**Supplementary Information 9: Discussions of results for each species,**

**Microwear data for *Sthenurus andersoni,* the only species of *Sthenurus* within the VFC-FC assemblage*,* indicates a browsing diet for most variables, but for others *St. andersoni* grouped with mixed feeders, which is borne out in the PCA. *Simosthenurus maddocki* and *Si. occidentalis* consistently fell out at the browser end of the modelled dietary spectrum, and were the end members in half of the variables. ANOVA tests demonstrated significant differences between these two *Simosthenurine* species and most modern grazers and mixed feeders. *Si. maddocki* also showed significant differences in some measures (e.g. *Sp, Vm*) with other browsing taxa, indicating a specialist diet. Given *Si. maddocki* had the highest values for four of five STA variables, and that these have traditionally been considered indicative of hard-object feeding taxa (Schulz *et al.* 2010), suggests a specialised browsing frugivore diet. This accords with highly specialised craniodental morphology including the relatively smallest teeth of any sthenurine and a long manipulative tongue (Prideaux 2004). Molar morphology further shows many fine crenulations and cuspules in the inter-loph valley for gripping seeds which were crushed by lateral grinding (Prideaux 2004). In contrast, data for *Si. baileyi* fell more consistently in the mid-range, suggesting a mixed-feeding diet. The PCA plot separated all three species of *Simosthenurus*, which supports there being differences in diet between them.**

***Metasthenurus newtonae* exhibits a DMTA signature of a browser in most modelled data, with a mixed-feeding signature for *epLsar.* While primarily differing from modern mixed feeders and grazers, *Me. newtonae* also differed from *Procoptodon browneorum* and *St. andersoni* in the *Smc* ANOVA. The PCA plot also indicates a similar diet for *Me. newtonae* and *Si. occidentalis. Procoptodon browneorum* and *P. gilli* group with browsing or mixed-feeding species for all models except *epLsar. Procoptodon goliah* though appears difficult to categorise, exhibiting a browsing signature apparent in the *Tfv, Ftfv*, *Sal, Sda,* and *Std,* models as well as in the PCA, a grazing signature in *Asfc, epLsar,* and *Smc,* and intermediate in other variables. ANOVA tests were more similar across all three *Procoptodon* species, with differences even noted between *Procoptodon* and *Simosthenurus* species for some measures (e.g. *Asfc, Vm*). The number of significantly different ANOVA post-hoc pairs varied between the three *Procoptodon* species, but is likely linked to sample size available for each. The low sample size available for *Procoptodon goliah* in particular likely played a role in the contradictory dietary signature presented.**

**The VFC-FC macropodine *Protemnodon brehus* exhibits a grazing or mixed-feeding signal in all models except for *Std* and *epLsar.* ANOVA comparisons revealed few significant differences to any taxa, across most measures. However, *Sda* differentiated *Pr. brehus* from a range of VFC-FC sthenurine and macropodine species, and modern browsers and mixed-feeders, but no modern grazers. Variables *Sp* and *Vm* also differentiate *Pr. brehus* from some sthenurine species and modern grazers. The PCA places the *P. brehus* towards mixed feeding or grazing taxa in component 1, but distinguishes it from these in component 2, possibly due to differences in tooth morphology between *Protemnodon* and extant grazers. Stable isotope analysis however indicated *Protemnodon* as a C3 specialist as would be consistent with browsing (Montanari *et al.* 2013), while mesowear suggested mixed-feeding (Butler *et al.* 2014). Analysis of enamel thickness similarly indicated *Protemnodon* to have thin enamel as seen in sthenurine kangaroos, while macropodine kangaroos typically exhibit thick enamel (Couzens 2016). This combination of somewhat conflicting results may indicate *Protemnodon* to specialise on an abrasive C3 resource, such as forbs. This is further supported by the lack of a mid-link found in other macropodine grazers to slice tougher grasses (Prideaux and Warburton 2010).**

**While little is known of the recently extinct *Macropus greyi,* a mixed-feeding to browsing diet is implied by the modelled data, and consistent with an animal living primarily in heathland (Van Dyck and Strahan 2008). Post-hoc comparisons for numerous variables (e.g. *Asfc, Tfv, Ftfv, Sda, Sp, Vm*) distinguish *M. greyi* from a range of modern species across the dietary spectrum, but few extinct taxa. Similarly, little is known of the recently-extinct *Lagorchestes leporides*, though its placement on the DMTA dietary spectrum were comparable to that of the congeneric *L. hirsutus*, so a similar mixed feeding diet may be inferred. Few significant differences to other taxa were revealed by the ANOVA post-hoc comparisons, though a difference to modern *L. hirsutus* in *Smc* is worth noting.**

