Does Breeding Method Effect Genetic Variability in Passerines?

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Objective:

Compare genetic variability of cooperative and non-cooperative breeding passerines.

Background:

4.5% of songbirds breed cooperatively.[1]

Cooperative breeding systems allow for greater parental care for offspring, potentially offsetting the deleterious effect of inbreeding on populations.[2]

If cooperative breeders have lower genetic variation, they would have lower adaptive potentials and may be more likely to face extinction.[3]

Hypothesis:

Cooperative breeders will be more inbred than non-cooperative

Cooperative breeders will have less genetic variation than non-cooperative

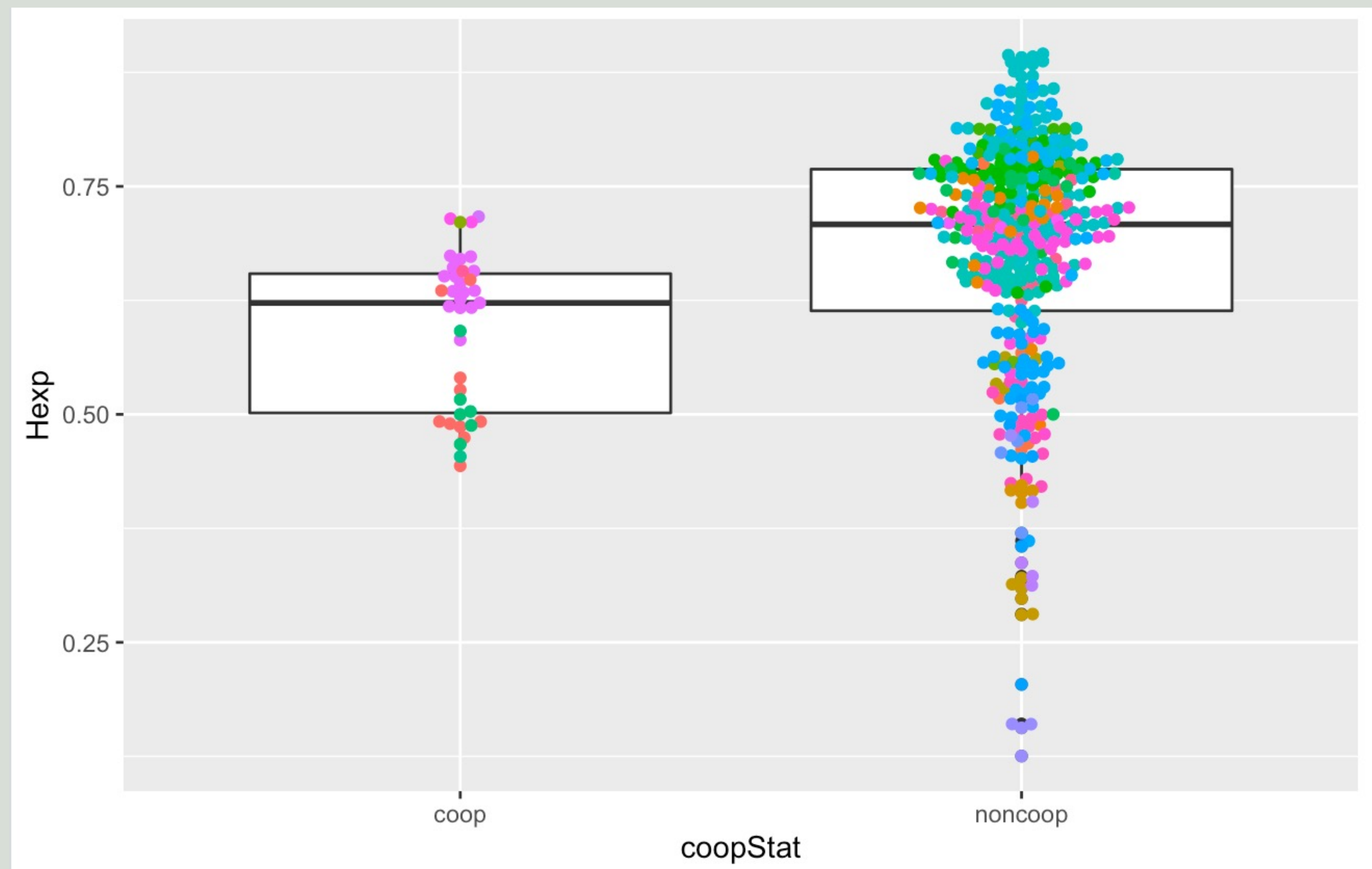

Figure 1. A boxplot with a swarm plot overlayed comparing Nei's H_{exp} values for every population of cooperative and non-cooperative breeders (coop and noncoop respectively). Each species has its own dot coloration.

