ACTA SCIENTIFIC DENTAL SCIENCES (ISSN: 2581-4893)

Volume 4 Issue 3 March 2020

Short Communication

Use of Tooth Traits in Evolutionary and Ecology Studies

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DOI: 10.31080/ASDS.2020.04.0781

Received: January 22, 2020

Published: February 10, 2020

Research on human dental science is relevant to health and life quality. This is somewhat obvious in medicine, but perhaps less obvious to researchers of this sector is that some dental traits can be used as practical indicators in ecology and evolutionary studies. The aim of this short note is to provide the reader with information on how some dental traits are used to support evolutionary hypotheses in mammalian species. The ideas presented in this note are further elaborated by the author in a recently published article in Ecological Indicators journal [1].

One of the characteristics of teeth of many mammalian species is that once they have emerged they have achieved their final size, and do not grow any further, neither are they repaired or replaced when the tooth is damaged. This means that (i) tooth wear accumulates across life, reducing the length of time the tooth works efficiently and so reducing the span of the animal´s life, and (ii) animals that spend more time chewing or chew food that is more abrasive will have faster rates of tooth wear compared to animals that spend less time chewing or that use less abrasive diets. Therefore, tooth wear is an interesting feature, as it can be used to track changes in mastication activity across an animal´s life, which helps to compare differences between individuals, sexes, populations or related species.

One interesting evolutionary hypothesis on senescence, which has been supported using records on tooth wear, predicts that body structures should be as durable as expected by the longevity of the individual, known as disposable soma theory [2]. For example, it is predicted that females of polygynous mammals live longer than males of the same species. This is based on the fact that these females produce a small number of offspring per year, generally one or two. Consequently, to achieve a large number of offspring by the end of their life the only possible strategy is to live longer. On the other hand, males of polygynous species can mate with many females and leave a greater number of offspring than a female within a season. For this to be possible males have to compete against other males for mating opportunities, and for them to succeed they need to be in the prime condition, which generally can only be maintained for a few years until other male outcompetes them. This means that the successful reproductive period of males of polygynous species is shorter in comparison with that of females of the same species. Within this framework the evolutionary theory predicts that polygynous males life span should be shorter than that of females, which is something supported by records of many populations of wild species, such as red deer [3].

Given the above background, with respect to teeth, it has been demonstrated that molars of red deer males are smaller than those of females relative to their body size [4], and this seems to be true for many other species of polygynous ungulates [5]. Assuming two individuals of the same age eat diets that do not differ in abrasiveness, we can predict that the individual which has more worn molars is the one which has spent more time chewing, because it has ingested more food or invested more time chewing per unit of food ingested (i.e. achieving smaller food particle size and more efficient digestion). There are a number of studies that have found that deer with more worn molars developed a larger body size [6] or were heavier [7] than deer of the same age but with less worn molars. This is good evidence to support that tooth wear can be used as a proxy to quantify nutritional expenditure. There is, however, a catch in this argument if we want to make fair comparisons in tooth wear between sexes: we are assuming that tooth hardness does not differ between sexes. Fortunately, Pérez-Barbería [1] recently dem-

onstrated in wild red deer, using a large sample of molars of known age, that males and females do not differ in molar hardness, which makes it possible to test ecological and evolutionary hypothesis that involve tooth wear comparisons between sexes. Some of the ideas presented here might help to inspire studies on tooth wear on human populations.

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