Ageing live ringed seals (Phoca hispida): which tooth to pull?

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Introduction

Ageing animals is a crucial step to life-history analysis, population dynamics, management and contaminant analysis. Teeth cementum Growth Layer Groups (GLGs) have been used to estimate ages of wild carnivores. Because of their large size, canines are the best choice for ageing purposes but are too important to be removed from live animals. Ages estimated from post-canines and incisors have been used for different species, including pinnipeds, with varying success. Due to the high variability in the visibility of GLGs between species, tooth tissues and tooth types, it is essential to test the validity of new methods for each species individually.

Objectives

L Determine precision and accuracy of age estimated by first Post-Canine (PC1) and second Incisor (I2) relative to age determined using Canine (C)
L Recommend an alternate tooth, other than the canine, to age live ringed seals

Methods

Lower jaws were boiled and cleaned (a) and teeth removed (b). PC1, I2 and C were decalcified (c) and cut in 10μm mid-longitudinal sagittal sections using a cryostat (d). Sections were mounted on albuminated slides, dyed with toluidine blue (e) and examined under transmitted light at low magnification (f). GLGs were counted in 2 to 3 blind replicates (g) and final ages were estimated using two identical readings or the median of 3 different readings.

Results

<table>
<thead>
<tr>
<th>Absence on jaw (%)</th>
<th>Quality (%)</th>
<th>Clarity (%)</th>
<th>Precision indexes</th>
<th>Estimates vs. Canine ages (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=511</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Post-Canine age estimates</td>
<td>Good</td>
<td>Approx</td>
<td>Poor</td>
<td>Medium</td>
</tr>
<tr>
<td>3.7</td>
<td>70</td>
<td>30</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>Incisor age estimates</td>
<td>4.5</td>
<td>60</td>
<td>40</td>
<td>55</td>
</tr>
<tr>
<td>P (χ²)</td>
<td>0.79</td>
<td>0.23</td>
<td>0.20</td>
<td>0.32</td>
</tr>
</tbody>
</table>

Table 1: Absence on the jaw, clarity of sections, quality of age estimates and precision indexes of PC1 and I2 did not differ statistically. GLGs counts on I2 tend to underestimate canine ages. PC1 ages were similar to C ages for ¾ of the estimations. PM is the percentage of age estimated by the median of 3 readings; D is defined as $D = \sum CV / \sqrt{N}$, with CV is the coefficient of variation and N the number of readings for each individual i.

Conclusion

L Precision in age estimation is not different for first post-canine and second incisor
L Accuracy is better achieved when counting GLGs in first post-canine than second incisor cementum
L Due to its larger size and better overall performances, the first post-canine is recommended over the second incisor for age determination purposes of live ringed seals

Acknowledgments

Photo: J.B. Dunn

Figure 1: Median regression of C on PC1 and I2 age estimates shows a significant positive relationship. The regression line of C on PC1 is not different from $y=x$, whereas the slope of the regression line of C on I2 is different from 1 (95%CI=1.151-1.715), showing a clear underestimation of age estimated by I2. R is the Spearman correlation value and $S_\chi$ is the standard error of estimate.