

Fig. S1. (A) Von Mises stress (solid lines) and displacement (stippled lines) magnitudes in the restored skull model for four different bite scenarios along eleven distinct measurement locations (aligned with the respective position on the skull in the background, comp Table S5). (B).

Displacement in the four different skull configurations for simulated bite at the tip of the snout (solid lines), the first maxillary tooth (large stippled lines), and the last maxillary tooth (small stippled lines).

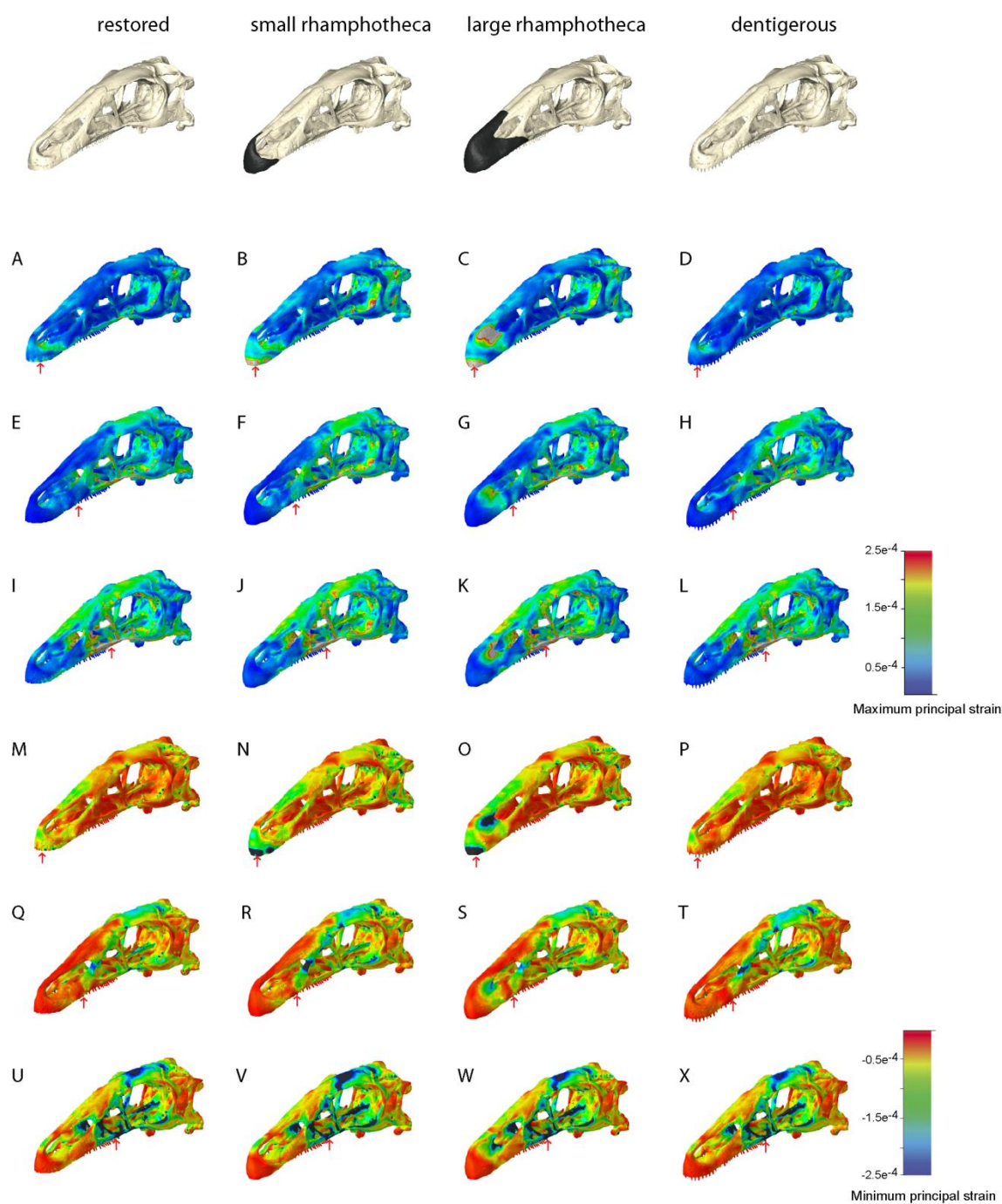


Fig. S2. Comparisons of (A–L) Maximum principal strain and (M–X) Minimum principal strain distribution in the different skull configurations of *Erlikosaurus andrewsi* subjected to different bite positions. Each of the four