

White-throated Sparrow
(*Zonotrichia albicollis*):
Biology of Color Morphs

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Adult White-throated Sparrows occur in two different color morphs: White-striped and Tan-striped. Half of adult birds are of each color morph, regardless of sex. (Photos were shown at DVOC meeting.) Color differences are summarized as follows:

	White-striped morph	Tan-striped morph
Crown stripes	White and black	Tan and dark brown
Supraloral spot	Bright yellow	Duller yellow
Malar stripe	Weak	Prominent
Breast pattern	Less streaky	More streaky
Breast color	Grayish	Brownish

Morphological differences are associated with a chromosomal difference.

In tan-striped birds, both copies of chromosome number 2 (the second-largest chromosome) are acrocentric (shaped like a clothespin). In white-striped birds, one copy of chromosome 2 is acrocentric and the other is metacentric (shaped like a letter X). This is due to a structural rearrangement (a pericentric inversion) of one copy of the chromosome: two breaks have occurred in the chromosome, the center piece has been turned upside-down, and the pieces have joined back together. (Photos were shown at the DVOC meeting.)

Behavioral differences

	Males		Females	
	White-striped	Tan-striped	White-striped	Tan-striped
Aggressiveness	++	+	+	-
Territoriality	++	+	+	-
Singing	++	+	+	-
Extra-pair copulations	++	+		
Parental care (provisioning)	+	++	++	+++

Mate choice

- Expected: 1:2:1 ratio of (TSxTS), (TSxWS), (WSxWS)
- Observed: over 95% of mated pairs are Tan-striped x White-striped
- Negative assortative mating (each bird prefers a mate of the opposite color morph)
- Offspring of TSxWS pairs are 1/2 TS and 1/2 WS

Biological consequences of negative assortative mating

	White-striped Male	Tan-striped Male	White-striped Female	Tan-striped Female
Aggressiveness, Territoriality, Singing	++	+	+	-
Parental care (provisioning)	+	++	++	+++

Behaviors of color morphs complement each other, so tan-striped male x white-striped female pairs exhibit the same total amount of aggressive/territorial/singing behavior, and provide the same total amount of parental care, as white-striped male x tan-striped female pairs.

Questions:

- How does chromosomal rearrangement result in morphological and behavioral differences?

For reasons discussed at the meeting, structural rearrangements of chromosomes can result in complex and pervasive changes in the activity of many genes and gene products. The specific changes that occur in White-throated Sparrows are not known.

- Why do birds choose mates of the opposite morph?

Although many hypotheses have been advanced, the answer to this question is not known with any certainty. However, the answer may lie in behavioral factors which make same-morph matings incompatible. White-striped birds are very aggressive and fight between themselves, possibly making WS x WS pairings unstable. Tan-striped birds exhibit reduced territorial behavior, and TS x TS pairs have difficulty keeping possession of a territory; this would weaken the pair bond. Occasionally, however, both of these pairings do occur, and they succeed in fledging young.

Unique among birds:

- Balanced chromosomal polymorphism
- Morphological polymorphism
- Behavioral polymorphism
- Negative assortative mating

References

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