***Macropus giganteus* is predominantly grazing today (Kirkpatrick 1965, Dawson *et al.* 2004, Arman and Prideaux 2015). Modelled DMTA data however place Pleistocene specimens for this taxon amongst mixed-feeding (e.g. *Std*), or even browsing taxa (e.g. *Sal*). These are echoed in the ANOVA post-hoc comparisons where *M. giganteus* differed significantly from a number of living grazers and *P. brehus* in a number of variables, though also differed from modern mixed feeders and *Procoptodon* species in *epLsar.* Modern *M. rufogriseus* is considered a mixed feeder, and DMTA data for palaeontological specimens also suggest a browsing or mixed feeding diet for most variables in the Pleistocene. Post-hoc comparisons from ANOVA tests find significant differences between *M. rufogriseus* and most modern browsers and mixed feeders (e.g. *Tfv, Ftfv*), as well as numerous sthenurine kangaroos and *Protemnodon* (*Asfc*), though *Sda* differs *M. rufogriseus* from a range of taxa with no clear link uniting them. *Wallabia bicolor* is an extant mixed feeder (Arman and Prideaux 2015), and VFC-FC specimens grouped with mixed feeding to browsing taxa in most analyses. Post-hoc comparisons for *Sda* distinguished VFC-FC *Wallabia bicolor* from all modern grazers, some modern browsers and, notably, modern *W. bicolor.* Significant differences to VFC-FC *M. rufogriseus* and *Protemnodon* also indicates some niche separation for these species in the middle Pleistocene. Other measures (*Sp, Vm*) distinguish VFC-FC *W. bicolor* from a range of modern species but no other palaeontological groups.**

**Extant species mostly accord with their dietary classifications. The paucity of extant browsing species and low sample sizes available for each in museum collections limit the creation of an adequate baseline for microwear patterns within modern browser feeding guild. This may have played a role in the few significant differences noted for *Do. atrata* (*n*=4, 21 scans) in the ANOVA post-hoc comparisons, and variable placement of this species in the modelled data. In contrast *Dor. vanheurni* (*n=*15, 92 scans) modelled mainly amongst browsers, and differed from a number of modern and VFC-FC taxa in the *Asfc* post-hoc comparisons. Post-hoc comparisons also revealed *Dor. vanheurni* to differ to a range of modern grazing and mixed feeding taxa in *Sp* and *Vm,* but only differing from VFC-FC species which show specialised diets (*Protemnodon brehus* and *Simosthenurus maddocki*). Tree kangaroo (*Dendrolagus*) DMTA data are the most perplexing presented here. Modelled data place *D. bennettianus* at the grazing end of the spectrum for *Ftfv* and *Std,* while similar results were seen for *D. lumholtzi* for *Asfc, Smc. Tfv, Ftfv, Sp* and *Vm.* ANOVA post hoc comparisons differentiate *D. bennettianus* from a range of taxa across the dietary spectrum as well as VFC-FC species for *Asfc,* while similar results are seen for *D. lumholtzi* for *Sp* and *Vm,* and both *Dendrolagus* species for *Smc, Tfv, Ftfv, Sal, Sda* and *Sp.* The PCA also places *D. lumholtzi* with modern grazing species. Why data are so confounding for these species could be due to some aspect of their arboreal habitat, given the role that grit may play in microwear formation and how this differs at height (Ungar *et al.* 1995). A more likely candidate is effect of profilers used, with these two taxa the most heavily sampled on ‘Connie’, despite using the soft filter template of Arman *et al.* (2016). *Setonix brachyurus* exhibited modelled data amongst modern browsing or mixed-feeding species. In ANOVA post-hoc comparisons, *S. brachyurus* notably differed from a range of modern grazers and mixed feeders in *Ftfv, Sp* and *Vm.***

**Mixed feeding species feel largely between browsing and grazing species in modelled data. *Lagorchestes hirsutus* yielded significant differences in the post-hoc comparisons to numerous taxa across the dietary spectrum in *Asfc,* though again may be affected by profiler effects from reliance on ‘Connie’ scans. Differences between *L. hirsutus* and other mixed feeders alongside VFC-FC species in *Smc,* and between modern mixed feeders and grazers in *Sp* and *Vm* may be due to the specialised spinifex seed diet of *L. hirsutus.* Other mixed feeders were more consistent, and modelled data placed them between browsing and grazing species. However, *Onychogalea unguifera* exhibited a browsing signature in *epLsar,* and *W. bicolor* and *T. thetis* exhibited more of a grazing signature for *Smc.* Post-hoc comparisons from the ANOVA tests were broadly similar across modern mixed feeding species, though differences in *epLsar* between *Onychogalea unguifera* (though not *O. fraenata*) and *T. stigmatica, T. thetis* and *W. bicolor* require more consideration*.***

**A browsing signature suggested for the grazing *M. rufus* in modelled data for *epLsar* requires further consideration. ANOVA post-hoc comparisons differentiated modern grazers from numerous VFC-FC species as well as modern mixed feeders and browsers. Differences between grazing species though were also apparent, and further analysis is required to determine if these are a result of fine scale differences in diet, particularly given differences between *M. rufus* and other grazers in the PCA.**

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