SKELETAL FUSION TIMING in PAN PANISCUS with COMPARISONS to PAN TROGLODYTES.

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INTRODUCTION

Fusion of skeletal elements provides markers for timing of growth and is one component of a chimpanzee's physical development. Most of what we know about the timing of development in chimpanzees derives from *Pan troglodytes.* Much less is known about the sister species, *Pan paniscus*, with few in captivity and a restricted wild range in central Africa.

MATERIALS AND METHODS

Here we report on the timing of skeletal fusion for female captive *P. paniscus* (n=5) whose known ages range from .83 to 11.68 years from the Milwaukee and San Diego Zoos. TABLE 1. We compared them to captive Yerkes *P. troglodytes* (n=10) whose ages range from 6-18 years (Kerley, 1966).

We then compared the *P. paniscus* to a sample of 9 immature female wild *P. troglodytes* of known age from the Taï National Forest, Côte d'Ivoire. TABLE 2.

TABLE 1: Captive *P. paniscus*

Age class	Age (years)
Infant	.83
Juvenile II	6.74
Juvenile III	7.30
Sub-Adult	8.54
Adult	11.68

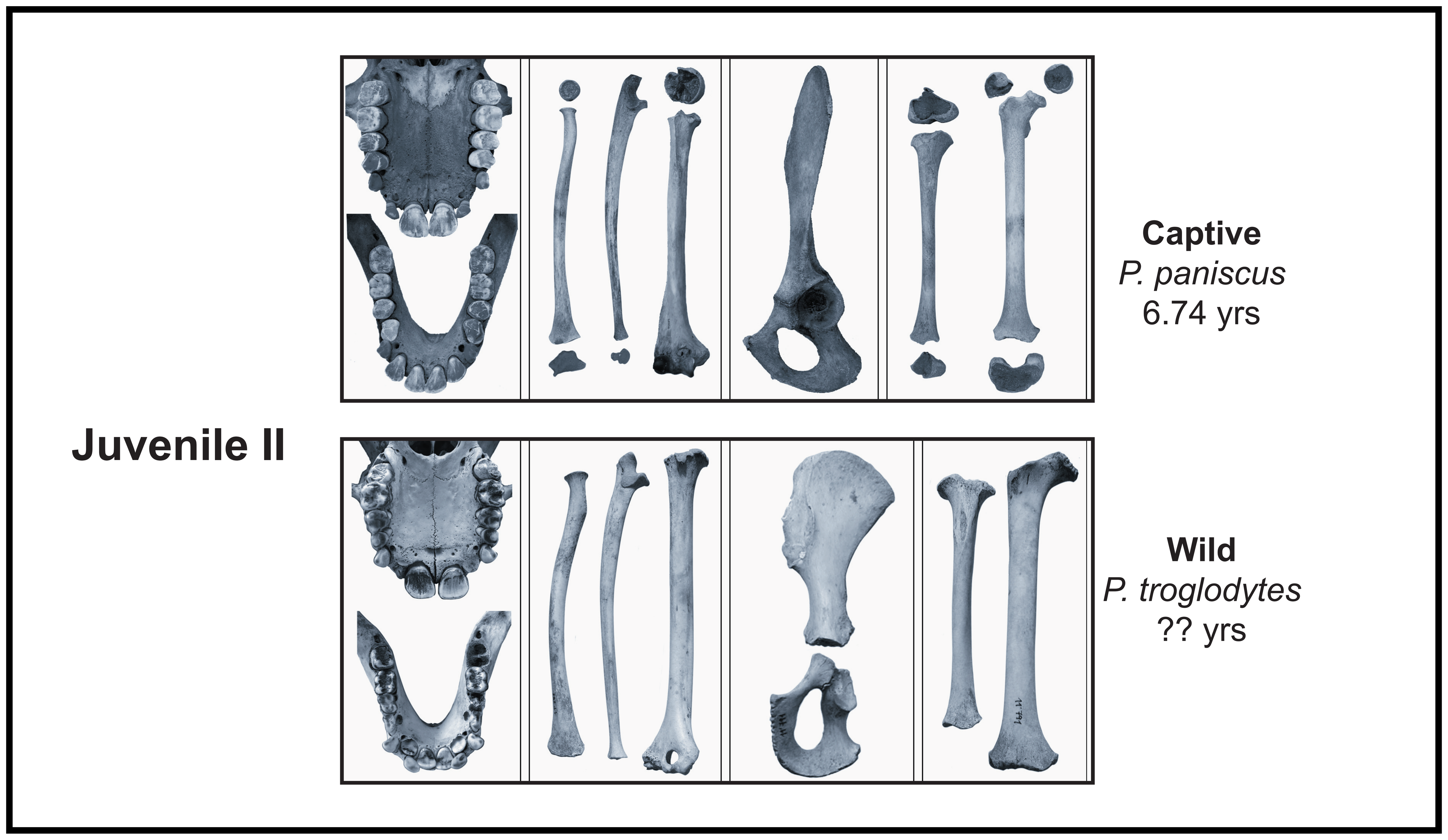
TABLE 2: Wild *P. troglodytes*

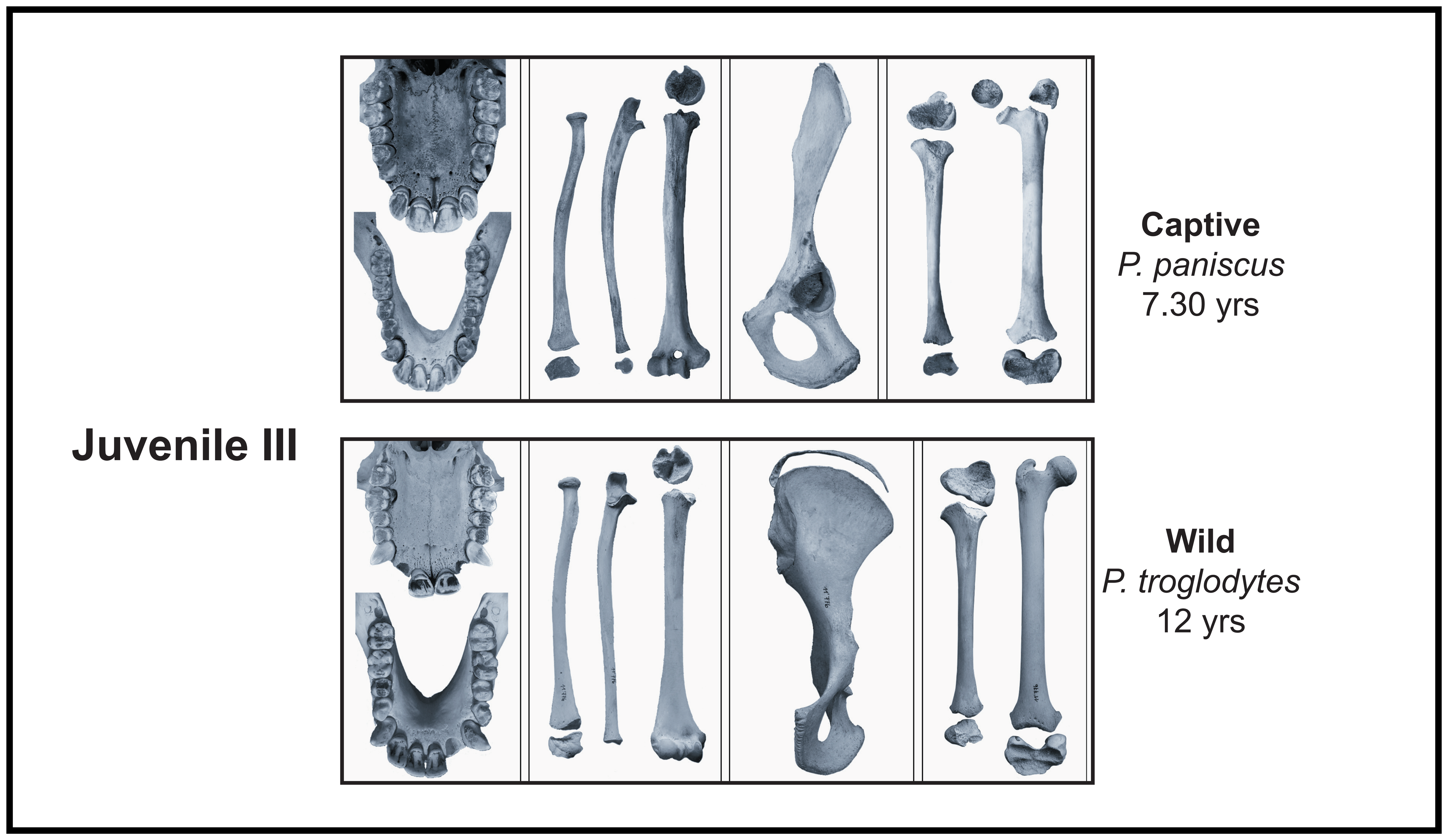
Age class	Age (years)
Infant	.74
Juvenile I	3.76
Juvenile I	5.19
Juvenile II	7.96
Juvenile II	?
Juvenile III	10
Juvenile III	11.38
Juvenile III	12
Sub-Adult	12

