

# Are Florida manatees (*Trichechus manatus latirostris*) wearing their teeth down beyond functionality? Interspecific and intraspecific mesowear in manatees

Nina Woodard and Daniel Gonzalez-Socoloske  
Biology Department, Andrews University, Berrien Springs, MI 49104

## Abstract

Florida manatees appear to experience greater levels of mesowear and fewer functional teeth than other manatee populations. Decreased functionality may mean that they spend more time feeding and less time in other behaviors, decreasing their fitness. Skulls were analyzed in order to determine if there is variation in mesowear between manatee taxa. Average number of teeth, number of functional teeth, and mesowear were statistically analyzed in order to see if they vary between taxa. If they have significantly more worn teeth, Florida may not only be a marginal habitat because of the cooler winter waters, but also because of the greater dental burden.

## Introduction

Manatees are herbivorous aquatic mammals. They have 6-8 molars that are continually replaced, conveyor-belt like, from the posterior to anterior end of the jaw (Fig.1). This adaptation is thought to have arisen to deal with highly abrasive foods or substances. Manatees belonging to different taxonomic groups eat different foods that grow amongst different substrates (Fig. 2).

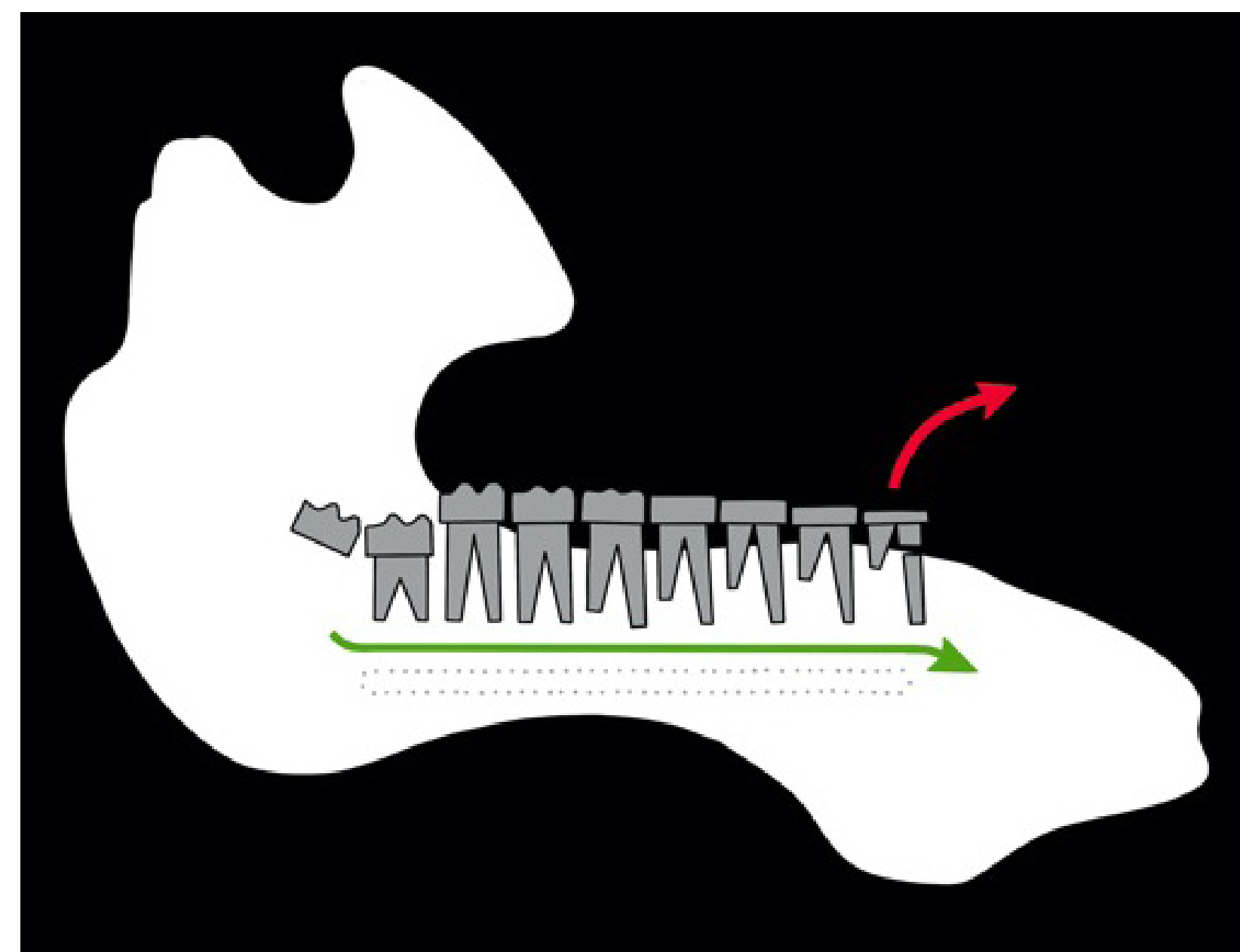


Figure 1. Conveyor-belt-like tooth replacement. Most known as marching molars. Modified from Rodrigues et al., 2008

