

Background

- The Gray Fox (*Urocyon cinereoargenteus*) is a wild canid with a range from southern Canada to South America.⁶
 - Size: 3-7 kg⁴; Life span: 6-8 years⁴
- Dental formula: **I 3/3, C 1/1, P 4/4, M 2/3**
- Diet: small prey items, carrion, insects, fruit, and other plant material^{4,5}
- Threats to survival:
 - Predation and interspecies aggression³
 - Infectious diseases³
 - Anthropogenic: commercial fur trapping, vehicle accidents
- Dental health impacts morbidity and mortality⁷
- Dentition provides information on ecological factors: diet, infectious disease, species interactions, effects due to human activity

Hypothesis

The dental pathology of the *U. cinereoargenteus* will be similar to that of the domestic dog and cat, with periodontitis and endodontal disease due to tooth fractures being most prevalent.

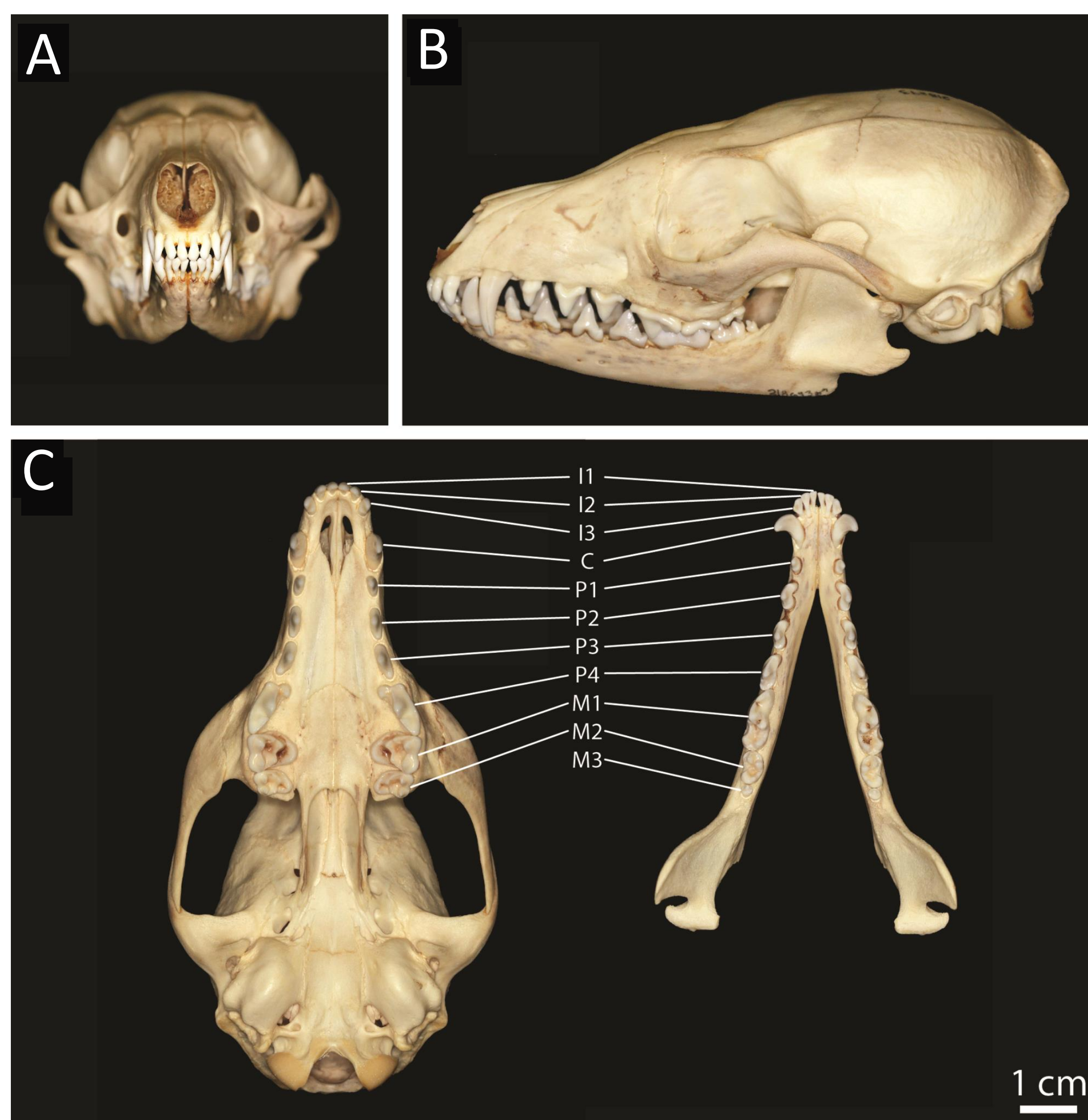


Figure 1. Normal dentition of the Gray Fox

Methods

- Macroscopic examination of 117 skull specimens from the California Academy of Science, San Francisco and 452 specimens from the Museum of Vertebrate Zoology, Berkeley (n=569)
- Specimens categorized into juvenile, young adult, and adult based upon presence of deciduous dentition and skull sutures fusion
- Teeth systematically examined for congenital/developmental abnormalities: congenital tooth absence, tooth form, root number, enamel hypoplasia supernumerary and persistent deciduous teeth
- Teeth also examined for acquired pathological abnormalities: acquired tooth loss, fractures, periodontitis, attrition/abrasion, periapical lesions
- Temporomandibular joint (TMJ) assessed for signs of osteoarthritis or other pathology
- Specimens examined for maxillofacial trauma
- Prevalence of lesions were compared between different age and sex groups using Chi-squared and Fisher's exact tests
- Prevalence of fractures and periodontitis for each tooth compared between different sex and age groups using the Mann-Whitney-Wilcoxon Test
- Prevalence of fractures over the collection period determined using the Cochran-Armitage test
- P<0.05 considered statistically significant

Results

Pathology	Data
Congenital Conditions:	
