Spines evolution in Madagascar tenrecs

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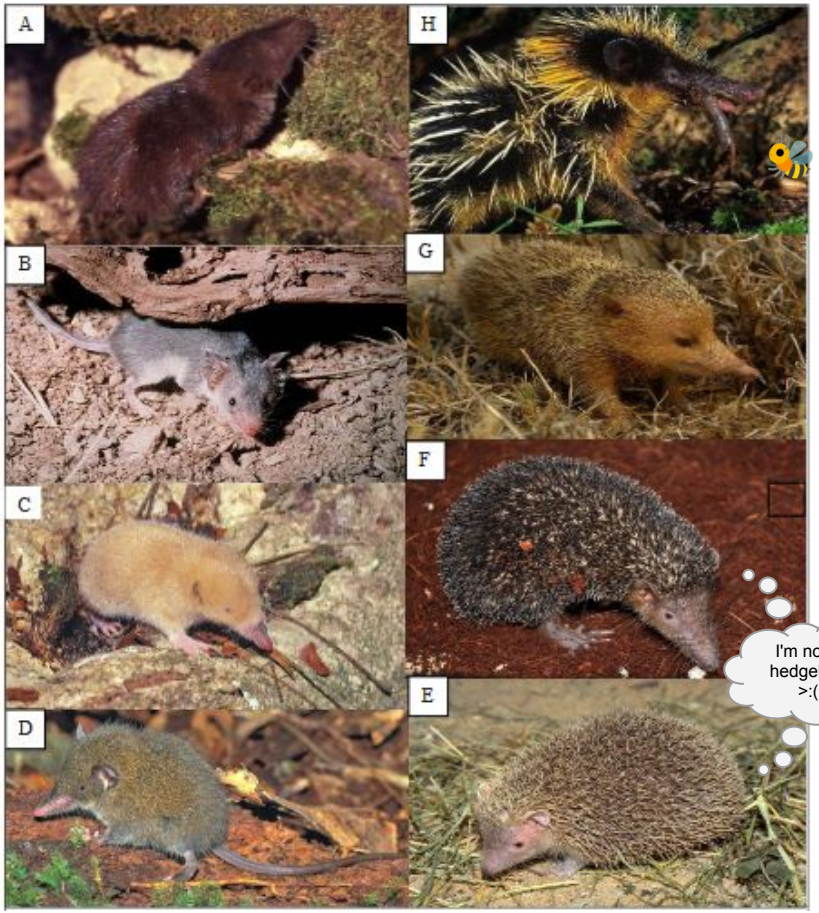
Aim

Did robust spines occur independently in different *Tenrecinae* species?

What factors influenced the evolution of spines?



[A – Nimba otter shrew (*Micropotamogale lamottei*)]
B – Large-eared tenrec (*Geogale aurita*)
C – Hova mole tenrec (*Oryzorictes hova*)
D – Taiva shrew tenrec (*Microgale taiva*)
E – Lesser hedgehog tenrec (*Echinops telfairi*)
F – Greater hedgehog tenrec (*Setifer setosus*)
G – Common tenrec (*Tenrec ecaudatus*)
H – Lowland streaked tenrec (*Hemicentetes semispinosus*)