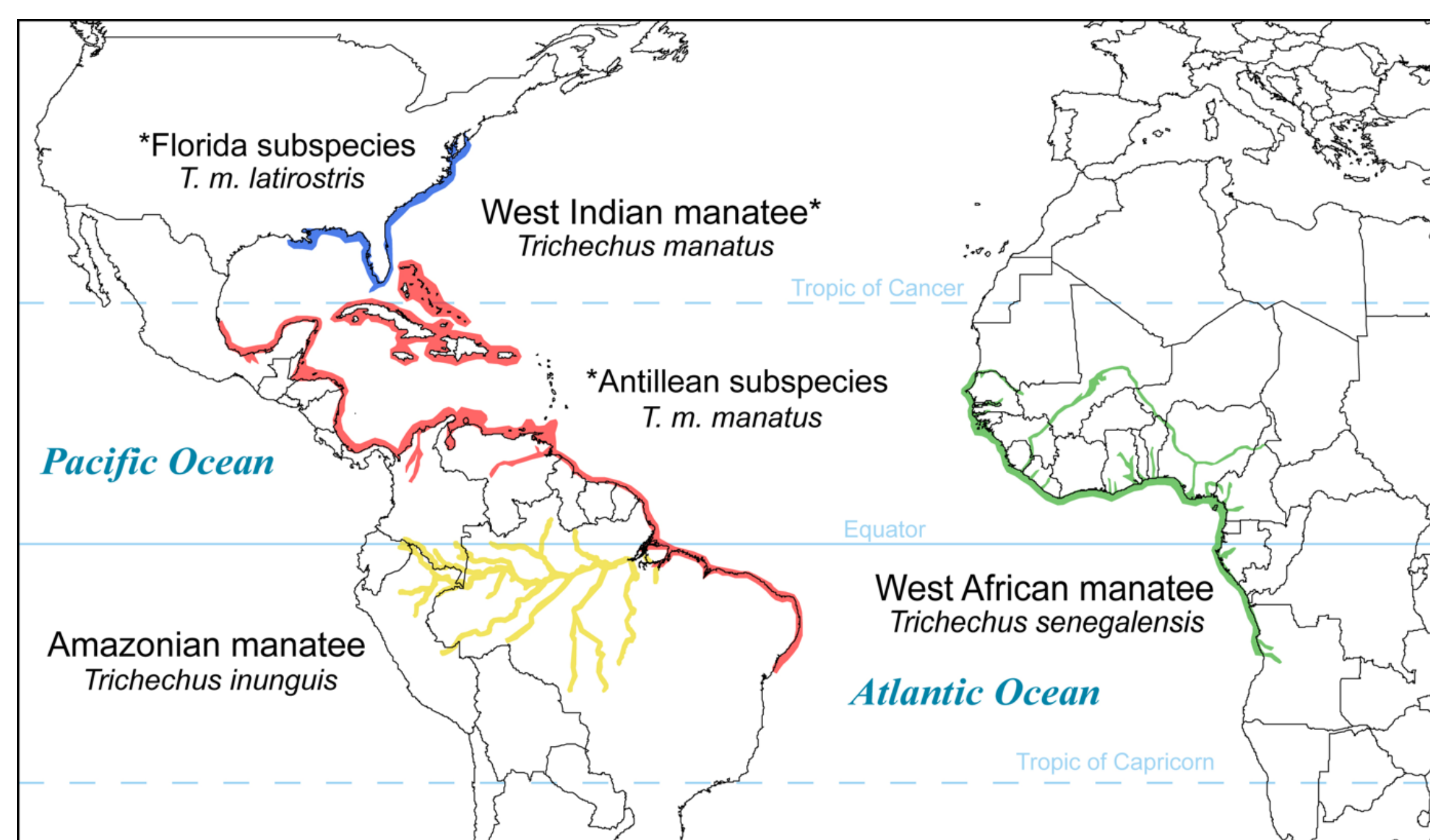


Figure 2. Map of the range of extant manatee populations. Modified from Gonzalez-Socoloske and Olivera-Gomez, 2012

