

Sexual dimorphism and variability in the skull of *Martes foina*

Ahmet Selçuk Özen*

Department of Biology, Faculty of Science and Literature, Kütahya Dumlupınar University Evliya Çelebi Campus.

43000 Kütahya, Turkey

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*¹ E-mail: aselcuk.ozen@dpu.edu.tr

Supplementary material

Table S1.

A comparison of measured skull characters between juvenile and adult individuals of *Martes foina*. All measurements in millimetres. *n*: number of samples, min–max: range margins, \bar{x} : mean, SD: standard deviation, CV: variation coefficient, *F*: value derived from Levene's test. For abbreviations of skull variables see fig. 2.

Characters	Juveniles (n = 31)			Adults (n = 26)			F	<i>t</i> test	P
	min–max	$\bar{x} \pm SD$	CV	min–max	$\bar{x} \pm SD$	CV			
TL	74.20–86.19	79.63 ± 3.41	4.28	77.10–88.91	83.41 ± 3.14	3.76	0.33	4.32	<0.05
CoL	71.28–83.21	76.68 ± 3.59	4.68	73.10–83.69	79.13 ± 2.69	3.40	5.26	2.87	<0.05
ZW	43.10–51.72	46.53 ± 1.95	4.19	44.92–52.61	49.76 ± 2.10	4.22	0.33	6.02	<0.05
MaW	33.54–39.90	36.68 ± 1.51	4.11	35.58–39.65	38.11 ± 0.99	2.61	4.82	4.28	<0.05
IW	17.28–22.45	19.74 ± 1.15	5.84	18.65–22.00	20.74 ± 0.91	4.40	0.29	3.56	<0.05
PW	16.70–21.80	18.89 ± 1.28	6.89	15.29–20.32	17.97 ± 1.13	6.31	1.06	–1.91	>0.05
PaW	23.12–27.30	25.04 ± 1.02	4.08	21.72–28.30	25.71 ± 1.57	6.12	2.20	1.93	>0.05
BL	64.68–75.81	69.88 ± 3.25	4.65	65.18–76.00	71.85 ± 2.77	3.85	1.57	2.44	<0.05
UTL	28.00–35.00	32.32 ± 1.88	5.83	30.30–35.00	33.47 ± 1.48	4.42	2.84	2.52	<0.05
CH	27.72–33.68	30.15 ± 1.59	5.28	29.12–32.62	30.98 ± 1.08	3.47	3.26	2.28	<0.05
CoH	20.98–25.78	22.72 ± 1.44	6.32	21.52–26.32	24.12 ± 1.30	5.40	0.73	3.81	<0.05
ML	46.80–55.39	51.18 ± 2.58	5.04	48.30–56.50	53.16 ± 2.21	4.15	1.99	3.07	<0.05
FW	21.50–27.55	24.86 ± 1.48	5.96	22.00–30.00	26.42 ± 2.08	7.88	3.37	3.29	<0.05
RW	14.38–18.28	15.85 ± 0.89	5.64	15.00–18.59	16.68 ± 0.88	5.26	0.47	3.52	<0.05

Table S2.

A comparison of measured skull characters between female and male individuals of *Martes foina*. All measurements in millimetres. *n*: number of samples, min–max: range margins, \bar{x} : mean, SD: standard deviation, CV: variation coefficient, *F*: value derived from Levene's test. For abbreviations of skull variables see fig. 2.

