

Karhu kiertää – tuoreimpia geologian alan väitöstutkimuksia

16.5.2025 Jon Engström,
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**Från lokala tolkningar till regionala
perspektiv: Nya insikter gällande den
tektoniska utvecklingen under de
sista skedena av den Svekofenniska
orogesen i sydvästra Finland**

**(From local constraints to regional
perspectives: Tectonic evolution
during the late stages of
the Svecofennian orogeny
in southwestern Finland)**

Denna studie fokuserar på den berggrunds-geologiska utvecklingen av migmatiter och associerade bergarter i sydvästra Finland. Forskningen har utförts genom strukturgeologisk kartläggning i mikro- och mesoskala, kombinerat med tryck-temperaturmodellering och åldersbestämningar med den konventionella U-Pb (zirkon) metoden och den relativt nya in situ Lu-Hf (granat och apatit) metoden. Platsen för studien är Olkiluoto området som har bevarat den geologiska och tektoniska historien väl i sydvästra Finland. Eftersom Olkiluoto är platsen där slutförvaringen av vårt kärnbränsle i Finland inom några år kommer att starta, har omfattande data om berggrun-



Kuva: Henrik Kalliomäki

den och dess geologiska strukturer som stöder detta forskningsarbete, redan tidigare samlats in där. Undersökning av den närliggande skjuvzonen, Kynsikangas skjuvzon, ger information om deformationsregimen för jordskorpan under den Svekofenniska orogesen. Lu-Hf geokronologitekniken i kombination med tryck-temperaturmodellering ger insikt i hur metamorfa processer och tektoniska händelser hängde samman i södra Finland. Denna forskning i Olkiluoto området och kring Kynsikangas skjuvzon ger insikter i hur den tektoniska evolutionen och metamorfa miljön har sett ut under den Svekofenniska orogesen. Data från den här studien gör det möjligt att koppla ihop Häme metamorfosbälte (öster om Olkiluoto) och Ljusdals litotektoniska enhet som är beläget västerut i mellersta Sverige. Forskningen indikerar även att öst-västliga suturzoner i såväl Finland som i Sverige kan sammankopplas tektoniskt till varandra via Kynsikangas skjuvzon.

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13.6.2025 Oscar Wilson,
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**Non-analogue Neotropical
communities: Large herbivore
ecometrics in northern South
America**

**(Neotropiikin epäanalogiset
lajiyhteisöt: muinaisten
kasvinsyöjänisäkkäiden ekometria
pohjoisessa Etelä-Amerikassa)**

The modern Neotropics contain many of the most biodiverse areas in the world, encompassing a range of habitats including rainforests, dry forests, wetlands, savannahs, and deserts, each with its own set of mammal communities. The relationships between the traits of these modern mammals and their environment are consistent with those on other continents. However, the composition of the mammal assemblages in the South American fossil record is very distinct from elsewhere because of its 'punctuated isolation' for most of the last 65 million years.

In general, the teeth of large herbivores can be used to reconstruct palaeoenvironments because of known functional relationships between molar shape/structure and the environment. These relationships are the foundation of the study of dental ecometrics. For example, in other continents, higher-crowned (hypsodont) molars are an adaptation to increase durability and are correlated with environmental aridity. In the fossil record of South America, several groups have hypsodont teeth because of their evolutionary history, even when they lived in tropical wetlands or rainforests.

The Neotropical fossil mammal record has been historically understudied compared to the diverse, well-preserved record from higher latitudes due to a variety of biases, including the relatively low preservation potential of

fossils in rainforests compared to many other environments. However, the Neotropics are particularly important to our understanding of environmental and faunal change in South America. This region contains a range of habitat types and is close to the Isthmus of Panama, through which a series of migration events have driven dramatic changes in the South American mammal faunas. The plant fossil record has provided some evidence for environmental change, but in some cases plant fossils are not available so it is critical to be able to use mammals to reconstruct palaeoenvironments.

Interpreting the environmental signal of some dental traits, including tooth crown height, has specific challenges in South America. However, dental traits vary between sites that have known environmental differences. Therefore, there is scope for further use of these methods in the Neotropics with more tailored models relating them to the environment. An alternative is the application of more universal traits, particularly diet and body mass. These can be estimated using relatively simple methods, even for fragmentary fossil teeth.

New multivariate statistical approaches to mapping differences in body mass distributions in mammal communities through generalised linear latent variable models (GLLVMs) reveal that modern mammal communities (and those where Pleistocene megafauna are included in the models assuming they had avoided extinction) differ in their body mass distributions in a way that is predictable according to environmental conditions. These GLLVM approaches therefore offer an opportunity for palaeoenvironmental reconstruction using relatively little information. However, they seem to perform best for more diverse fossil assemblages, which should be accounted for given the biases in the Neotropical record.

Novel mesowear angle methods indicate the diet of herbivores (Fig. 1), and these mesowear angles can be used to predict the



Figure 1. Herd of *Taubatherium paulacoutoi* around the lake at Taubaté, Brazil during the late Oligocene (~27 million years ago). Mesowear analysis of these ungulates shows that they were browsers, eating leaves and hard branches. Art by Miguel Hernandez.

Kuva 1. Lauma *Taubatherium paulacoutoi* -nisäkkäitä Brasiliassa Taubatéjärven rannalla oligoseenikauden lopulla (n. 27 miljoonaa vuotta sitten). Hampaiden kulumajälkien tutkimus osoittaa näiden kaviokyntisten ruokavalion koostuneen korkeammalla sijaitsevista kasvinosista kuten lehdistä ja kovista oksista. Kuva: Miguel Hernandez.

palaeoenvironment. For example, a greater proportion of grazers, reflected by higher mesowear angles, should indicate greater availability of grasses. Previously, mesowear angles have only been applied to a limited number of groups that have teeth with multiple lophs, particularly proboscideans, but the methods are useful for other types of teeth. Combining mesowear angles across herbivores with different tooth morphologies in a given location should give an accurate reflection of the plants there. These approaches are potentially applicable across continents and timescales.

Investigations into the Neotropical fossil record from the Late Oligocene to the Late Pleistocene highlight that both traditional

dental functional traits (e.g. hypsodonty) and these new universal traits have utility for palaeoenvironmental reconstruction, given concordance with independent proxies. However, further research is needed to calibrate the trait-environment relationships in a more quantified way. Further discoveries continue to be made in the Neotropics, both through reassessment of museum collections and new fieldwork. As the mammal fossil record grows, so too will our understanding of the palaeoenvironments of the Neotropics, through application of these ecometric approaches.

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