## Methods

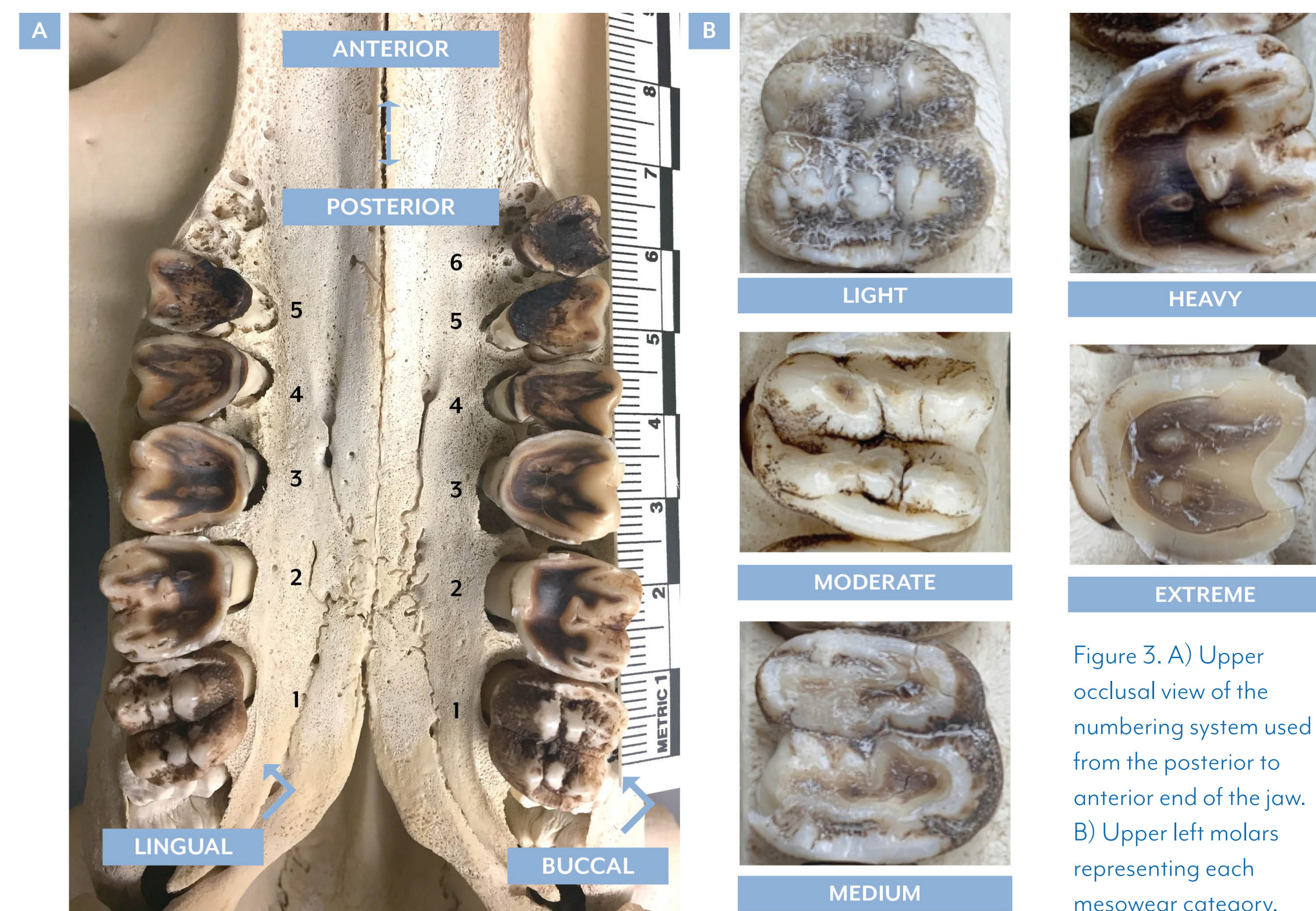


Figure 3. A) Upper occlusal view of the numbering system used from the posterior to anterior end of the jaw. B) Upper left molars representing each mesowear category.

- A total of 238 manatee skulls, totaling 5324 teeth, from four manatee taxonomic groups were examined (Fig. 3A).
- Mesowear was divided into 5 distinct categories: 1. Light, 2. Moderate, 3. Medium, 4. Heavy, and 5. Extreme (non-functional) (Fig. 3B).
- Total number of teeth per quadrant (TNTQ) and total number of functional teeth per quadrant (TNFTQ), defined as mesowear <5, were counted.
- Average TNTQ, TNFTQ, and mesowear of molars were compared statistically using Kruskal-Wallis test.
- Post hoc pair-wise comparisons (Mann-Whitney U) were conducted to determine where specific differences occurred when significance was detected.