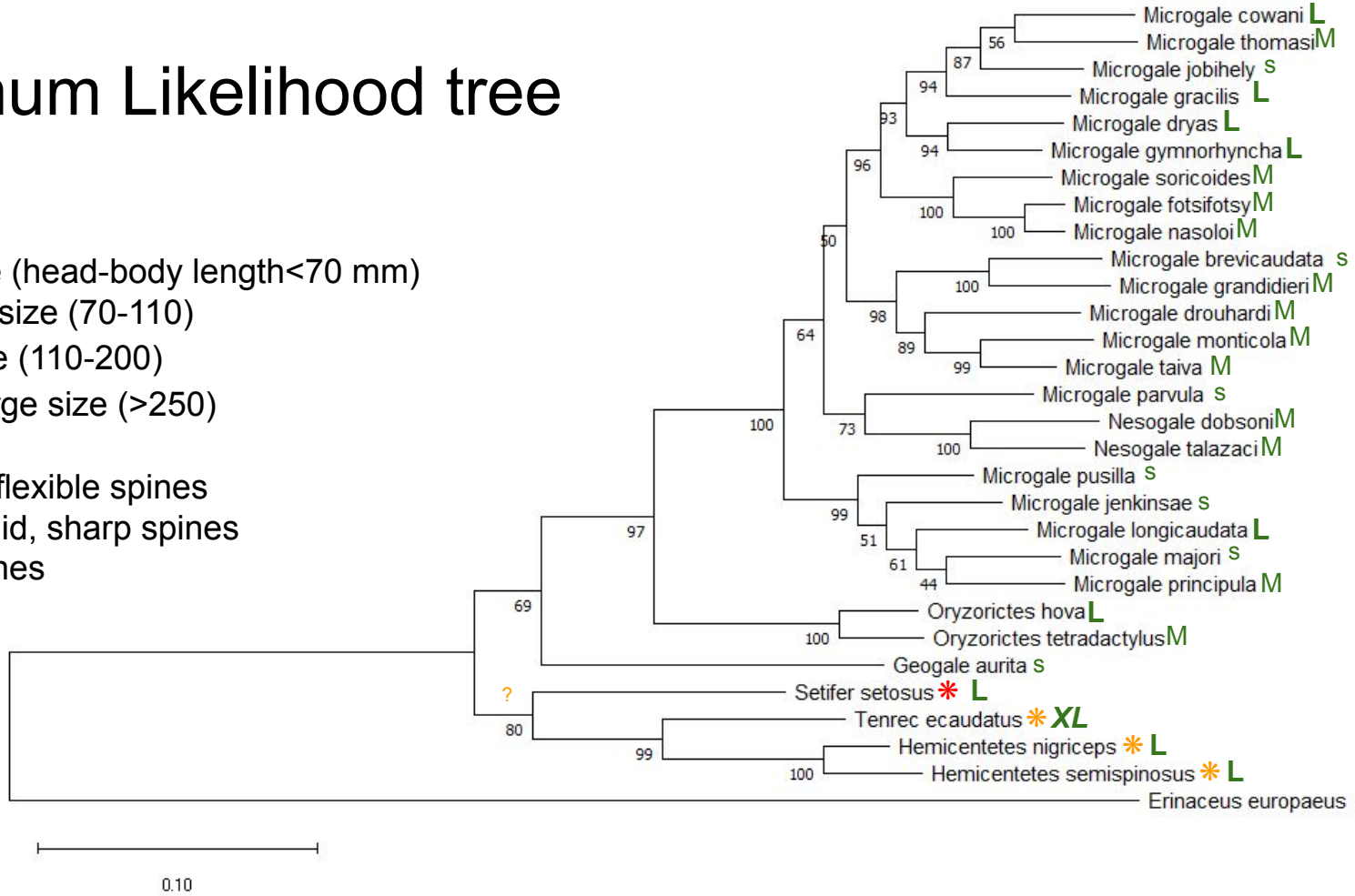
Methods

1. ND2 (NADH dehydrogenase subunit 2, mitochondrial) and RAG1 (exon 1 of recombination activating gene, nuclear) markers for *Tenrecinae* species (Everson KM, 2016) from NCBI Nucleotide; European hedgehog (*Erinaceus europaeus)* as an outgroup
2. MAFFT for alignment
3. TrimAl for filtering
4. SequenceMatrix for concatenation
5. MEGA Maximum Likelihood and Neighbor-joining methods for tree reconstruction
   (500 bootstrap replications, Jukes-Cantor substitution model)

Maximum Likelihood tree

(s) small size (head-body length<70 mm)
(M) medium size (70-110)
(**L**) large size (110-200)
(***XL***) very large size (>250)

