Supplementary Online Material (SOM):

Biomechanics of the mandible of *Macaca mulatta* during the power stroke of mastication: Loading, deformation, and strain regimes and the impact of food type

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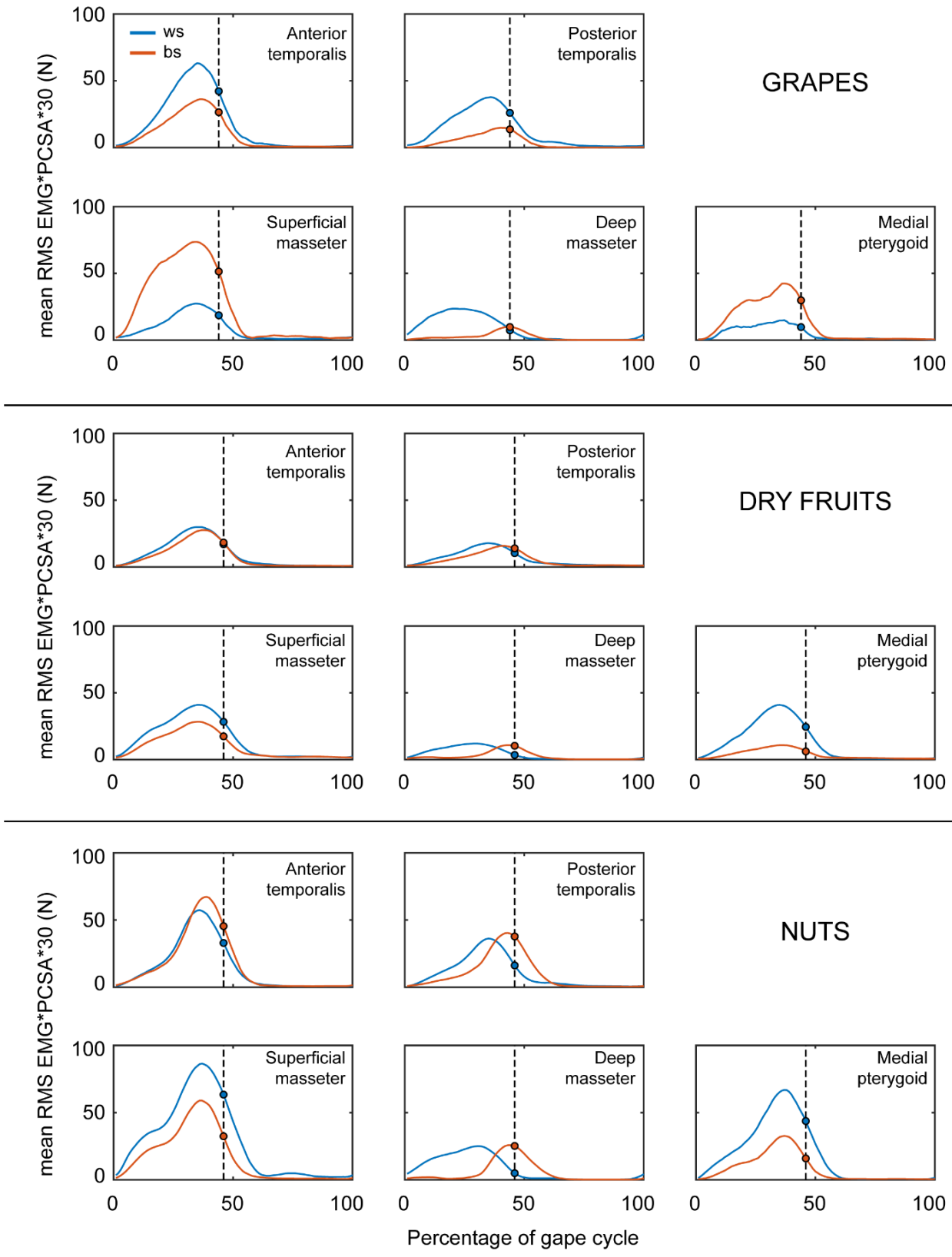
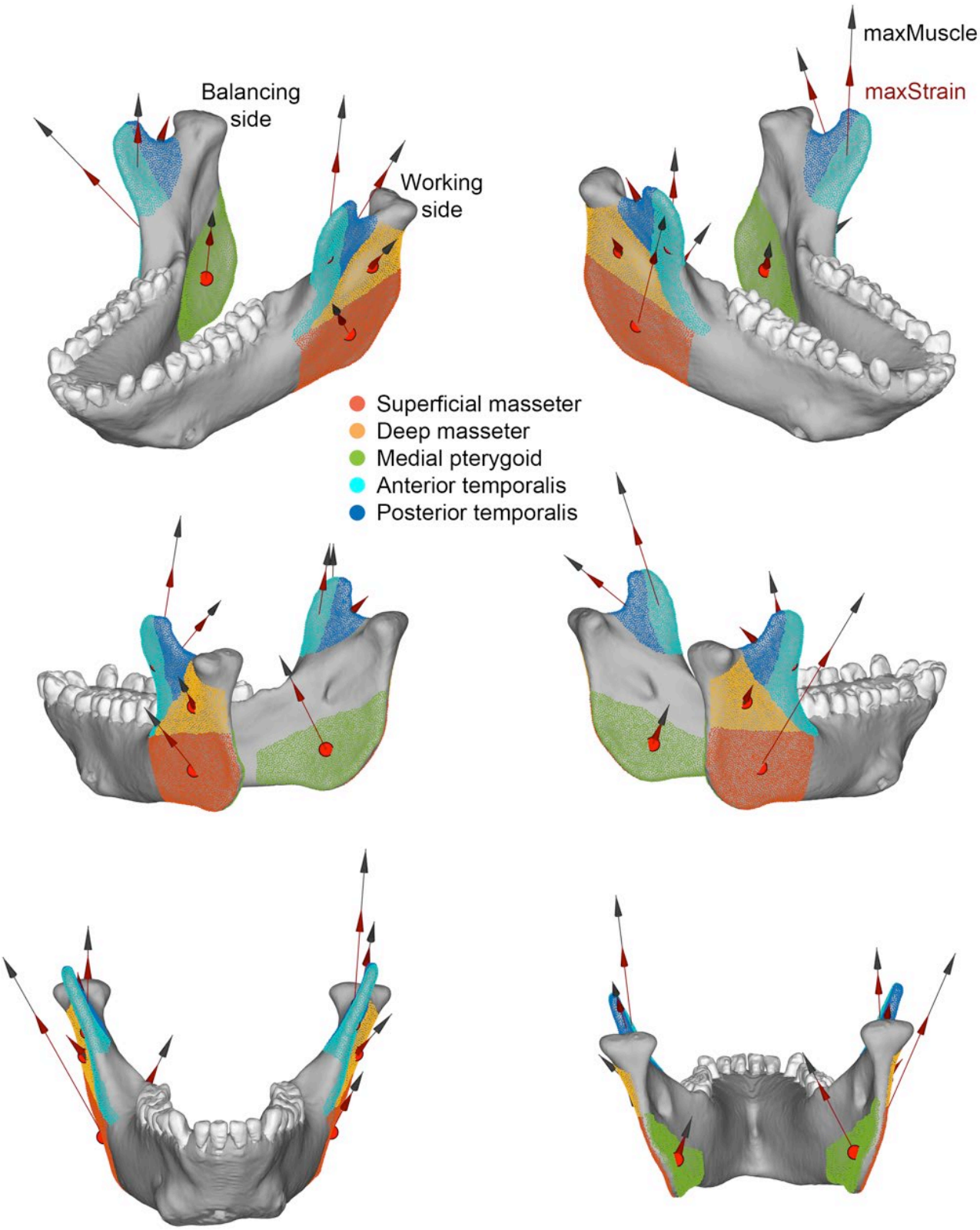
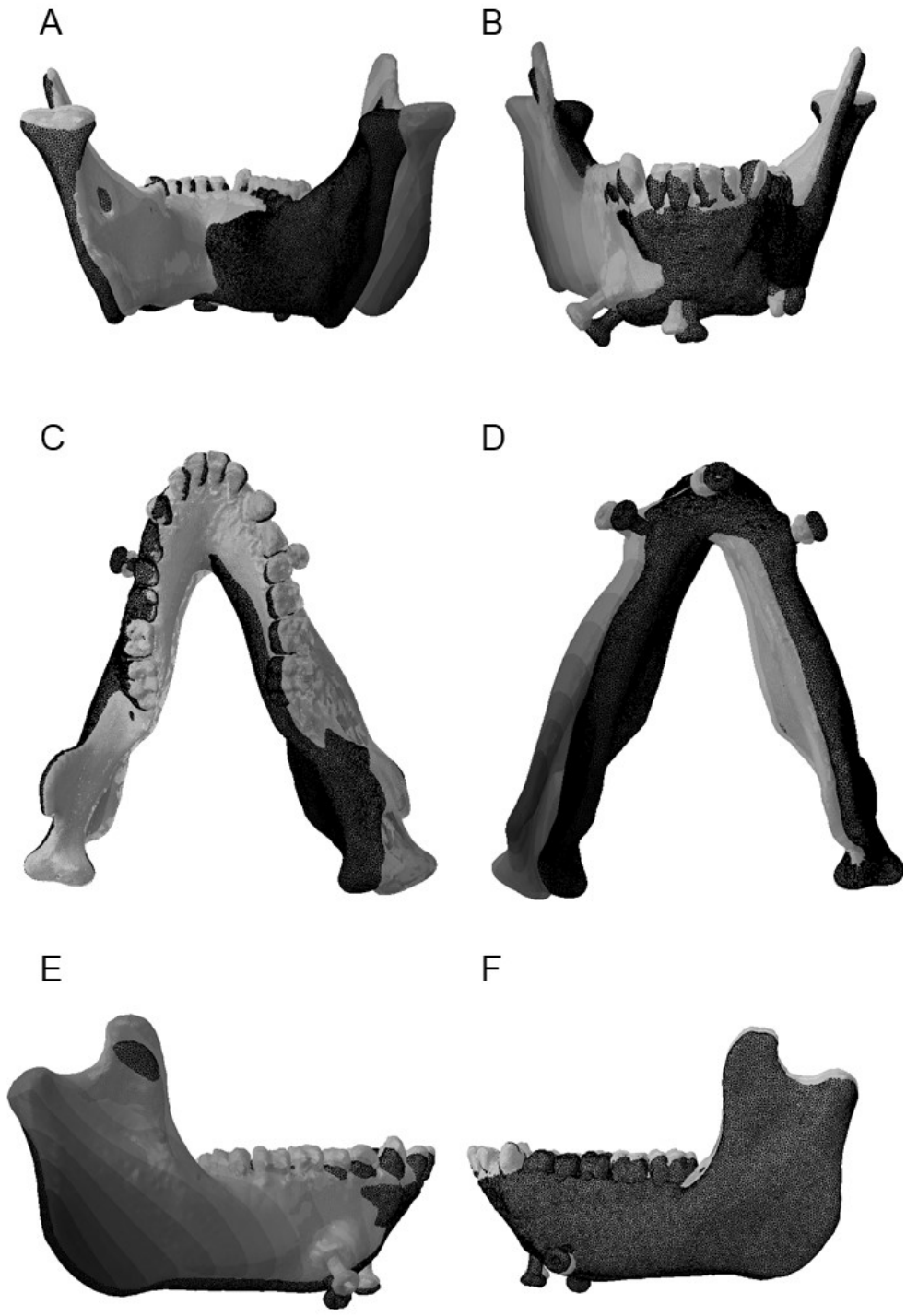

