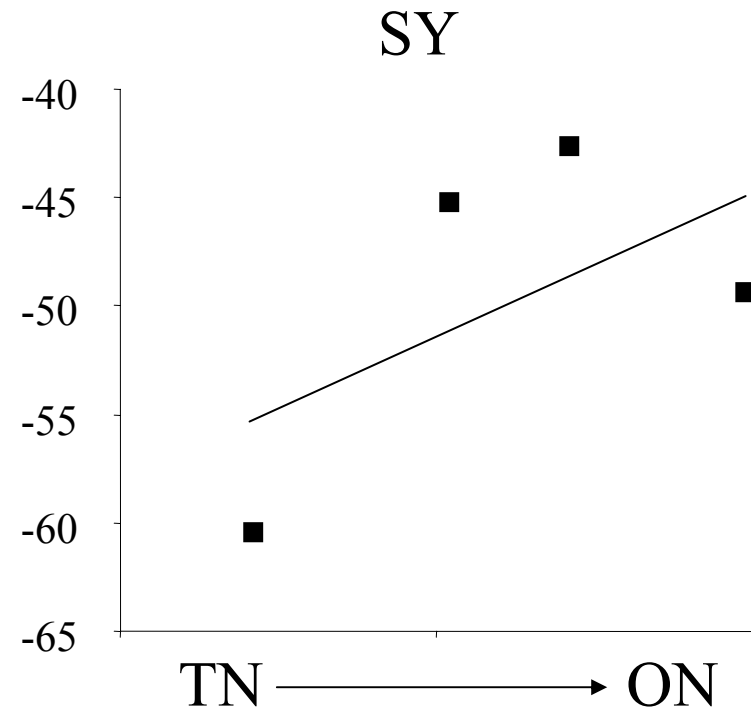
# Adult/natal dispersal

Capture region (year $t$ )	Assignment (year $t-1$ )			
	ON	IL	TN	PA/WV
ON	14/8	0/0	1/0	0/0
IL	5/0	7/0	0/0	6/1
TN	0/0	1/1	12/7	0/0
PA	2/0	7/2	0/0	3/5
WV	0/0	11/5	2/1	0/2
Totals	21/8	26/8	15/8	9/8