Characters	Females (n = 8)			Males (n = 18)			F	<i>t</i> test	P
	min–max	$\bar{x} \pm$ SD	CV	min–max	$\bar{x} \pm$ SD	CV			
TL	77.10–86.10	80.82 ± 3.04	3.77	77.78–88.91	84.56 ± 2.47	2.92	0.87	–3.33	<0.05
CoL	73.10–80.90	76.72 ± 2.69	3.50	75.57–83.69	80.20 ± 1.93	2.41	1.77	–3.76	<0.05
ZW	45.15–51.39	48.11 ± 1.97	4.10	44.92–52.61	50.50 ± 1.73	3.43	0.34	–3.11	<0.05
MaW	35.58–38.12	37.24 ± 1.05	2.82	37.25–39.65	38.49 ± 0.70	1.82	4.66	–3.60	<0.05
IW	18.90–21.30	20.24 ± 0.88	4.33	18.65–22.00	20.96 ± 0.86	4.10	3.03	–1.96	>0.05
PW	15.29–18.70	17.38 ± 1.19	6.86	16.20–20.32	18.23 ± 1.03	5.68	0.67	–1.83	>0.05
PaW	21.72–25.66	24.06 ± 1.54	6.38	24.38–28.30	26.44 ± 0.91	3.43	6.60	–4.07	<0.05
BL	65.18–73.79	69.54 ± 2.87	4.13	68.26–76.00	72.88 ± 2.06	2.82	0.98	–3.38	<0.05
UTL	30.30–34.18	32.24 ± 1.37	4.26	31.50–35.70	34.02 ± 1.18	3.48	0.91	–3.38	<0.05
CH	29.12–32.48	30.38 ± 1.18	3.90	29.70–32.62	31.27 ± 0.92	2.94	0.31	–2.18	<0.05
CoH	21.52–25.63	23.13 ± 1.47	6.36	22.56–26.32	24.56 ± 0.97	3.93	2.46	–2.96	<0.05
ML	48.30–55.90	51.23 ± 2.55	4.97	50.70–56.50	54.02 ± 1.40	2.59	5.97	–2.90	<0.05
FW	22.00–28.00	25.11 ± 1.75	6.97	22.46–30.00	27.00 ± 1.98	7.35	0.29	–2.32	<0.05
RW	15.00–17.00	15.96 ± 0.88	5.52	16.10–18.59	17.00 ± 0.67	3.96	3.59	–3.33	<0.05

Table S3.

Pearson's correlations between skull characters in females of *Martes foina*. The upper number indicates the correlation coefficient values, the lower number represents the *P* value. For abbreviations of skull variables see fig. 2. (NS: not significant.)

	TL	CoL	ZW	MaW	IW	PW	PaW	BL	UTL	CH	CoH	ML	FW	RW
TL	1													
CoL	0.960**	1												
	0													
ZW	0.830*	0.707*	1											
	0.011	0.05												
MaW	0.804*	0.828*	0.695	1										
	0.016	0.011	NS											
IW	0.668	0.627	0.789*	0.56	1									
	NS	NS	0.02	NS										
PW	0.222	0.133	0.674	0.182	0.685	1								
	NS	NS	NS	NS	NS									
PaW	-0.535	-0.387	-0.42	-0.121	-0.212	-0.064	1							
	NS	NS	NS	NS	NS	NS								
BL	0.953**	0.937**	0.756*	0.841**	0.572	0.154	-0.584	1						
	0	0.001	0.03	0.009	NS	NS	NS							
UTL	0.910**	0.895**	0.835**	0.824*	0.882**	0.419	-0.389	0.881**	1					
	0.002	0.003	0.01	0.012	0.004	NS	NS	0.004						
CH	0.676	0.56	0.830*	0.46	0.395	0.559	-0.55	0.667	0.527	1				
	NS	NS	0.011	NS	NS	NS	NS	NS	NS					
CoH	0.793*	0.806*	0.844**	0.683	0.853**	0.669	-0.299	0.763*	0.891**	0.686	1			
	0.019	0.016	0.008	NS	0.007	NS	NS	0.028	0.003	NS				
ML	0.964**	0.925**	0.892**	0.786*	0.800*	0.442	-0.521	0.928**	0.961**	0.716*	0.915**	1		
	0	0.001	0.003	0.021	0.017	NS	NS	0.001	0	0.046	0.001			
FW	0.563	0.531	0.689	0.681	0.760*	0.436	0.223	0.423	0.698	0.242	0.578	0.584	1	
	NS	NS	NS	NS	0.029	NS	NS	NS	NS	NS	NS	NS		
RW	0.906**	0.905**	0.859**	0.888**	0.796*	0.399	-0.258	0.886**	0.952**	0.609	0.878**	0.932**	0.759*	1
	0.002	0.002	0.006	0.003	0.018	NS	0.538	0.003	0	NS	0.004	0.001	0.029	

** , Correlation is significant at the 0.01 level (two-tailed). * , Correlation is significant at the 0.05 level (two-tailed).

Table S4.