ws
bs
Anterior temporalis
Posterior temporalis
Superficial masseter
Deep masseter
Medial pterygoid
GRAPES
DRY FRUITS
NUTS
mean RMS EMG*PCSA*30 (N)
Percentage of gape cycle
0
50
100

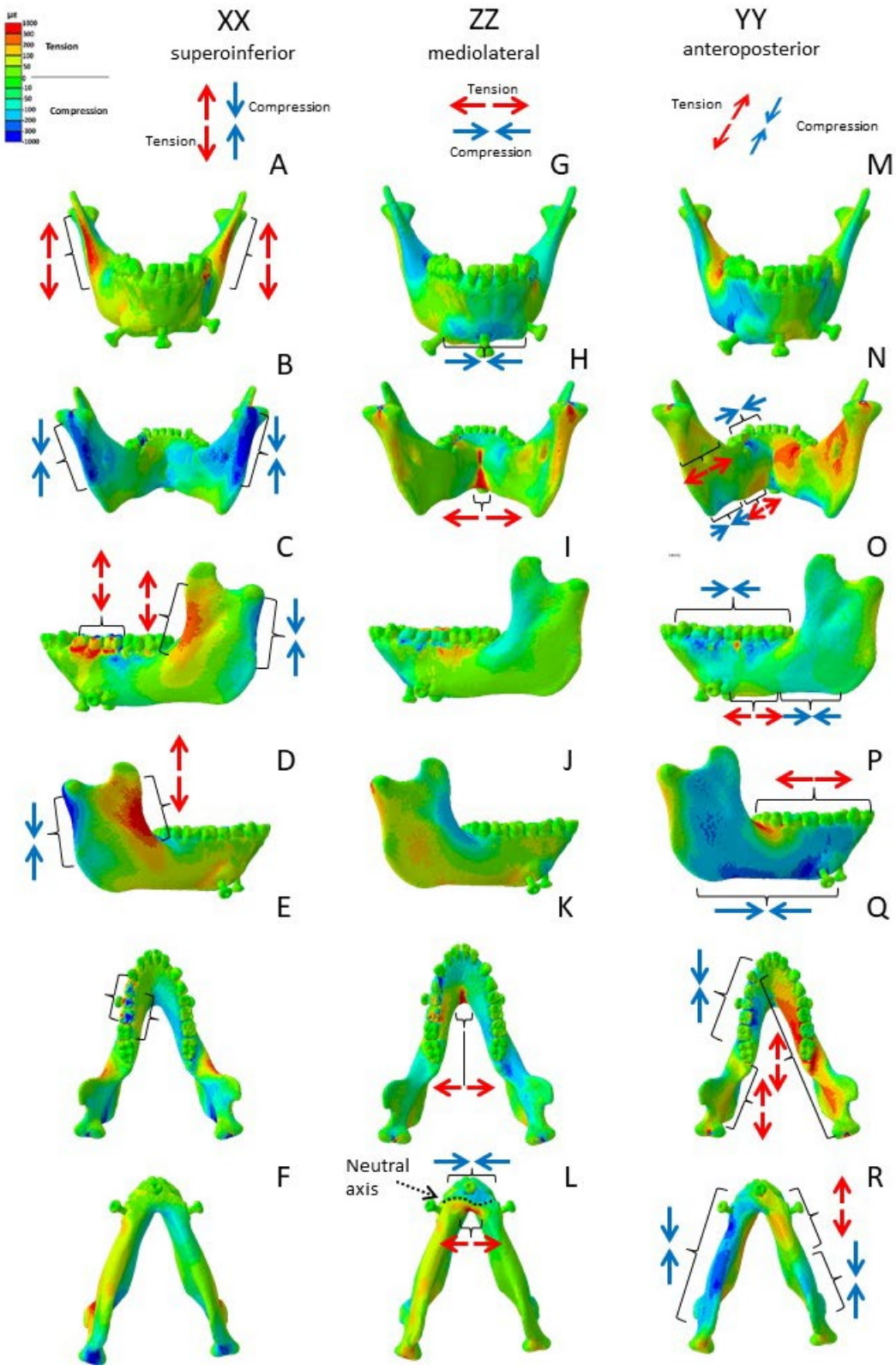
SOM Figure S1. Electromyographic (EMG) data from masticatory muscles when the animal was chewing on grapes, dried fruits, and nuts, throughout a standardized gape cycle, from maximum gape to the next maximum gape. Red lines indicate the mean root mean square (RMS) EMG multiplied by the muscle's physiological cross-sectional area PCSA and by 30 kN/m^2, for both working and balancing-side (blue and orange lines, respectively). The dashed vertical line indicates the timing of maximum strain in the lower lateral gauge (see Panagiotopoulou et al., 2017).


Balancing side
Working side
maxMuscle
maxStrain
Superficial masseter
Deep masseter
Medial pterygoid
Anterior temporalis
Posterior temporalis