# A hint of connectivity

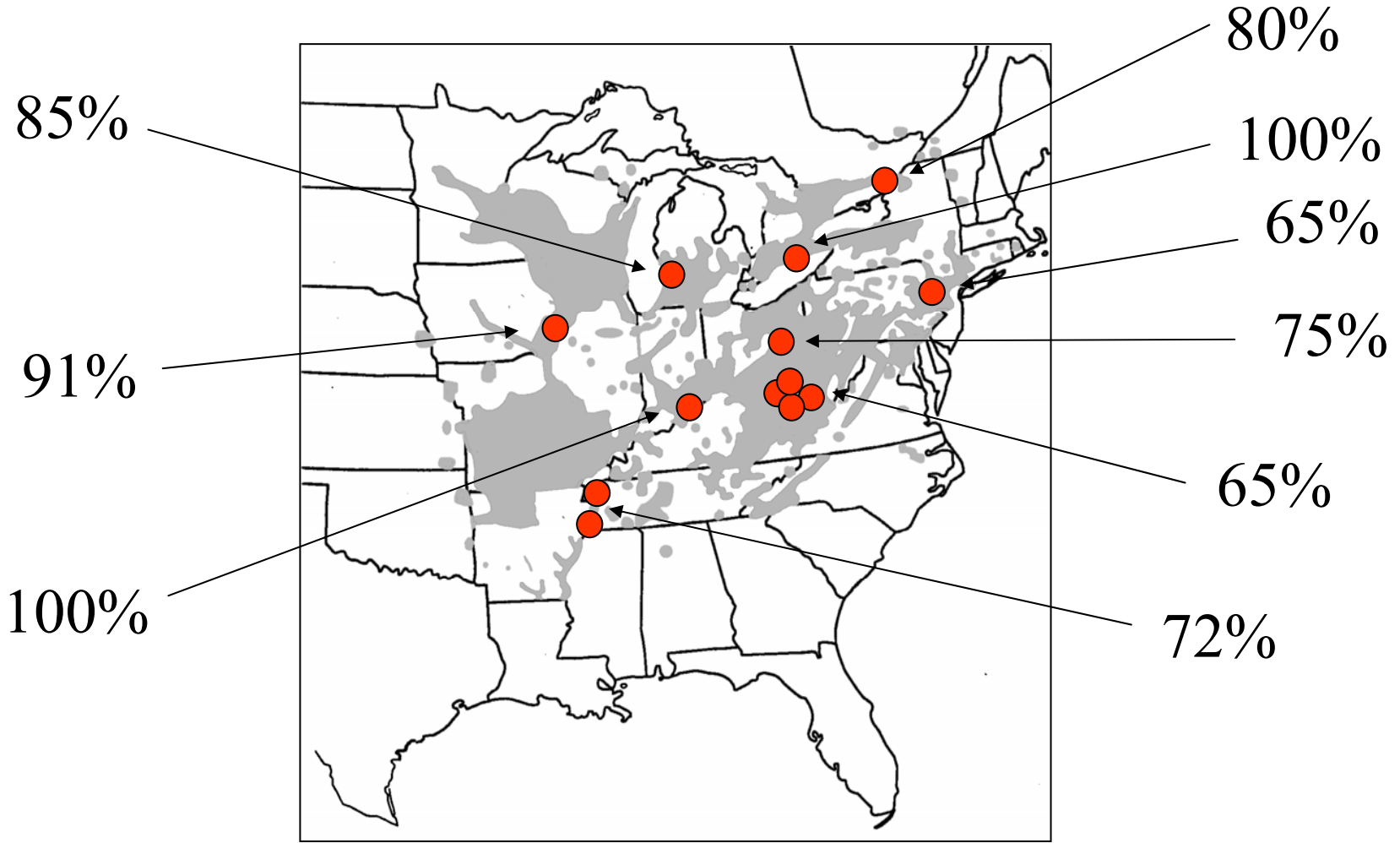


$$y = -92.9 + 0.009x$$
$$F = 34.56, P < 0.001$$



$$y = -87.5 + 0.007x$$
$$F = 9.15, P = 0.005$$

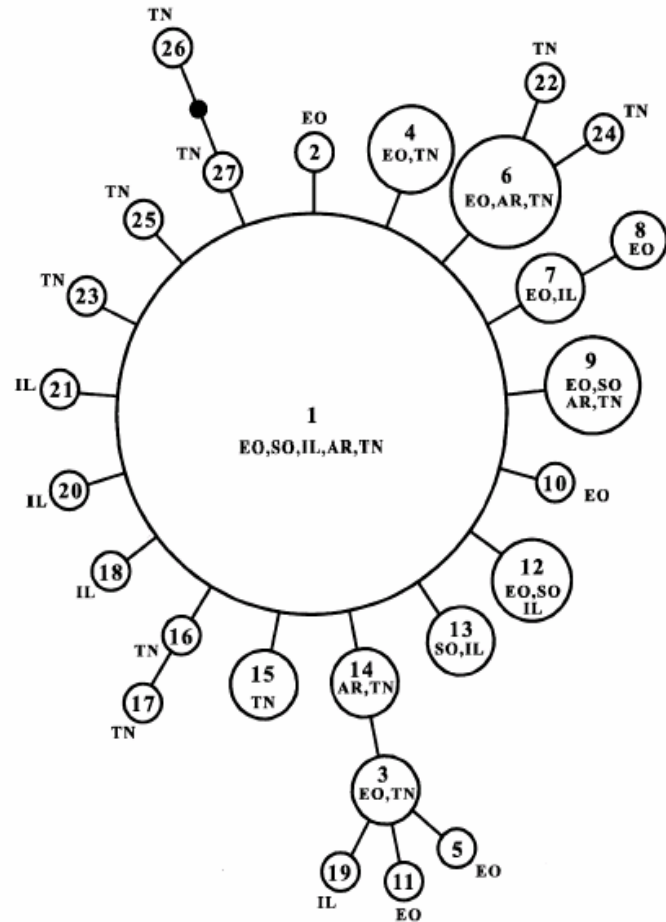
# Age ratio



Where are all the SY birds?