Congenital Absence	<ul style="list-style-type: none"> 0.06% of all teeth Mandibular third molar teeth most common site
Supernumerary Teeth	<ul style="list-style-type: none"> 10 supernumerary teeth in 9 (1.6%) foxes Mandibular third molar teeth most common site
Root Number Variation	<ul style="list-style-type: none"> 10.7% of foxes Maxillary third premolar teeth most common site
Other	<ul style="list-style-type: none"> 1 fox with maxillary brachygnathism
Acquired Pathology:	
Acquired Absence	<ul style="list-style-type: none"> 0.8% of all teeth Incisor teeth most commonly affected
Periodontitis	<ul style="list-style-type: none"> 48.7% of foxes had bony changes consistent with of periodontitis Most common sites for stage 2: maxillary fourth premolar and first molar teeth Most common sites for stage 3: maxillary fourth premolar teeth Adults more likely to have stage 3 and stage 4 Males more likely to have stage 2
Fractures	<ul style="list-style-type: none"> 78.4% of foxes Canine teeth most commonly affected Adult foxes exhibited more of all fracture types except uncomplicated crown-root fractures
Attrition/Abrasion	<ul style="list-style-type: none"> 85.6% of foxes Fourth premolar, first and second molar teeth in all quadrants most affected Abrasion significantly more common in adult foxes
Temporomandibular Joint (TMJ)	<ul style="list-style-type: none"> No TMJ osteoarthritis TMJ fracture in 5.8% of foxes
Enamel Hypoplasia	<ul style="list-style-type: none"> 1 adult female with left mandibular first incisor tooth affected
Trauma	<ul style="list-style-type: none"> 9.8% of foxes Evidence of bites, gunshot wounds, motor vehicle accidents No evidence of bone healing
Periapical Lesions	<ul style="list-style-type: none"> 2 foxes with periapical lesions: Tooth root abscess associated with complicated crown fracture of left mandibular first molar tooth Bone lysis over root of left maxillary fourth premolar tooth
Other	<ul style="list-style-type: none"> 2 foxes with acquired maxillofacial anomalies: Shortened mandible and bone remodeling due to trauma or infection Chronic mandibular fracture with evidence of bone healing