## Results

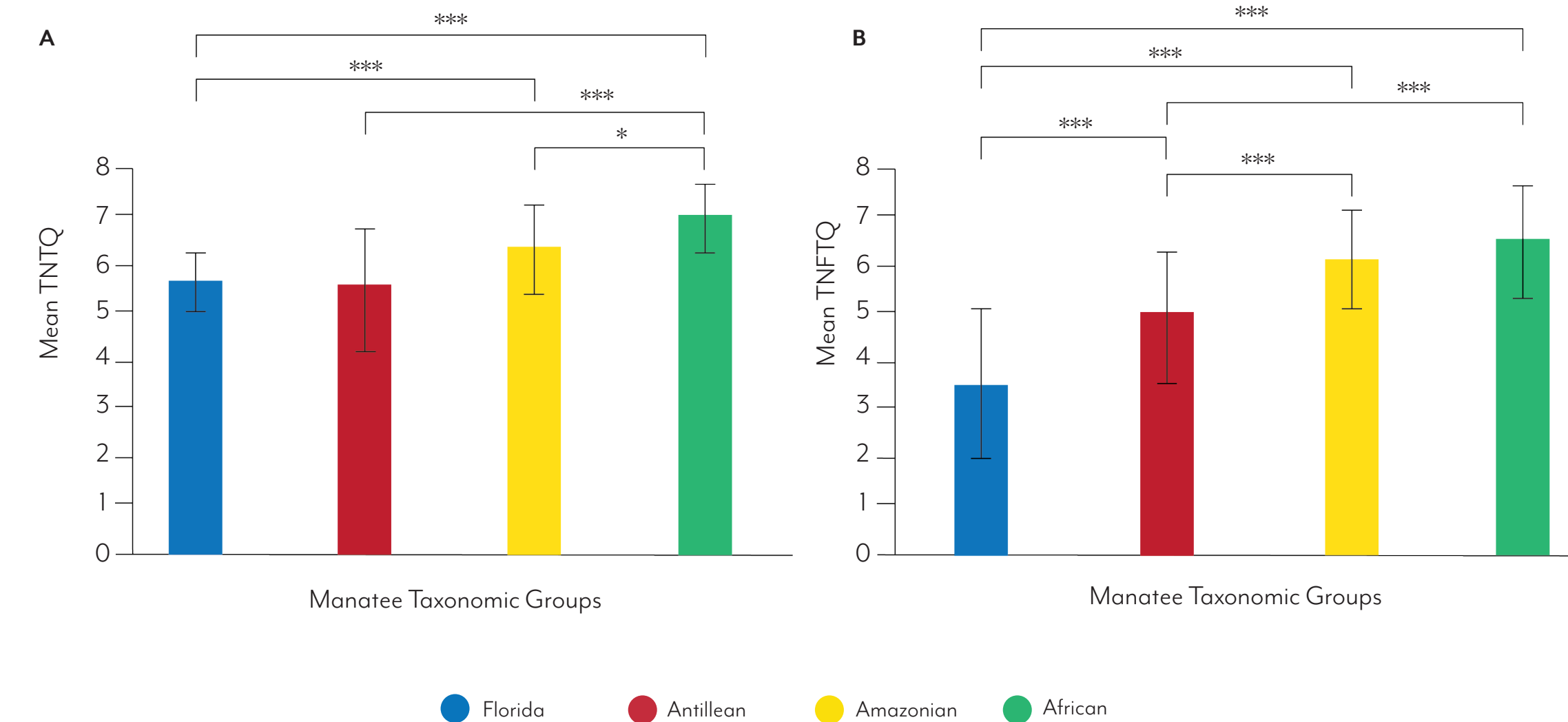


Figure 4. Mean A) TNTQ and B) TNFTQ were statistically different between manatee taxa ( $H(3)=130.038, p<0.001, H(3)=362.218, p<0.001$ ). Post hoc pairwise comparisons (Mann-Whitney U) indicated by the following symbols \*  $p<0.05$ , \*\*  $p<0.01$ , \*\*\*  $p<0.001$ .