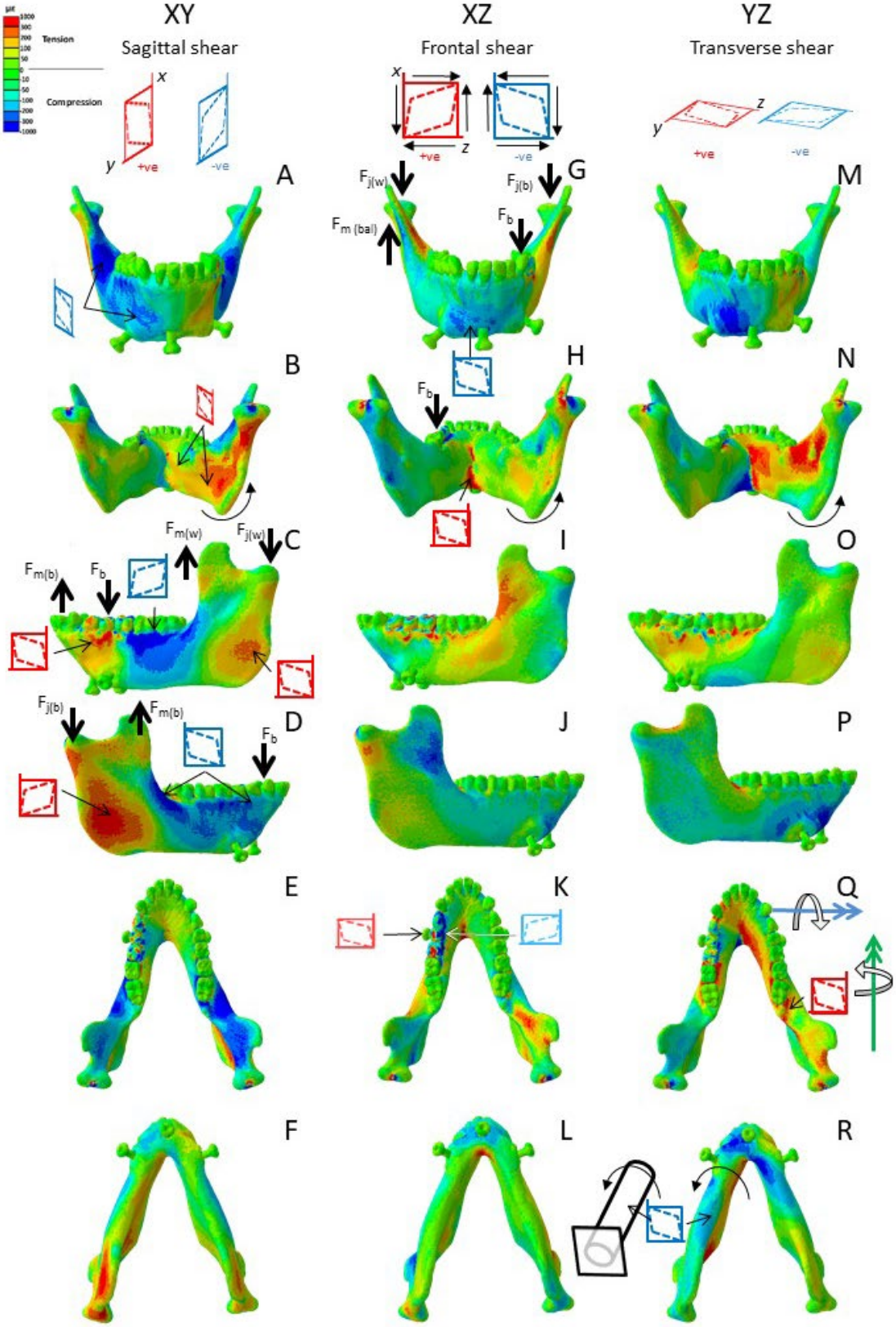
SOM Figure S2. Diagram illustrating the attachment areas and force vectors of the modeled muscles. Red circle indicates the centroid of each muscle and the black and red arrows indicate the direction of the individual muscle forces at the timing of maximum bone strain (maxStrain; the data used in this study) or maximum muscle force (maxMuscle). Arrow lengths are proportional to muscle force magnitudes.