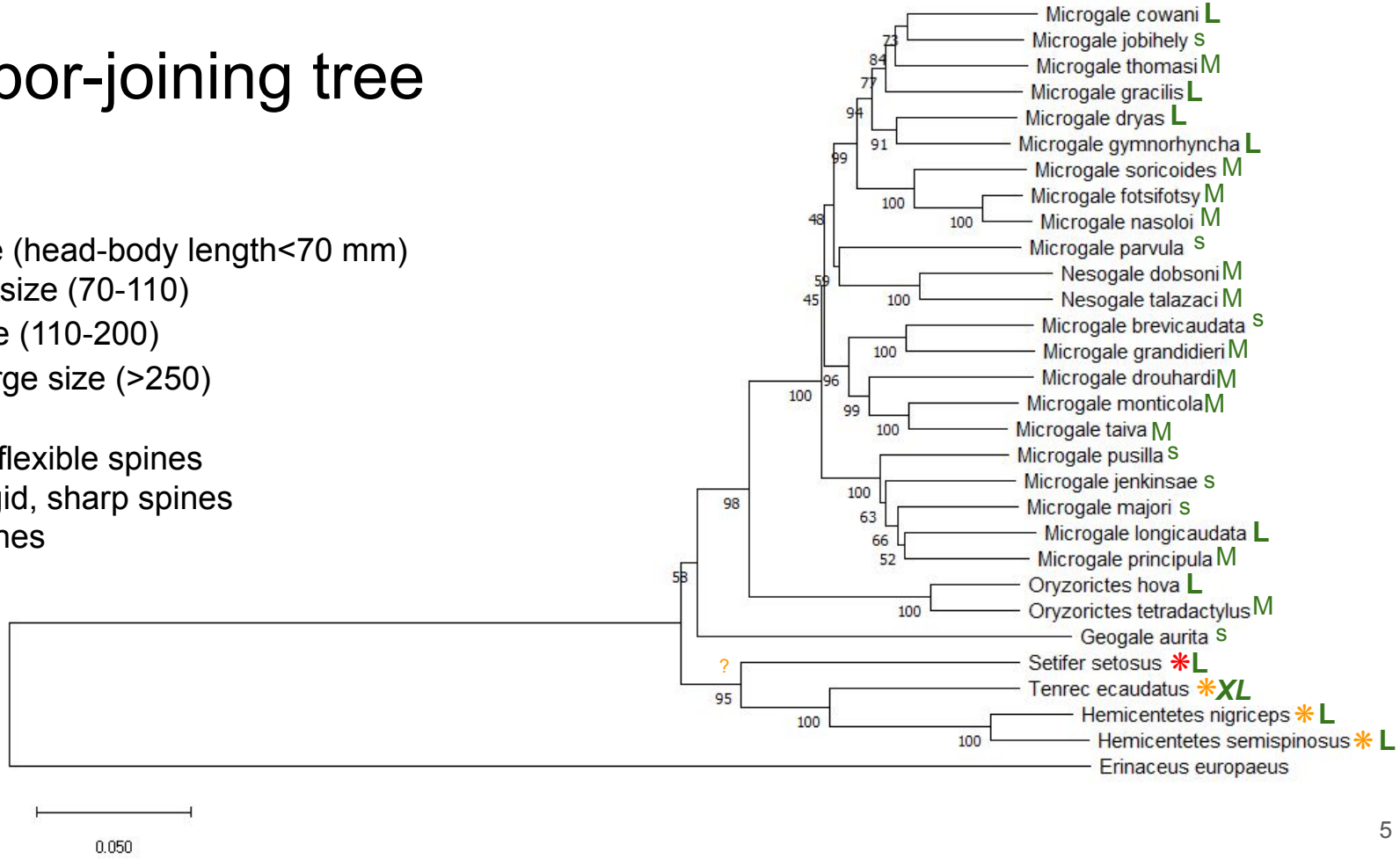
(✱) sparse, flexible spines
(✳) thick, rigid, sharp spines
() lack of spines



Neighbor-joining tree

(s) small size (head-body length<70 mm)
(M) medium size (70-110)
(**L**) large size (110-200)
(***XL***) very large size (>250)

