

Table S1. Total length, sex, and vertebral process length of 20 manatees sampled for the present study

Developmental stage	Field ID	TL (cm)	Sex	Average vertebral process length (mm)			
				thoracic	lumbar	caudal (anus)	caudal (fluke)
perinatal	MEC16038	113	F	29.85±2.09	22.17±1.26	23.78±2.27	14.94±2.16
				17.99±0.48	46.61±7.14	41.09±0.67	36.19±1.37
	MEC16048	130	F	24.09±0.73	22.43±0.42	16.12±1.49	13.76±2.02
				18.34±2.53	37.88±2.58	32.49±2.31	33.85±2.49
	MNW16030	118	M	21.33	28.52	13.2±1.31	7.18±0.42
MNW16017	98	M	16.24±0.37	31.96	20.92±5	26.27±0.01	
			21.17±0.26	28.11±3.98	11.35±0.3	8.63±1.2	
MSW16058	119	M	11.72±0.78	36.88±4.21	28.25±0.72	32.18±1.96	
			27.91±0.62	23.80±0.44	18.11±1.61	7.81±1.33	
			15.86±2.19	35.75±2.54	36.31±2.68	32.44±2.37	
calf	MNW16014	209	F	54.99±0.82	47.95±3.79	44.42±0.25	27.56±4.34
				34.54±0.66	79.8±2.72	92.37±1.52	61.42±3.8
	MSW16028	192	F	49.26±2.56	40.85±5.13	34.95±1.84	15.16±2.65
				24.51±0.92	76.4±5.84	82.9±4.49	53.98±6.74
	MSW16023	185	F	28.60±4.89	30.97±4.94	14.68±4.29	8.37±1.22
22.18±0.66				61.53±7.8	65.1±1.58	47.85±3.13	
MNW16019	206	M	29.58±1.27	30.97±4.94	14.68 ±4.23	8.37±1.22	
			46.96±0.74	80.99±1.34	74.76±0.97	71.95±0.6	
SWFTM1603b	219	M	60.77±4.79	42.59±0.5	32.60±2.35	16.97±2.03	
			48.12±1.12	84.97±11.29	92.09±2.53	78.37±1.66	
subadult	MEC16019	250	F	62.34±0.49	47.43±1.81	33.17±1.61	18.93±0.13
				30.61±1.42	84.42±7.28	102.18±2.83	85.38±2.63
	MEC16022	243	F	40.96±9.51	39.98±7.79	22.98±4.84	14.53±3.88
				55.47±0.9	88.91±15.18	96.99±2.21	75.09±3.26
	LPZ103313	256	M	59.41±0.57	48.22±0.05	33.37±0.91	19.73±0.41
31.69±1.01				10.3.48±6.71	113.88±0.5	92.71±0.3	
MNW16018	245	M	59.54±0.84	49.95±4.15	36.30±2.17	17.8±0.48	
			33.26±0.46	96.4±0.47	89.16±0.9	56.81±8.7	
MNW16021	241	M	67.58±0.15	46.60±3.55	36.80±2.87	16.43±1.64	
			44.54±0.57	99.35±9.21	96.93±3.04	75.56±1.75	
adult	MEC15085	292	F	62.25±0.95	46.02±0.71	29.74±2.39	21.15±4.05
				50.26±2.4	133.98±2.91	117.75±2.69	90.65±4.14
	MSW15072	308	F	38.15	46.98	28.26±1.54	21.75±0.86
				43.95	177.5	144.5±1.75	117.82±2.64
	MNW16016	310	M	63.08±1.96	46.55±1.91	37.69±7.11	23.69±3.8
68.31±1.25				138.2±8.08	125.86±6.7	122.54±1.8	
MSE16016	308	M	52.65±1.02	56.64±4.41	36.28±4.39	17.31±2.49	
			69.48±4.13	159.75±3.88	122.63±8.43	89.01±2.88	
MSW16020	287	M	60.90±1.33	61.09±1.62	36.35±1.28	16.27±0.58	
			34.47±0.28	123.46±6.91	120.2±2.12	96.24±1.37	

* TL is total length. Average vertebral process lengths in black text denote spinous process, and in gray text represents transverse process length.

Table S2. Tukey *post hoc* ordered letters report for four-way ANOVA main effects

Main effect		<i>Post hoc</i> ordered letters		
		σ_y (MPa)	E (MPa)	U_r (Jmm ³)
developmental stage	perinatal	C	C	C
	calf	B	B	B
	subadult	A	A	A
	adult	A	A	A
region	thoracic	B		C
	lumbar	B		BC
	caudal (anus)	A		A
	caudal (fluke)	AB		AB
orientation	rostrocaudal	A	A	A
	dorsoventral	C	B	B
	mediolateral	B	B	B
sex	female	A	A	
	male	B	B	

*Blanks denote no difference between groups for that mechanical property. Letters that are not A are significantly different from the greatest least squares mean.