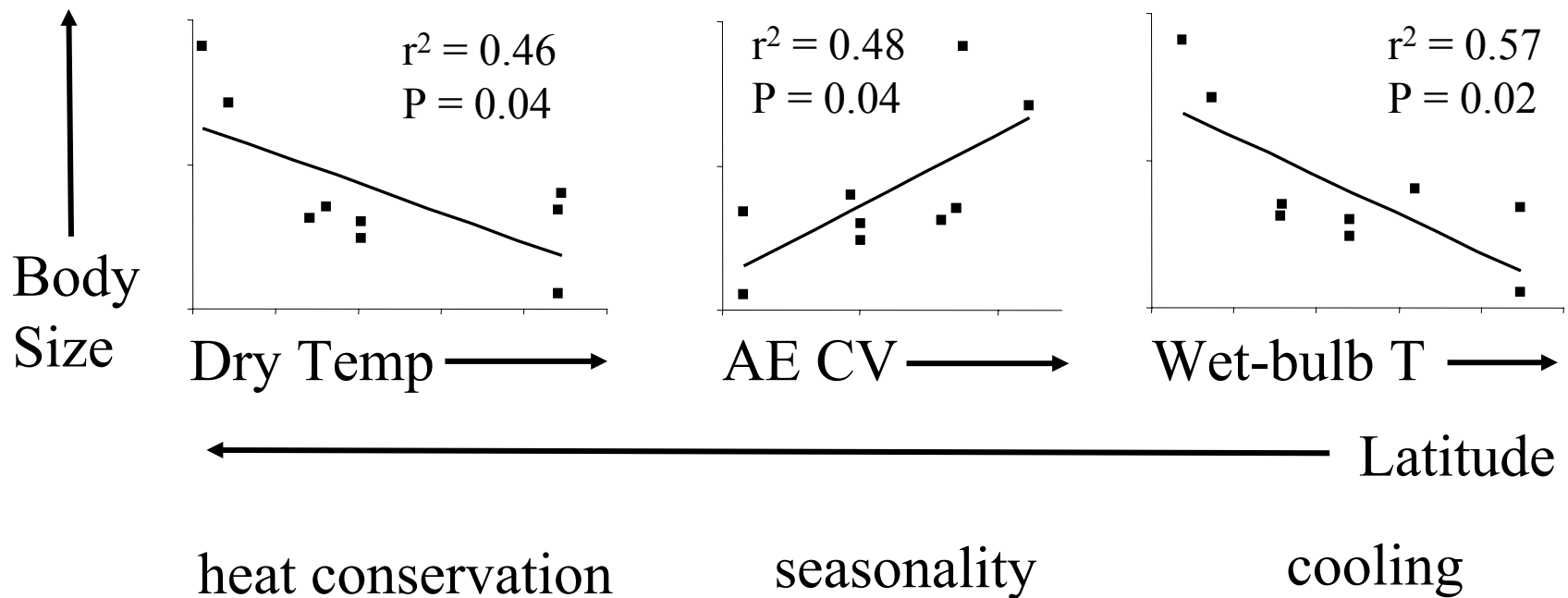
# Genetic variability - or not

- one haplotype in 63% of 152 individuals
- 45% of 78 alleles shared by all populations



# Significant morphological variability

Adherence to Bergmann's Rule despite gene flow/dispersal



# So what do we need?

- more (and better) data on:
  - fecundity
  - adult survival – esp. for females
  - juvenile survival – both genders
  - immigration/emigration – breeding & natal
- fitness consequences of habitat selection decisions