(✱) sparse, flexible spines
(✱) thick, rigid, sharp spines
() lack of spines

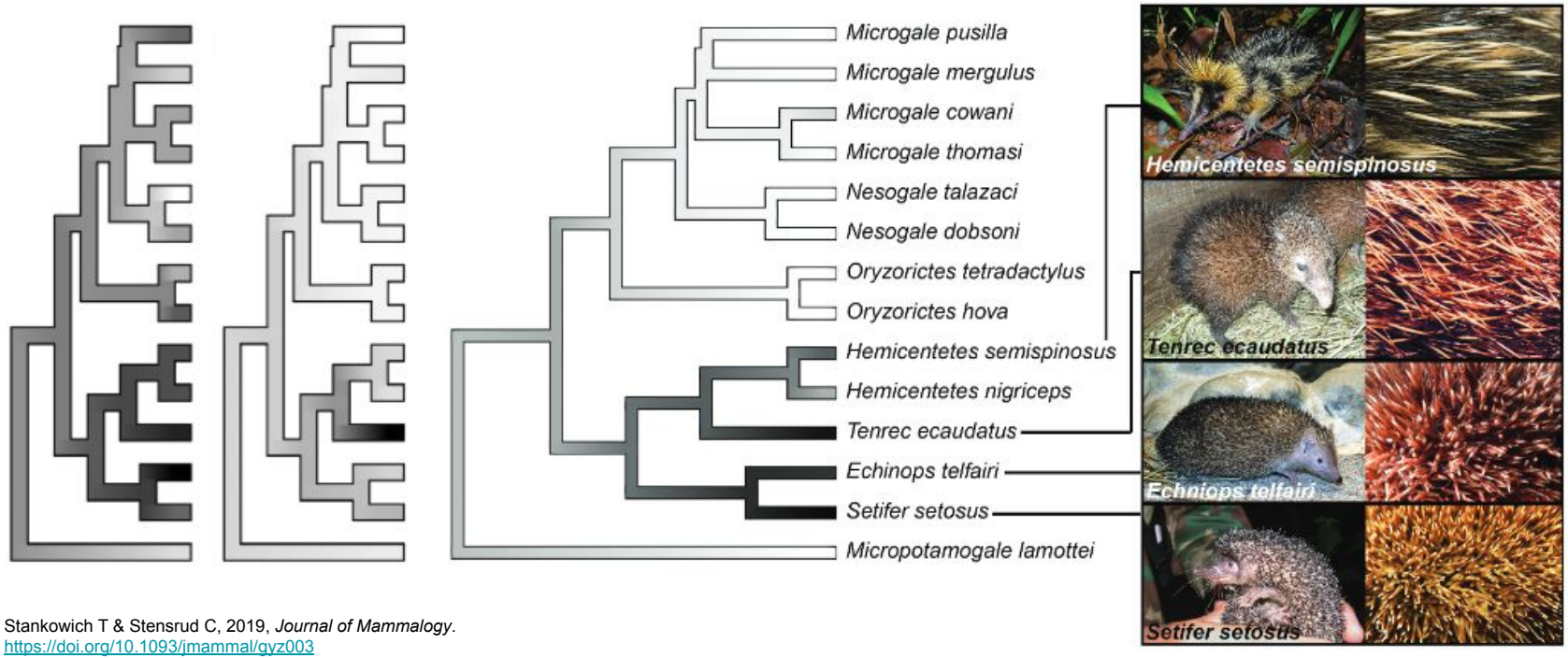


Morphoecological and biogeographical analysis

openness of habitat

body mass

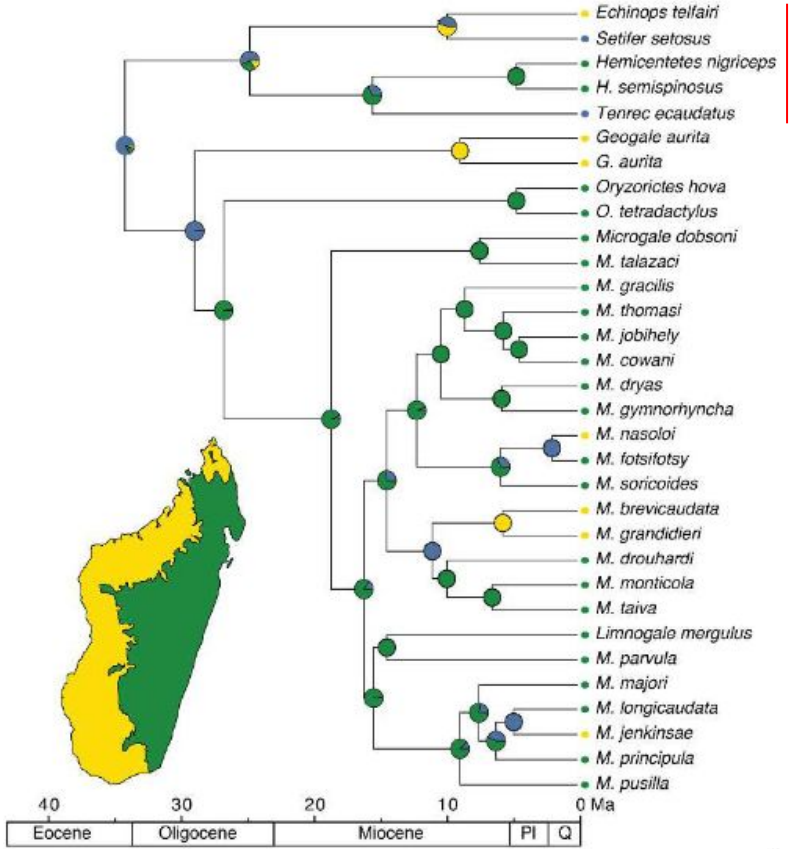
spinescence
(PC1 for nape width, nape volume, back width and back volume, 93.8% variance explained)



Stankowich T & Stensrud C, 2019, *Journal of Mammalogy*.
https://doi.org/10.1093/jmammal/gyz003

Morphoecological and biogeographical analysis

Zero extinction and equal rates of dispersal between both humid and dry regions.The rate of speciation in humid habitats is three times higher than in dry habitats and is highest for eurytopic species



Habitat associations (GeoSSE model)
humid, dry, both/eurytopic

Everson KM et al., 2016, *Systematic Biology*.
https://doi.org/10.1093/sysbio/syw034

Conclusion

Moderate or sparse spines evolved early in the *Tenrecinae* and then became more robust in closely-related *Tenrec*, *Echinops*, and *Setifer.*

As tenrecs evolved a larger body size and moved into a more open habitat, they were more likely to evolve spines.

Thank you :)