Table S3. Tukey *post hoc* ordered letters report for significant interaction terms (developmental stage * region and developmental stage * sex) for σ_y (MPa)

		<i>Post hoc</i> ordered letters
Developmental stage *	Region	
perinatal	thoracic	E
	lumbar	E
	caudal (anus)	E
	caudal (fluke)	E
calf	thoracic	DE
	lumbar	CDE
	caudal (anus)	AB
	caudal (fluke)	ABC
subadult	thoracic	ABC
	lumbar	BC
	caudal (anus)	A
	caudal (fluke)	AB
adult	thoracic	AB
	lumbar	AB
	caudal (anus)	AB
	caudal (fluke)	BCD
Developmental stage *	Sex	
perinatal	female	E
	male	E
calf	female	CD
	male	D
subadult	female	A
	male	BCD
adult	female	ABC
	male	AB

*Letters that are not A are significantly different from the greatest least squares mean.

Table S4. Tukey *post hoc* ordered letters report for significant developmental stage by region interaction term for *E* (MPa)

Developmental stage *	Region	<i>Post hoc</i> ordered letters
perinatal	thoracic	EF
	lumbar	F
	caudal (anus)	EF
	caudal (fluke)	EF
calf	thoracic	DEF
	lumbar	CDEF
	caudal (anus)	ABCD
	caudal (fluke)	BCDE
subadult	thoracic	ABCD
	lumbar	ABCD
	caudal (anus)	AB
	caudal (fluke)	ABCD
adult	thoracic	A
	lumbar	ABC
	caudal (anus)	ABCD
	caudal (fluke)	BCDE

*Letters that are not A are significantly different from the greatest least squares mean.

Table S5. Tukey *post hoc* ordered letters report for significant interaction terms (developmental stage * region and developmental stage * sex) for U_r (Jmm³)

		<i>Post hoc</i> ordered letters
Developmental stage *	Region	
perinatal	thoracic	F
	lumbar	F
	caudal (anus)	EF
	caudal (fluke)	CDEF
calf	thoracic	F
	lumbar	DEF
	caudal (anus)	ABCD
	caudal (fluke)	ABC
subadult	thoracic	ABCDEF
	lumbar	BCDEF
	caudal (anus)	AB
	caudal (fluke)	ABC
adult	thoracic	ABCDE
	lumbar	AB
	caudal (anus)	A
	caudal (fluke)	ABCDEF
Developmental stage *	Sex	
perinatal	female	D
	male	CD
calf	female	BC
	male	BCD
subadult	female	A
	male	BC
adult	female	AB
	male	A

*Letters that are not A are significantly different from the greatest least squares mean.

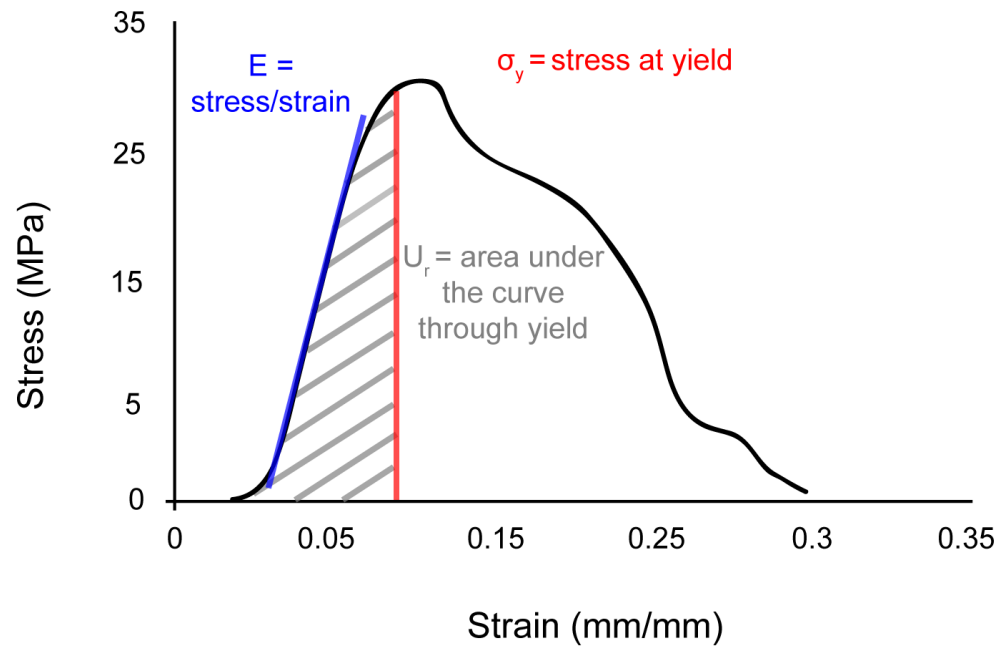


Figure S1. Stress-strain curve of an adult Florida manatee's vertebral trabecular bone in compression. Three values were gleaned from each curve: stiffness (E ; resistance to deformation), yield strength (σ_y ; resistance to permanent deformation) and toughness (U_r ; ability to absorb energy up through yield).