

**Supplementary Information 1.** Transformation matrices (in Avizo) used to create the 3D reconstruction of the lower jaw of *Eusthenopteron*. Individual bones from the right side of MHMN 06-538 were reflected and moved into place on the left side of the specimen; left side elements remain in place. A surface model of the third infradentary of UMZC GN. 1147 was imported, scaled to the same size as MHMN 06-538, and moved into place. Lastly, the reassembled bones from the left side of the lower jaw were mirrored and moved into final position to create right ramus.

Left lower jaw

*Anterior half of dentary*

-0.738911 -0.673803 0 0 -0.673802 0.738913 0 0 0 0 1 0 222.107 77.4421 -1.78054 1

*First infradentary*

0.805777 0.590002 -0.0511443 0 -0.564056 0.79091 0.237282 0 0.180447 -0.162348 0.970092 0  
93.1476 -16.5398 -14.6261 1

*Second infradentary*

0.869946 0.486022 0.0835271 0 -0.493146 0.857289 0.147848 0 0.000250868 -0.169811 0.985475 0  
114.632 1.20955 -11.2237 1

*Third infradentary fragments*

0.831327 0.555746 0.00609803 0 -0.54546 0.81374 0.200741 0 0.106599 -0.170209 0.979624 0 137.212  
15.2359 -15.4731 1

*Third infradentary 3 from UMZC GN.1147*

Scaled by: 1.35

Then translated/rotated: 0.0755206 -1.344 -0.154641 0 1.30544 0.113041 -0.344916 0 -0.355024  
0.129764 -1.30117 0 92.4594 159.151 241.177 1

*Postsymphysial*

-0.738911 -0.673803 0 0 -0.673802 0.738913 0 0 0 0 1 0 222.107 77.4421 -1.78054 1

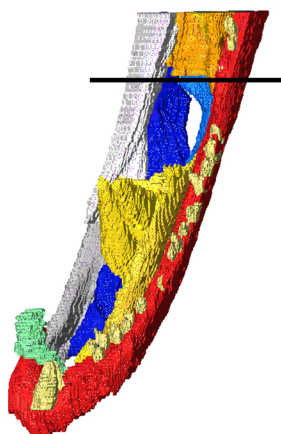
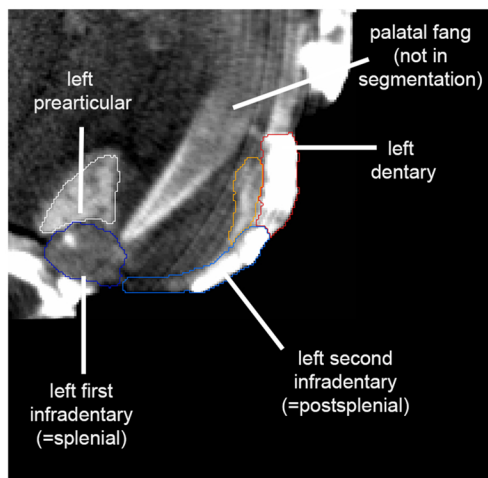
*Adsymphysial*

1 0 0 0 0 1 0 0 0 0 1 0 5.53645 0 -0.728224

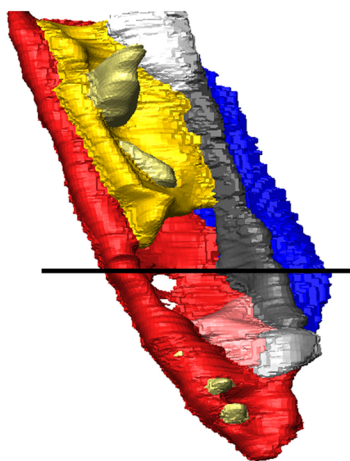
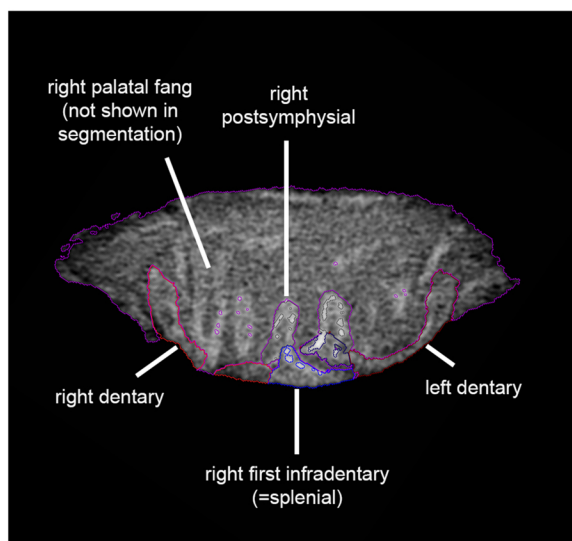
*Final transforms of entire lower jaw rami:*

Left side: 0.86051 -0.508465 -0.0313908 0 0.508127 0.861082 -0.0185362 0 0.0364551 -5.58794e-009  
0.999333 0 -36.6248 63.5478 4.53616 1

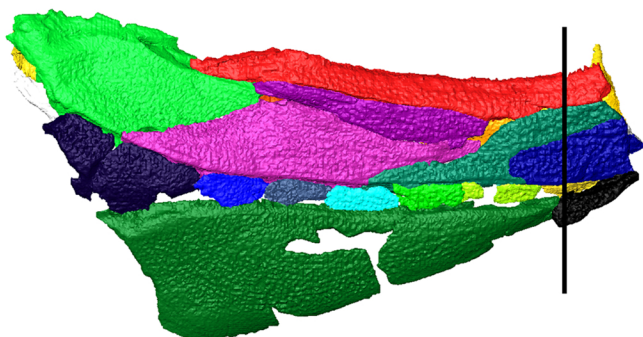
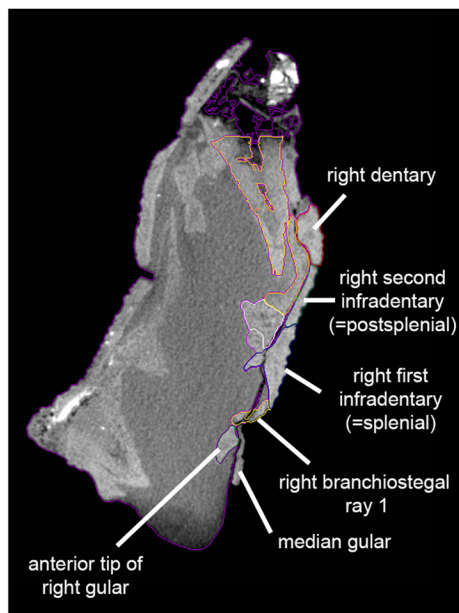
Right side: -0.870344 -0.491421 0.0317497 0 -0.491094 0.870923 0.0179147 0 0.0364552 6.51926e-008  
0.999334 0 211.844 61.1655 -4.52796 1



A



B



C