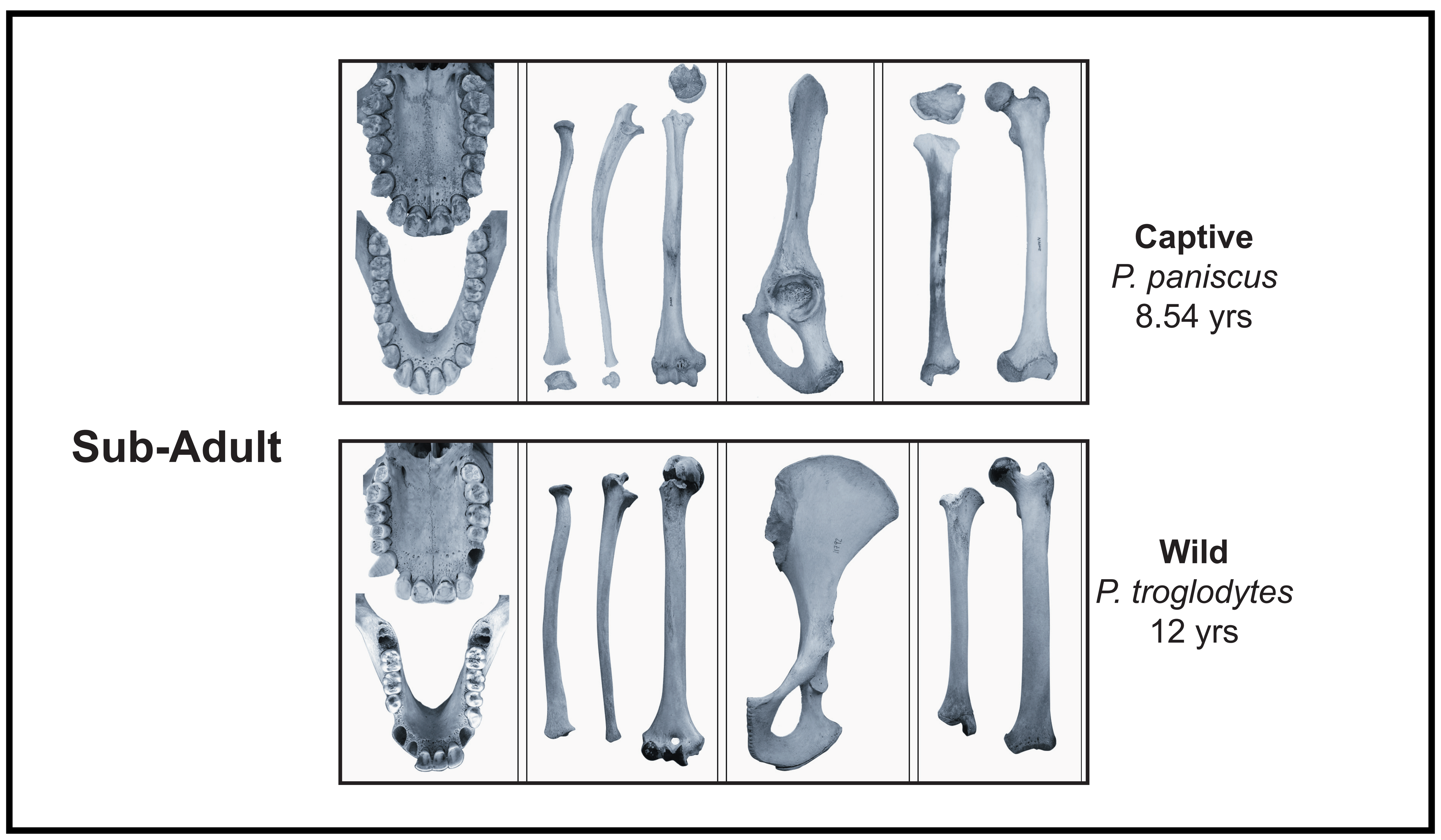
Dentition organizes individuals into age classes (after Zihlman et al., 2007). Data on the fusion times of 22 skeletal elements on both left and right sides were assessed for the individuals (not all data points are available on every specimen): Epiphyses were considered unfused if the ends were unattached, fully fused if bones were completely grown together, and partially fused if bones were united but still partially open (after Bolter and Zihlman, 2003). If the two sides differed, the more advanced stage was used.

