

Supplementary material

Table S1. Number of nests and individuals in each experimental group in a given breeding season.

	Nests	Nestlings:	Early 1	Early 2	Late	Control	All nestlings
2017	24		54	54	51	55	214
2018	20		52	52	52	50	206
Both Seasons	44		106	106	103	105	420

Table S2. Values of PC loading for variables characterizing microstructure of barb's cross-sections.

Variable	PC1	PC2
height	-0.89	0.14
width	-0.69	0.24
total area	-0.97	0.13
medullary area	-0.96	0.03
cortex area	-0.82	0.27
no. of vacuoles	-0.71	0.02
vacuoles area	-0.82	0.04
melanosomes	-0.63	-0.76
melanosomes density	-0.25	-0.96

Table S3.

Results of the linear mixed models showing effects of experimental double-stage brood size manipulation on red chroma of tail feathers. The model included experimental group, year and sex as fixed factors and nest of rearing as a random term. Reference levels for fixed effects: exp. group – CONTROL; sex – female; year – 2017.

	Estimate	SE	df	t	p
Red chroma					
Intercept	-5.769	4.597	31.880	-1.255	0.219
Early1	0.003	0.003	32.270	0.904	0.372
EarlyY2	0.000	0.003	32.060	0.904	0.935
Late	0.005	0.003	29.680	1.708	0.098
Sex: Males	-0.013	0.001	274.300	-10.262	<0.001 ***
year	0.003	0.001	31.880	1.303	0.202

Table S4. Mean value and standard deviation of **A.** nestlings mass, tarsus length, tail feathers morphometrics and colour metrics (*sample size of colour metrics measurements was 164 and 141 for males and females, respectively), averaged within sex; **B.** tail feather barb cross-section microstructure variables; **C.** small angle X-ray scattering (SAXS) metrics. **B.** Analysis of barbs microstructure characteristics was performed on subsample of 3 randomly chosen nestlings from each experimental nest, therefore the sample size within each sex is given in brackets in column headings. **C.** SAXS analysis was performed on a subset of tail feathers from the 2017 season, thus the sample size within sex is given in brackets in column headings.

A.	Males (n = 222)	Females (n = 205)
mass	10.97 ± 1.15	10.97 ± 1.15
tarsus length	16.79 ± 0.62	16.79 ± 0.62
rectrix length	31.87 ± 4.15	31.86 ± 4.15
rectrix sheath	14.00 ± 1.74	13.99 ± 1.73
erupted part	17.89 ± 4.08	17.89 ± 4.08
tail brightness*	4608.13 ± 686.36	4608.14 ± 686.35
Tail UV chroma*	0.28 ± 0.02	0.28 ± 0.02
B.	Males (n = 69)	Females (n = 46)
Height	65.24 ± 11.56	65.12 ± 11.42
Width	18.23 ± 2.64	18.19 ± 2.60
Total area	808.38 ± 252.95	803.45 ± 247.36
Medullary area	433.43 ± 160.57	430.93 ± 157.68
Cortex area	379.17 ± 114.15	376.75 ± 112.02
No vacuoles	4.44 ± 1.39	4.43 ± 1.38
Vacuoles area	167.45 ± 75.02	166.71 ± 74.01
Melanosomes	94.32 ± 68.75	92.72 ± 67.68
Melanosomes per area	0.12 ± 0.07	0.11 ± 0.07
C.	Males (n = 95)	Females (n = 53)
Maximum peak height	9.79E-12 ± 3.67E-12	9.81E-12 ± 3.67E-12
Peak position	3.03E-03 ± 1.95E-04	3.02E-03 ± 1.96E-04
Peak FWHM	3.20E-03 ± 2.97E-04	3.20E-03 ± 2.98E-04