Values of latent roots and loadings factors of the PCA for two principal components (PC1, PC2) in females: their eigenvalues, percentage (variability %) and cumulative percentage (cumulative %) expressions. For abbreviations of skull variables see fig. 2.

	PC1	PC2
BL	0.941	0.277
TL	0.895	0.393
CoL	0.845	0.391
ML	0.842	0.529
PaW	-0.786	0.304
UTL	0.729	0.636
RW	0.703	0.670
CH	0.699	0.272
MaW	0.637	0.536
FW	0.159	0.890
IW	0.395	0.829
PW	0.042	0.735
CoH	0.626	0.694
ZW	0.654	0.665
eigenvalue	6.65	4.91
variance (%)	47.51	35.12
cumulative (%)	47.51	82.63

Table S5.

Pearson's correlations between skull characters in males of *Martes foina*. The upper number indicates the correlation coefficient values, the lower number represents the *P* value. (NS: not significant.) For abbreviations of skull variables see fig. 2.

	TL	CoL	ZW	MaW	IW	PW	PaW	BL	UTL	CH	CoH	ML	FW	RW
TL	1													
CoL	0.815**	1												
	0.000													
ZW	0.581*	0.297	1											
	0.012	NS												
MaW	0.249	0.421	0.184	1										
	NS	NS	NS											
IW	0.607**	0.374	0.830**	0.217	1									
	0.008	NS	0.000	NS										
PW	-0.192	-0.323	0.011	0.284	0.048	1								
	NS	NS	NS	NS	NS									
PaW	0.305	0.330	0.223	0.328	-0.023	0.134	1							
	NS	NS	NS	NS	NS	NS								
BL	0.809**	0.950**	0.327	0.396	0.424	-0.138	0.279	1						
	0.000	0.000	NS	NS	NS	NS	NS							
UTL	0.601**	0.576*	0.438	0.287	0.382	-0.146	0.218	0.598**	1					
	0.008	0.012	NS	NS	NS	NS	NS	0.009						
CH	0.641**	0.355	0.372	0.336	0.287	0.191	0.440	0.387	0.221	1				
	0.004	NS	NS	NS	NS	NS	NS	NS	NS					
CoH	0.717**	0.564*	0.558*	0.222	0.522*	0.172	0.270	0.686**	0.434	0.543*	1			
	0.001	0.015	0.016	NS	0.026	NS	NS	0.002	NS	0.020				
ML	0.768**	0.800**	0.408	0.340	0.447	-0.093	0.256	0.836**	0.484*	0.335	0.715**	1		
	0.000	0.000	NS	NS	NS	NS	NS	0.000	0.042	NS	0.001			
FW	0.462	0.394	0.703**	0.218	0.875**	-0.197	0.090	0.351	0.338	0.062	0.300	0.304	1	
	NS	NS	0.001	NS	0.000	NS	NS	NS	NS	NS	NS	NS		
RW	0.536*	0.368	0.537*	-0.047	0.523*	0.194	0.176	0.523*	0.447	0.348	0.666**	0.337	0.349	1
	0.022	NS	0.022	NS	0.026	NS	NS	0.026	NS	0.157	0.003	NS	NS	

** , Correlation is significant at the 0.01 level (two-tailed). * , Correlation is significant at the 0.05 level (two-tailed).

Table S6.

Values of latent roots and loading factors of the PCA for three principal components (PC1–PC3): their eigenvalues, percentage (variability %) and cumulative percentage (cumulative %) expressions. For abbreviations of skull variables see fig. 2.

	PC1	PC2	PC3
CoL	0.944	0.164	0.152
BL	0.877	0.240	0.266
ML	0.792	0.253	0.256
TL	0.757	0.467	0.275
UTL	0.609	0.336	0.108
IW	0.206	0.938	0.034
ZW	0.170	0.876	0.164
FW	0.247	0.817	−0.186
RW	0.219	0.630	0.318
PW	−0.507	0.091	0.713
CH	0.262	0.209	0.704
PaW	0.258	−0.049	0.610
MaW	0.293	0.021	0.526
CoH	0.472	0.493	0.500
eigenvalue	4.11	3.48	2.31
variance (%)	29.39	24.92	16.52
cumulative (%)	29.39	54.31	70.83