columns presents a different modeled state, from left, restored skull, with small rhamphotheca, with large rhamphotheca, with teeth added to the premaxillae and maxillae. The rows depict different bite positions (indicated by red arrows). Contour plots are scaled to (A–C) 0.00025 peak strain and (D–F) -0.00025 peak strain.

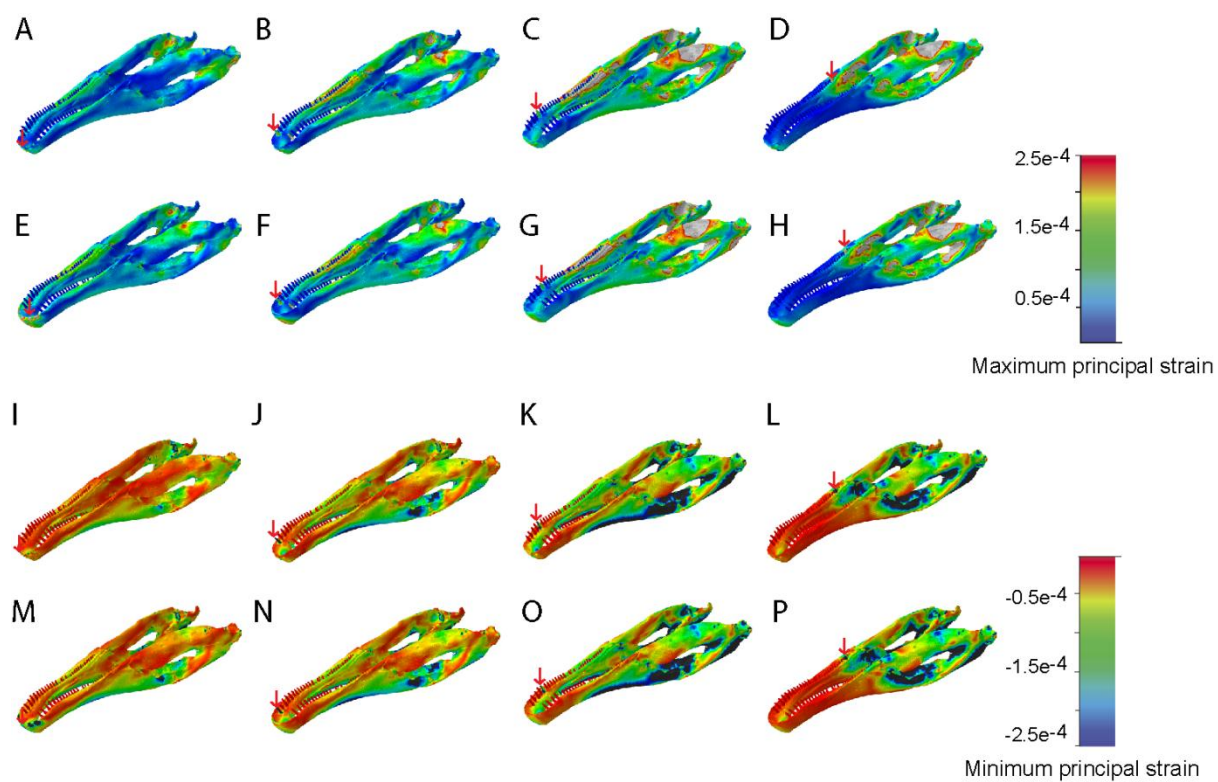


Fig. S3. Comparisons of (A–H) Maximum principal strain and (I–P) Minimum principal strain distribution in the different jaw models of *Erlikosaurus andrewsi*. (A–D, I–J) restored lower jaw model, (E–H, M–P) restored lower jaw with rhamphotheca. Each column presents a different bite positions (indicated by red arrows). Contour plots are scaled to (A–H) 9 MPa peak stress and (I–P) 0.25 mm displacement.