RESULTS

Comparisons between captive *Pan* confirm a general uniform pattern in sequence and absolute timing of skeletal fusion in the two species. When the captive *P. paniscus* were compared to wild *P. troglodytes* by dental age class, the skeletal fusion timings were also consistent. However, the absolute timing of fusion differed. (See Figures).







DISCUSSION

The absolute timing of key skeletal fusion events (along with dental emergence timing) is consistent across captive *Pan* populations. The acceleration of skeletal fusion up to 3-4 years in captive *P. paniscus* compared with wild *P. troglodytes*, particularly in the later maturing bone regions, is consistent with the findings for quick maturation in captive *P. troglodytes* compared to wild specimens (Zihlman et al., 2007), and with dental development more protracted in the wild than in captivity (Zihlman et al., 2004; Smith and Boesch, 2010; Smith et al., 2010).

Although no data exist on wild skeletal maturation patterns in *P. pansicus*, evidence from other body systems suggests that developmental timing quickens in captivity compared to populations in the African Congo (Kano, 1992; Hashimoto, 1997; Reinartz et al., 2003; De Lathouwers and Van Elsacker, 2005).

We emphasize that decreased energy requirements allow more resources to be invested in somatic growth, which accelerates the tempo of captive chimpanzee maturity (Zihlman et al., 2007).

SUMMARY

- Both species of *Pan* share the sequence of skeletal fusion.
- Captive *P. paniscus* timing of epiphyseal fusion is generally consistent with captive *P. troglodytes*.
- When comparing captive *P. paniscus* to wild *P. troglodytes* skeletal fusion is consistent across dental age classes.
- Captive *P. paniscus* skeletal fusion timing is accelerated compared to wild *P. troglodytes* of known ages.
- Accelerated physical maturity in provisioned *Pan* may be a product of a captive versus naturalistic developmental environment.
- Aging an unknown wild immature *P. paniscus* with postcrania would be best modeled on timing of epiphyseal fusion data from wild *P. troglodytes* populations.

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