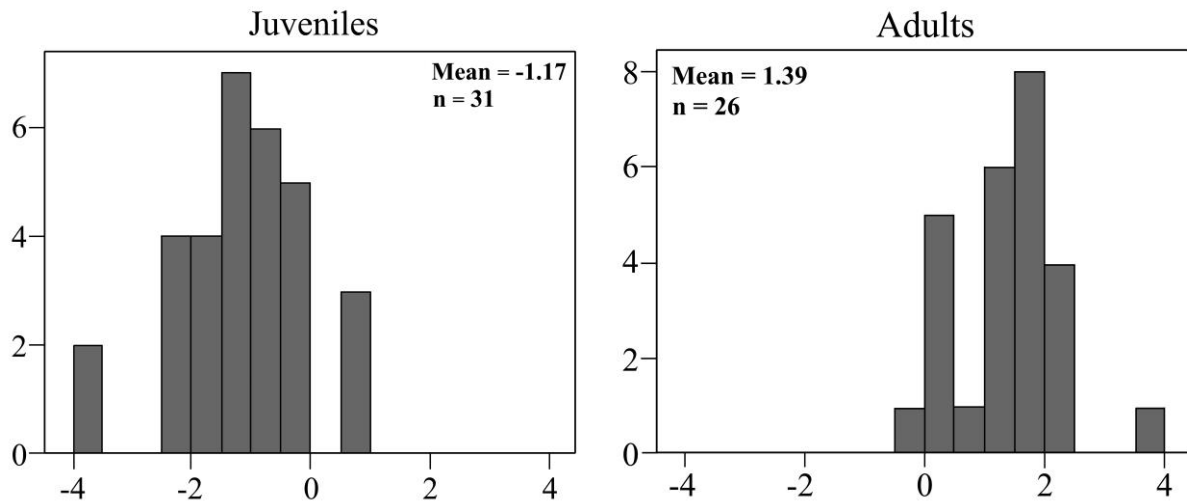


Figure S1. Histogram of discriminant scores of juveniles and adults of *Martes foina*. The descriptive statistic showed that males had a bigger skull compared to females in adult samples (supplementary table S2).

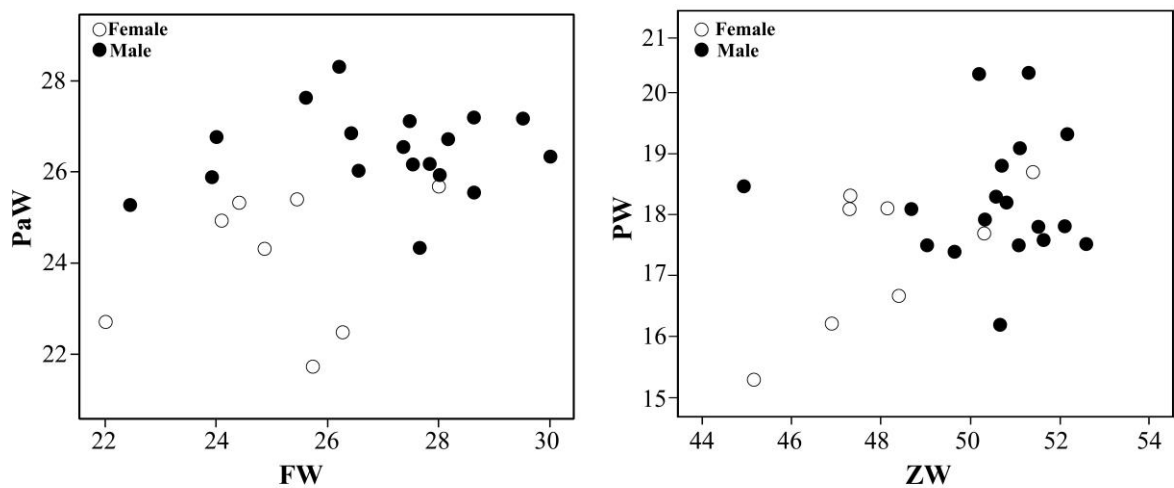


Figure S2. PaW (palatal width) vs. FW (frontal width) and PW (postorbital width) vs. ZW (zygomatic width) in males and females of *Martes foina*.