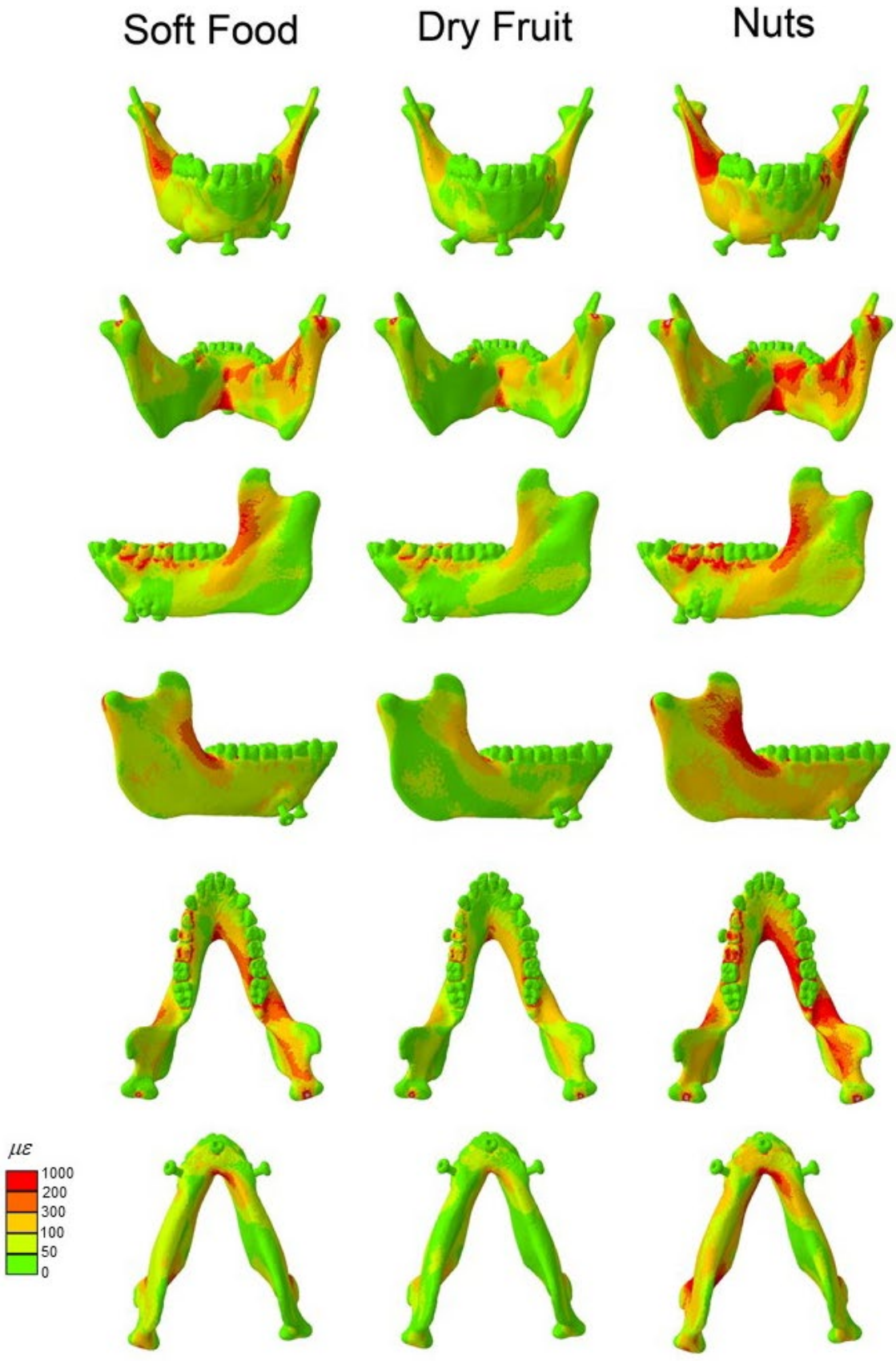
SOM Figure S3. Deformation regime in the mandible in six axial views. Deformation regime during simulated nut chewing. Deformation scale factor = 70. See SOM File S1 for animation.


XX
superoinferior
ZZ
mediolateral
YY
anteroposterior
Tension
Compression
Tension
Compression
Tension
Compression
Tension
Compression
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
Neutral
axis

