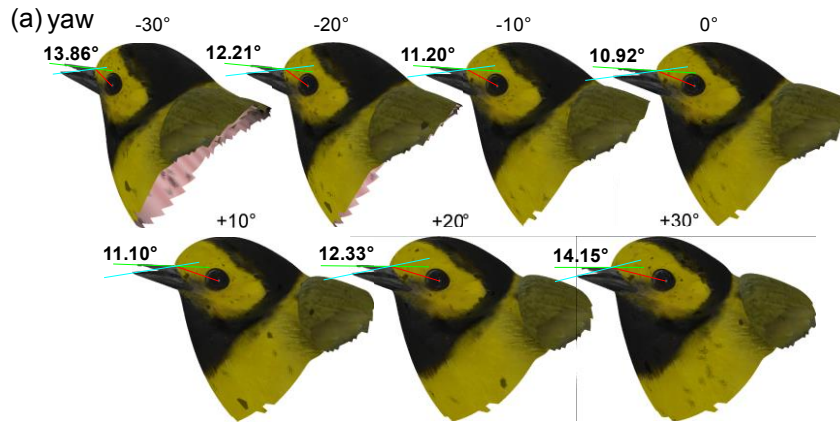


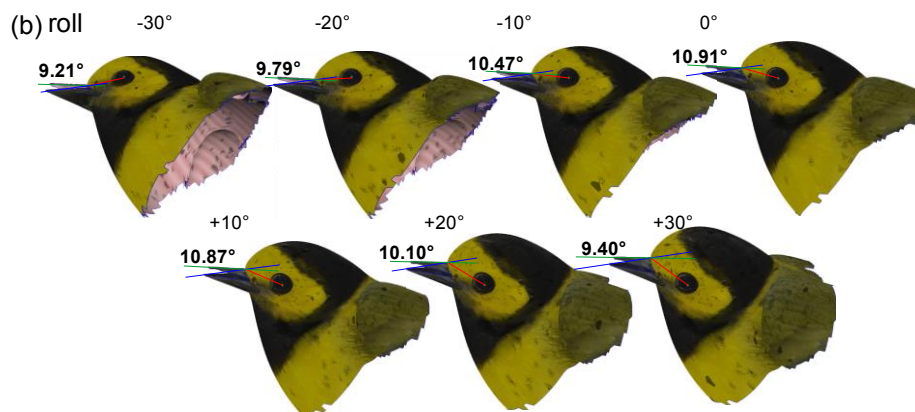
Supplementary information for “Upper beak depression instead of elevation dominates cranial kinesis in woodpeckers”

Lyons, S., Baeckens, S., Van Wassenbergh, S.

Figure S1:



head yaw angle (°)	-30	-20	-10	0	+10	+20	+30
perceived upper beak angle (°)	13.86	12.21	11.20	10.92	11.09	12.34	14.15
change %	+26.86	+11.73	+2.55	0	+1.49	+12.94	+29.52



head roll angle (°)	-30	-20	-10	0	+10	+20	+30
perceived upper beak angle (°)	9.21	9.79	10.47	10.91	10.87	10.10	9.40
change %	-15.61	-11.73	-4.02	0	-0.33	-7.37	-13.81

Fig. S1: Sensitivity analysis of the effect of pose angles of the head with respect to the camera. Simulated reference image sets were generated and exported from 3D graphics software in which a 3D songbird head with an upper beak angle of 10.92° was rotated in yaw (a) and roll (b). The error (‘change %’) in upper beak angle measured from different viewing perspectives was quantified. Head yaw resulted in a consistent overestimation of beak rotation while roll of the head had an inverse effect as it reduces the perceived rotation amplitude. Error due to perspective imperfection in the video dataset of our study was estimated by comparison of the observed poses with this reference image dataset.