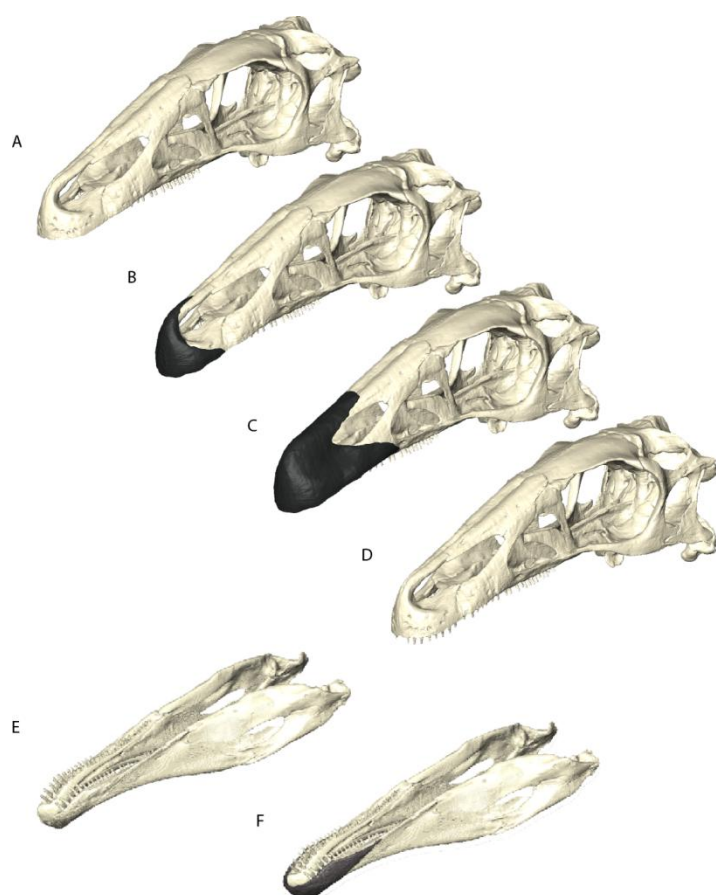


Fig. S4. Different skull configurations of *Erlikosaurus andrewsi*. (A) restored skull, (B) skull with small rhamphotheca, (C) skull with large rhamphotheca, (D) skull with teeth added to the premaxilla and maxilla, (E) restored lower jaw, (F) lower jaw with rhamphotheca.

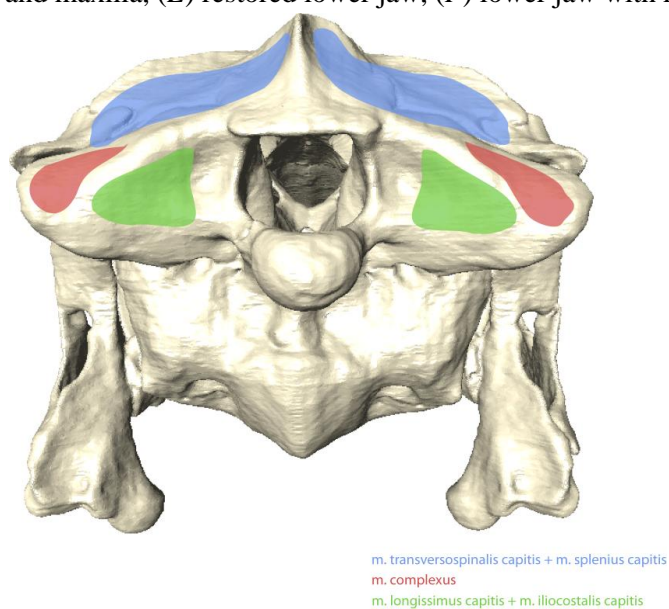


Fig S5. Generalized attachment sites of the neck musculature for muscle force calculations (Table S4).