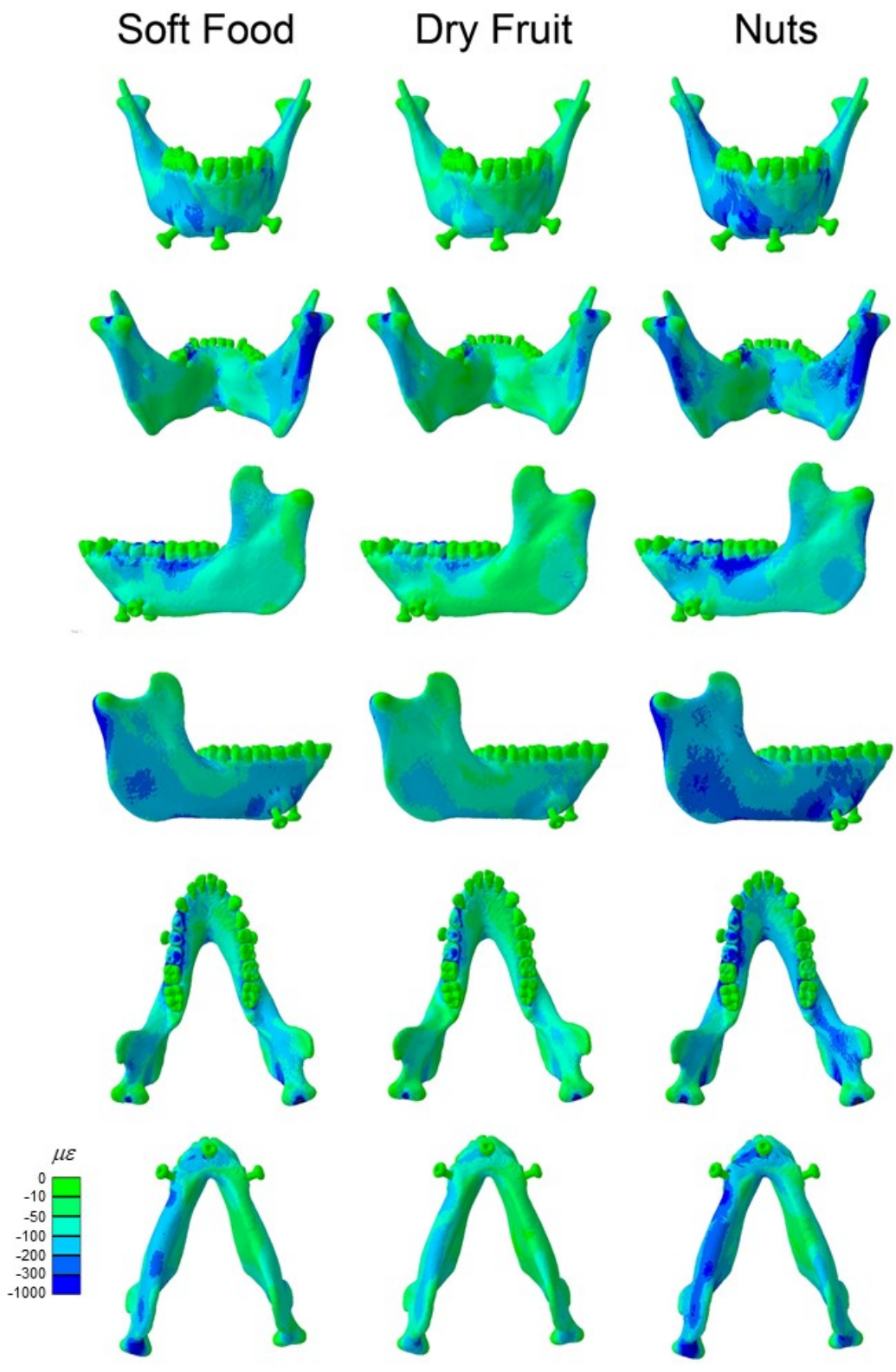
SOM Figure S4. Axial strain regimes in the FEM during simulated nut chewing. Scale is in microstrain, warm colours indicate positive strain (increase in relative length), cool colors indicate compressive strain (decrease in relative length). A–F) XX (superoinferior) axial strains. G–L) ZZ (medial-lateral) axial strains. M–R) YY (anteroposterior) axial strains. Converging blue arrows and diverging red arrows highlight areas of compressive and tensile strains, respectively, as indicated by the parentheses.


XY
Sagittal shear
XZ
Frontal shear
YZ
Transverse shear
Tension
Compression
+ve
-ve
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
$F_{j(w)}$
$F_{j(b)}$
$F_{m(bal)}$
F_b
$F_{m(w)}$
$F_{m(b)}$

SOM Figure S5. Shear strain regimes in the FEM during simulated nut chewing. A–F) XY (sagittal) shear strains. G–L) XZ (frontal or coronal). M–R) YZ (transverse) planes. Shear strain definitions in top row are shown relative to models in anterior view; i.e., A, G, H. See also Figure 1.


Soft Food
Dry Fruit
Nuts
με
1000
200
300
100
50
0

SOM Figure S6. ε_1 strain regimes in the finite element model during simulated nut chewing.


Soft Food
Dry Fruit
Nuts
με
0
-10
-50
-100
-200
-300
-1000

SOM Figure S7. ε_2 strain regimes in the finite element model during simulated nut chewing.

SOM File S1. Three animations of 1–70× deformation colored by Von Mises Stress magnitude (1), principal strain magnitude (2), and principal stress magnitude (3). (Provided separately as a PowerPoint file.)