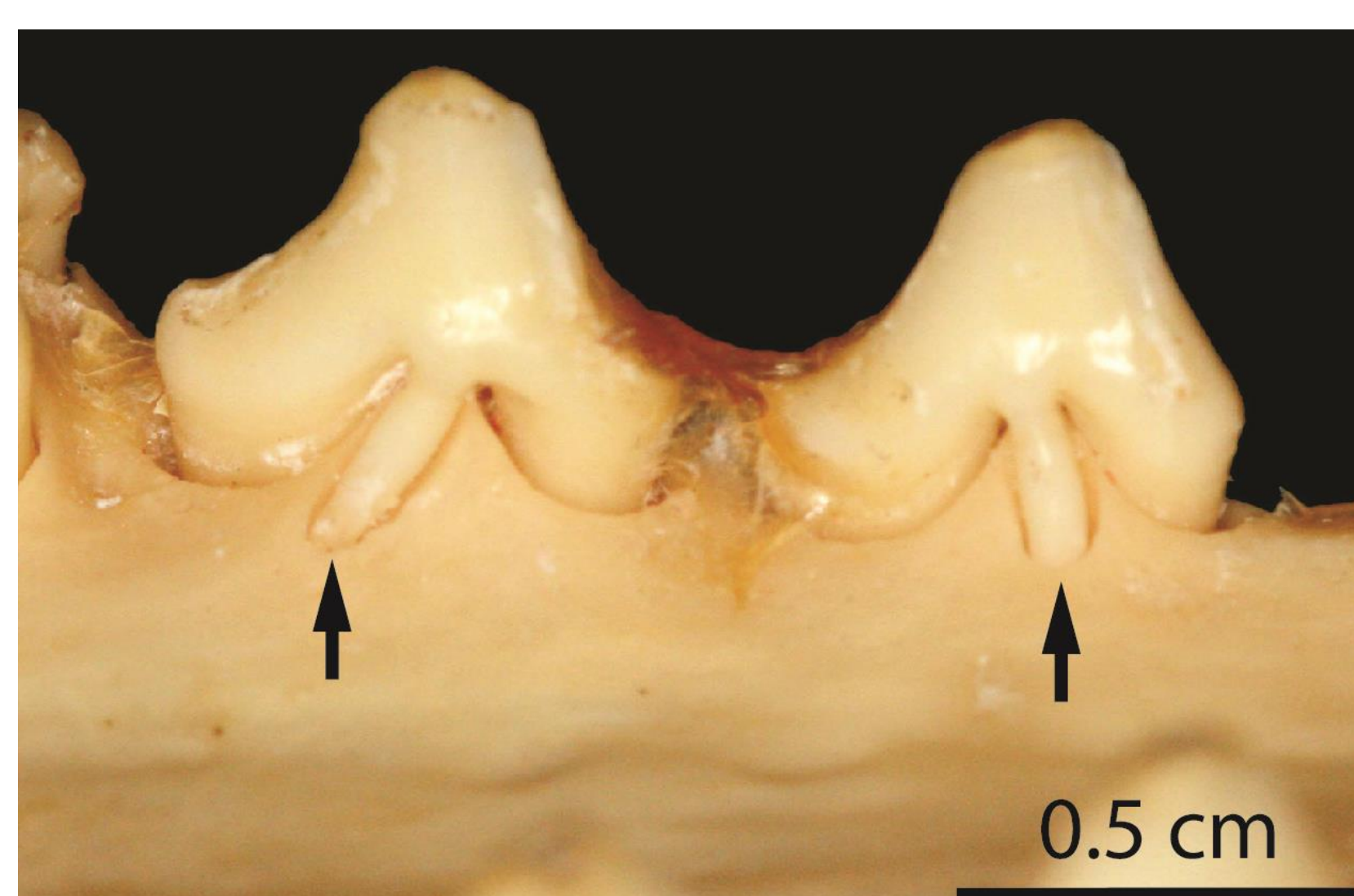


Figure 2. Extra roots on right maxillary second and third premolars

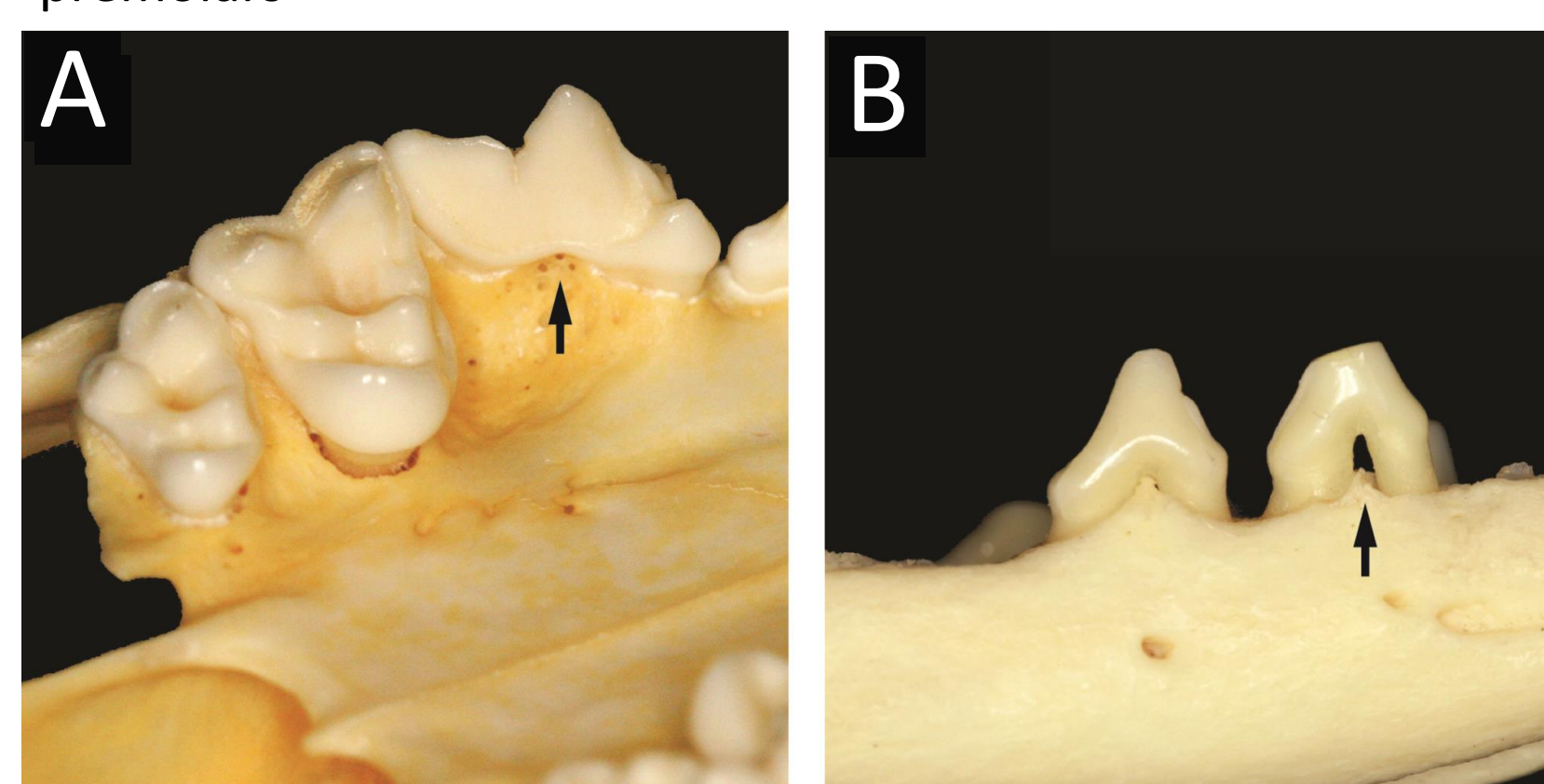


Figure 3. Stages of periodontal disease: (A) Stage 2, (B) Stage 3, (C) Stage 4

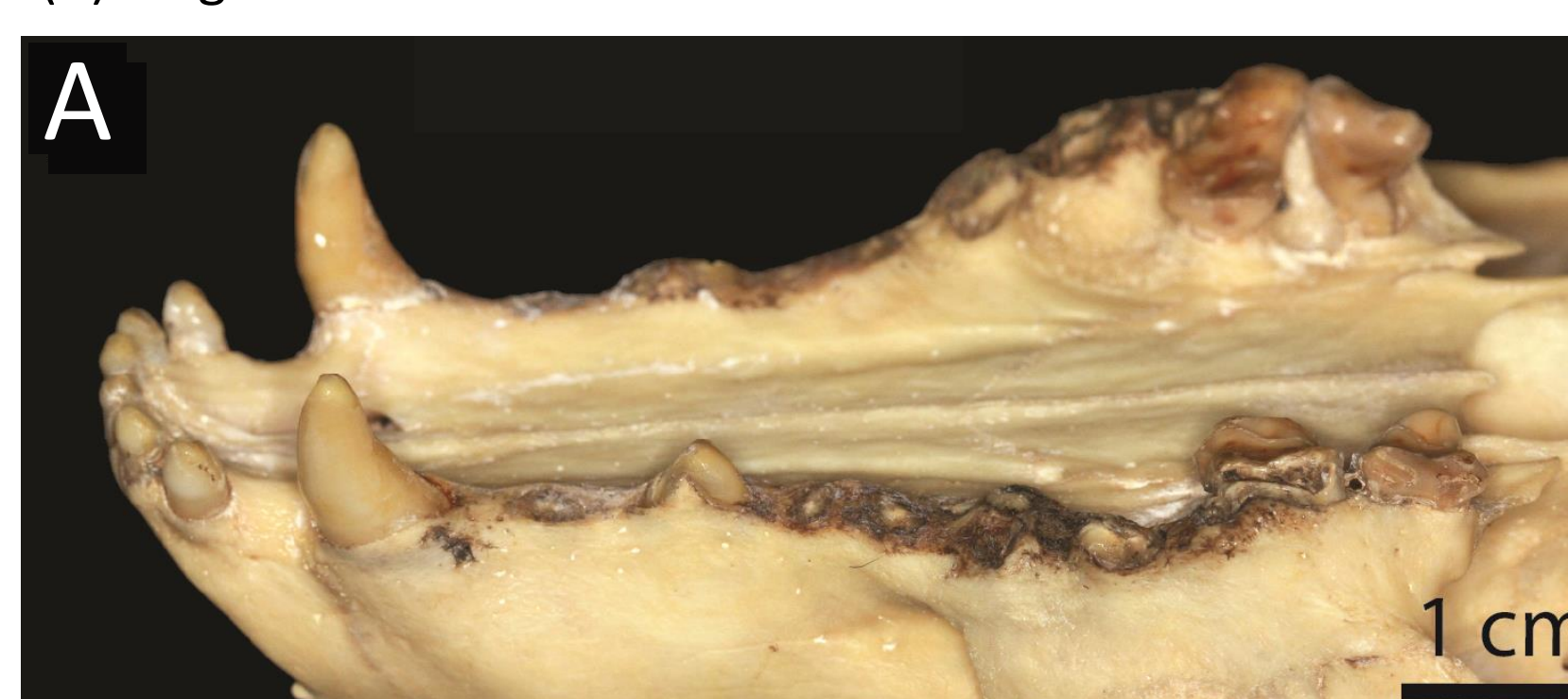


Figure 4. Severe fractures of (A) teeth of the maxilla and (B) teeth of the mandible

Discussion

- Attrition/abrasion and dental fractures most commonly recorded dental pathology in the Gray Fox
 - Omnivorous with plant material making up a large percentage of their diet⁵
 - Impact of commercial trapping on the prevalence of fractures unknown
- Supernumerary roots most common congenital abnormality
 - Etiology likely genetic
- Periodontitis present in almost half of the study population
- Skull fractures due to trauma relatively common
 - Degree of damage ranged from single fractures to completely shattered skulls
 - Deaths due to conspecific or interspecific aggression or predation
 - Deaths due to anthropogenic effects: commercial trapping, traffic accidents
- Enamel hypoplasia prevalence lower than expected given the rates of canine distemper in many populations of Gray Fox
- TMJ osteoarthritis not seen in the study population.
 - Contrasts with larger carnivores such as California Mountain Lion (*Puma concolor cougar*)¹ and American Black bear (*Ursus americanus*)²

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