## Results

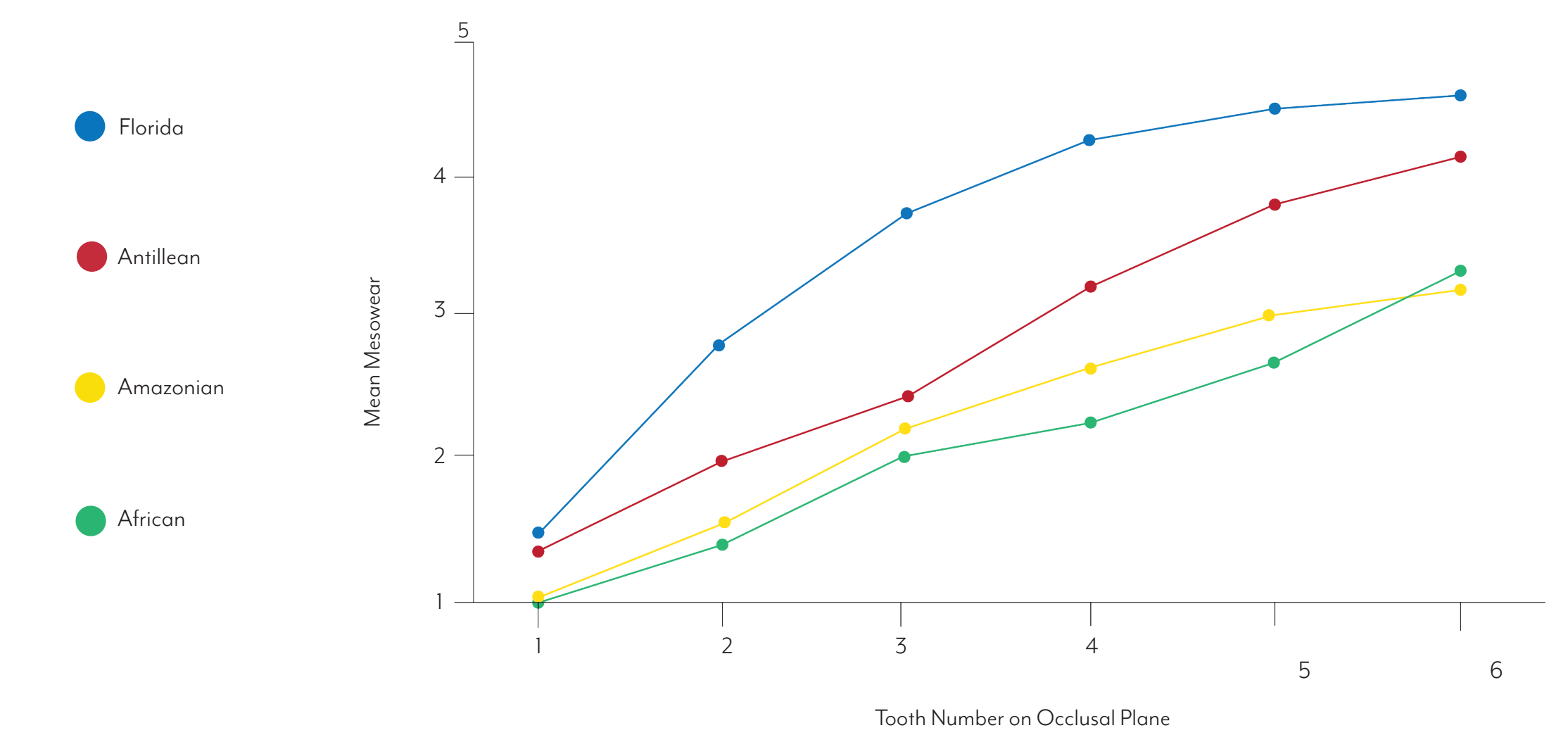


Figure 5. Mean mesowear for molars 1-6 were statistically different between manatee taxa (Kruskal-Wallis test  $p<0.001$  for all 6 molars). Post hoc pairwise comparisons (Mann-Whitney U) within each molar revealed that the Florida manatees had statistically higher mean mesowear than all other manatee populations, except for molar 1, in which the Florida manatees were not statistically different than the Antillean manatees.

## Conclusion

- Florida manatees have significantly fewer mean TNTQ than other manatee populations, except for Antillean manatees
- Florida manatees have significantly fewer mean TNFTQ than other manatee populations, including Antillean manatees.
- Florida manatees have significantly higher levels of mean mesowear on M1-6 than other manatee populations, resulting in a substantial dental burden.
- The implications of this dental burden are important as extreme dental wear may mean the Florida manatees decrease their food processing efficiency, increasing the feeding time, increasing the number of chews per item, and increasing the amount food consumed.
- US waters are a marginal habitat due not only to cooler winter waters, but also this dental burden.

## Literature cited

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