Comparison of molar metric variation and dental microwear among three species of Parapapio from the Pliocene cave site of Sterkfontein Member 4, South Africa

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Sterkfontein Member 4, a 2.4 million year old karstic cave in South Africa, has yielded three species of Parapapio, including Pp. broomi, Pp. jonesi and Pp. whitei. Prior analyses of dental metric variation have indicated that Pp. whitei exhibits the largest molars, followed by Pp. broomi, with Pp. jonesi having the smallest. However, craniofacial morphometrics and isotopic values have shown a lack of clustering of individuals with respect to taxon, whereas dental microwear analyses have suggested that all Parapapio from Sterkfontein exhibit evidence of hard-object consumption, particularly Pp. broomi.

Using a trifocal microscope camera coupled with precise measuring software, measurements were taken of the molar dimensions of a sample of Parapapio (n = 67) dental casts, including Pp. broomi (n = 20), Pp. jonesi (n = 23) and Pp. whitei (n = 24) to corroborate or contradict previous species clusters. Examination was also performed on a subset of these dental casts using low-magnification stereomicroscopy, including Pp. broomi (n = 4), Pp. jonesi (n = 6) and Pp. whitei (n = 6) to detect species differences in use-wear scars. A bivariate relationship between mesiodistal and buccolingual dimensions of the first molar with ellipses of 95% confidence around group centroids suggests that Pp. whitei is largely distinct from Pp. jonesi, but that Pp. broomi partially overlaps both of these taxa. Analysis of variance by Tukey’s post-hoc test of significance indicates that Pp. whitei is significantly larger than both Pp. jonesi and Pp. broomi in molar dimensions. An analysis of variance for dental microwear features suggests that Pp. broomi has significantly more coarse scratches compared to both Pp. jonesi and Pp. whitei, whereas Pp. jonesi has a significantly greater number of hypercoarse scratches than Pp. whitei. A discriminant function analysis of four dental microwear features largely separates Pp. broomi and Pp. whitei. These results indicate that Pp. whitei is the most distinct taxon of the three and that the smaller Parapapio taxa may have specialized preferentially on hard-object feeding or extractive foraging.