Ho	Hs	Ht	Dst	Htp	Dstp	Fst	Fstp	Fis	Dest
0.6459	0.6860	0.7099	0.0239	0.7107	0.0247	0.0336	0.0348	0.0584	0.0788
Ho	Hs	Ht	Dst	Htp	Dstp	Fst	Fstp	Fis	Dest
0.5579	0.5875	0.6490	0.0615	0.6695	0.0820	0.0948	0.1225	0.0503	0.1988

Figure 2. Example of overall basic.stats results for 2 datasets (*Poecile Atricapillus* on top, *Acrocephalus sechellensis* on bottom). F_{is} is the key variable in this table.

Methods:

Collect microsatellite data from published sources (Figure 3) for all passerine species available

Calculate H_{exp} and F_{is} for populations using poppr and basic.stats functions in R (Figure 2)

Preform mixed model regressions for each variable

Pop	Pop Abbrev.	PAT MP 2-14		Titgata39		Escu6		Titgata02		PAT MP2-43		Ase18	
1	WH	149	161	222	234	148	150	228	232	177	207	204	204
2	ED	141	159	234	238	142	146	236	240	157	165	204	204
3	HI	141	143	238	254	146	156	232	236	165	175	204	220
3	HI	141	141	242	242	140	150	228	244	159	169	204	204
4	BUC	141	141	238	242	140	158	220	228	165	177	204	204
4	BUC	143	155	230	234	140	156	232	232	157	217	204	204
4	BUC	141	143	226	234	128	146	228	232	165	207	204	204
4	BUC	141	143	226	234	142	156	232	236	157	159	204	216
4	BUC	141	143	238	242	148	158	228	228	153	207	204	216
4	BUC	141	143	242	254	142	154	232	248	159	165	204	204
4	BUC	141	141	230	234	124	140	220	236	153	157	204	216
5	NSK	139	141	238	238	136	144	224	268	155	165	204	204
5	NSK	141	141	234	234	136	144	232	236	147	155	204	216
5	NSK	141	155	242	250	142	154	228	244	161	165	204	204
5	NSK	141	143	238	246	144	150	236	248	153	155	204	204
5	NSK	143	143	234	246	144	158	232	240	149	199	204	216
5	NSK	141	141	238	242	150	156	236	244	153	153	204	204
5	NSK	141	159	234	238	142	150	236	240	147	157	204	204
5	NSK	141	141	234	242	144	146	224	236	161	185	204	204

Figure 3. Neutral microsatellite data pulled from dryad.org and manipulated for R.[4]

Results:

40 species, 431 populations

20% species cooperatively breed

Statistical analysis in process

Conclusion:

This project is not finished, so my conclusions are extremely limited. The results of the boxplot (Figure 1) give preliminary, limited support for my hypothesis. Further conclusions will be drawn following the final mixed model regressions.

Works Cited: 1. Downing, P.A., Griffin, A.S., and Cornwallis, C.K. 2020. Group formation and the evolutionary pathway to complex sociality in birds. Nature Ecology & Evolution **4**(3): 479–486. 2. Hajduk, G.K., Cockburn, A., Margraf, N., Osmond, H.L., Walling, C.A., and Kruuk, L.E.B. 2018. Inbreeding, inbreeding depression, and infidelity in a cooperatively breeding bird*. Evolution **72**(7): 1500–1514. Society for the Study of Evolution. 3. Hoffmann, A.A., Sgrò, C.M., and Kristensen, T.N. 2017. Revisiting Adaptive Potential, Population Size, and Conservation. Trends in Ecology & Evolution **32**(7). 4. Kuhn, Kerstin et al. (2014), Data from: Differentiation in neutral genes and a candidate gene in the pied flycatcher: using biological archives to track global climate change, Dryad.