Model	Number of elements	Surface area [mm ²]	Mass [g]
Restored skull	1 905 393	124 815	360
Restored skull with small rhamphotheca	1 921 002	126 117	365
Restored skull with large rhamphotheca	1 989 380	128 897	374
Restored skull, fully dentigerous model	1 961 098	125 418	368
Lower jaw	1 007 423	60 560	107
Lower jaw plus rhamphotheca	1 077 317	62 972	111
Premaxillary & maxillary teeth	-	-	3
Small rhamphotheca (skull only)	-	-	5
Large rhamphotheca (skull only)	-	-	15

Table S1. Size (number of elements, surface area, calculated mass) of the individual FE models. The weight of the individual models and components (Table S1) was calculated by using volumetric measurements for single components and specific densities for bone (1770 kg/m³), teeth (2076 kg/m³), and keratin (1269 kg/m³).

#	Model Skull	Loaded forces		Constraints			Constraints simulating bite process		
		Adductor muscles	Neck muscles	Occipital condyle	Paroccipital process	Quadrate	Tip of snout	1st maxillary tooth	Last maxillary tooth
1	restored	X		X	X	X	X		
2	restored	X		X	X	X		X	
3	restored small	X		X	X	X			X
4	rhamphotheca small	X		X	X	X	X		
5	rhamphotheca small	X		X	X	X		X	
6	rhamphotheca large	X		X	X	X			X
7	rhamphotheca large	X		X	X	X	X		
8	rhamphotheca large	X		X	X	X		X	
9	rhamphotheca	X		X	X	X			X
10	dentigerous	X		X	X	X	X		
11	dentigerous	X		X	X	X		X	
12	dentigerous	X		X	X	X			X
13	restored	X	X	X		X	X		
14	restored large		X	X		X	X		
15	rhamphotheca large	X	X	X		X	X		
16	rhamphotheca		X	X		X	X		

Table S2. Model setup for different tested FE models of the skull of *Erlisosaurus andrewsi* presented in this study.

#	Model Lower jaw	Loaded forces		Constraints		Constraints simulating bite process			
		Adductor muscles		Glenoid		Tip of dentary	1st dentary tooth	5th dentary tooth	Last dentary tooth
17	Lower jaw	X		X		X			
18	Lower jaw	X		X			X		
19	Lower jaw	X		X				X	
20	Lower jaw	X		X					X
21	Lower jaw + rhamphotheca	X		X		X			
22	Lower jaw + rhamphotheca	X		X			X		
23	Lower jaw + rhamphotheca	X		X				X	
24	Lower jaw + rhamphotheca	X		X					X

Table S3. Model setup for different tested FE models of the lower jaw of *Erlisosaurus andrewsi* presented in this study.

Muscle	Muscle force [N]
Adductor muscles (muscle forces per side)	
m. pterygoideus dorsalis	55.94
m. pterygoideus ventralis	182.15
pseudotemporalis profundus	13.49
m. pseudotemporalis superficialis	44.76
m. adductor mandibulae externus profundus	78.11
m. adductor mandibulae externus medialis	76.80
m. adductor mandibulae externus superficialis	83.22
adductor mandibulae posterior	34.86
Cervical muscles (combined for left and right side)	
m. transversospinalis capitis + m. splenius capitis	600
m. complexus	500
m. longissimus capitis + m. iliocostalis capitis	600

Table S4. Calculated muscle forces for the adductor and neck musculature.

Measurement location	Description
1	Nasal process of premaxilla, rostrally
2	Nasal process of premaxilla, caudally
3	Nasal/premaxilla contact
4	Dorsal surface of nasal
5	Nasal/frontal contact
6	Dorsal surface of frontal, rostrally
7	Laterodorsal surface of frontal
8	Frontal/parietal contact
9	Frontal/postorbital contact
10	Dorsal surface of parietal
11	Parietal/supraoccipital contact

Table S5. Location of measurement sites along the skull of *Erlikosaurus andrewsi* as shown in Fig S1.