Figures

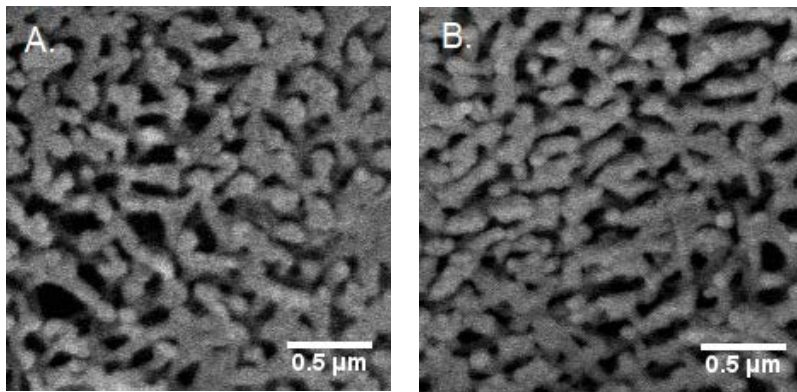


Fig. S1. SEM micrographs of the female (A.) and male (B.) rectrix barb cross-section, showing fragment with keratin spongy structure.

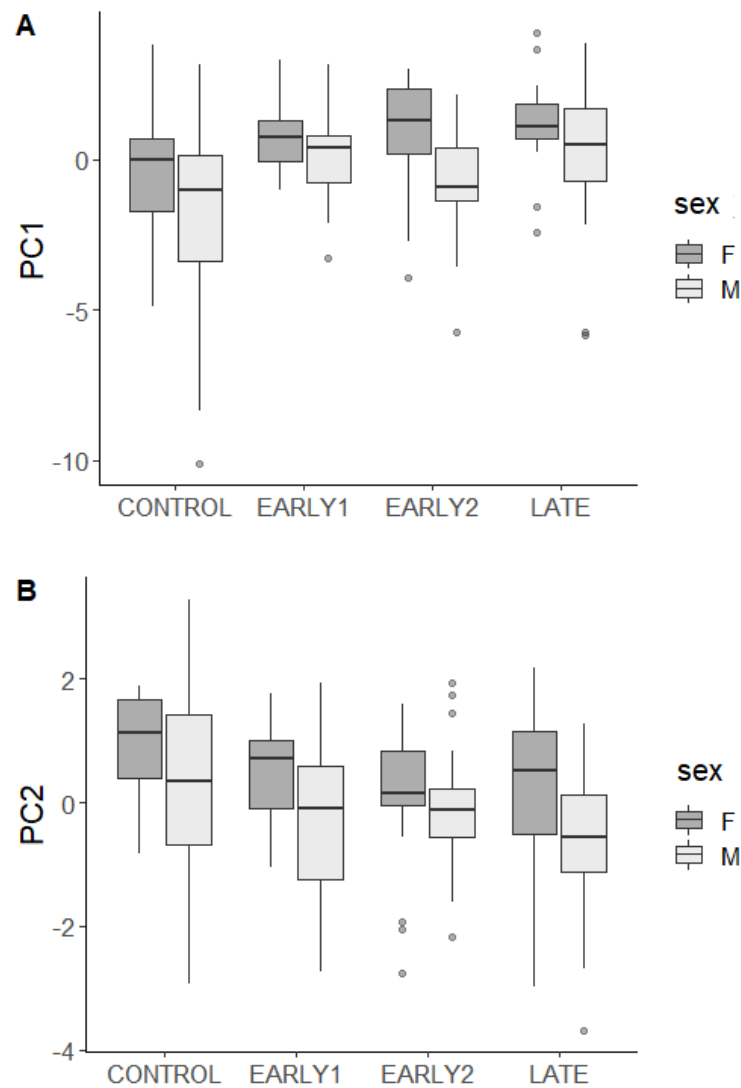


Figure S2. Differences in PC1 (A), and PC2 (B) between experimental groups. “Early1” indicate the group in which broods were enlarged at day 2 and left without further manipulation until fledging, in the group “Early2” broods were enlarged at day 2, and subsequently reduced at day 6, in the group “Late” broods were enlarged at day 6, and “Control” was the group with not manipulated broods. Black horizontal bars indicate median, whiskers indicate minimum and maximum values, dark grey and light grey colours denote, respectively, females and males.