Evidence for the existence of the supposed endemic Cuban platyrrhine *Ateles anthropomorphus* (formerly *Montaneia anthropramorpha* Ameghino, 1910) is exclusively based on the holotype. The latter consists of a collection of isolated teeth found in 1888 by Dr Luis Montané at Boca del Purial, an alleged pre-Columbian cave site in the Cordillera del Escambray. Although all recent authorities agree that the teeth from Boca del Purial represent *Ateles* (e.g. Arredondo & Varona, 1983; Ford, 1990), whether or not *anthropramorpha* is actually a distinct species of spider monkey or an import from the mainland remains unresolved (cf. MacPhee & Woods, 1992). Doubt on this issue could be largely removed if the supposed pre-Columbian age of the holotype could be subjected to a meaningful radiometric test.

Essential facts relating to the discovery and interpretation of the holotype are as follows. Montané's (1908, 1917) original interest in Boca del Purial was purely archaeological, and was sparked by the discovery of a supposedly ancient human skull at the cave in January, 1888. He began his own excavations in June of the same year. While trenching the cave floor he encountered a speleothem, described as a *plancher stalagmitique* ("stalagmite floor"), at a depth of 40 cm. Immediately beneath this floor he found palm seeds, hutia remains, human bones and, improbably, 16 isolated yet perfectly preserved mandibular teeth clearly referable to an anthropoid primate.

No additional material facts about the actual circumstances of discovery of the monkey teeth seem to be known. Montané's later archaeological excavations at Boca del Purial, in 1904 and 1906, failed to yield any new evidence that would permit an age estimate for the teeth, beyond the fact that they occurred in a cave in which a pre-Columbian Amerindian occupation had also been found. Interestingly, Montané (1917) himself made very little of the co-occurrence of monkey and human remains beneath the speleothem, simply noting without further comment that they had been found in the same confined place.

Florentino Ameghino received the Boca del Purial teeth for study in 1910, directly from Montané's hands. With his customary zeal, that same year he published a brief paper naming *Montaneia anthropramorpha*, formally making it the first allegedly native non-human primate from the West Indies. Similarities to *Ateles* were noted but dismissed; indeed, Ameghino (1910) was more impressed by what he took to be significant resemblances to Old World anthropoids (e.g. presence of a hypoconulid on some molars).

Ameghino's principal conclusion, that the Boca del Purial material represented a new anthropoid species, was subsequently challenged by Miller (1916), to whom Montané showed the teeth during a visit to Washington, DC. On the authority of Oldfield Thomas of the British
Museum, who examined photographs of the teeth, Miller (1916) concluded that they were virtually indistinguishable from mandibular teeth of Recent Ateles, especially A. fusciceps (incorrectly cited in his report as A. "fuscoper") whose range extends from northwestern South America to Panama (Grover, 1993). Montanè seems to have accepted Miller's conclusion that the Boca del Purial monkey was an Ateles, but not that it was conspecific with any living species of spider monkey. He later carried his monkey teeth to still other museums and other authorities, seemingly never resolving to his satisfaction what the Boca del Purial specimen really represented.

Williams & Koopman (1959) briefly took up the case of the Cuban spider monkey in their overview of extinct West Indian monkeys. They concluded, as had Miller (1916), that the best overall dental match for Ateles anthropomorphus was A. fusciceps. This implied that the Boca del Purial monkey had to be a recent immigrant, so recent as to practically require that humans were involved in some manner in transporting it (or its teeth) to Cuba. Their viewpoint was echoed by MacPhee & Woods (1982), who maintained that if Montanè was simply an import, it was devoid of any biogeographical significance.

Arredondo & Varona (1983) accepted the strength of the resemblances to Ateles pointed out by other students but contended that no continental spider monkey combines all features seen in the Boca del Purial teeth, and that therefore Ateles anthropomorphus should still be considered a true endemic. This conclusion has recently been supported by Ford (1990). However, because the holotype material is unique, there is no secure way of assessing whether the differentiae proposed for anthropomorphus actually define a species or merely reflect individual variation.

Context dates have also been cited in support of the separate species argument, but they do not solve the problem. Arredondo & Varona (1983) placed some weight on a "collagen method" age estimate (1900 ± 40 B.P.) for human bone from Boca del Purial (originally analysed for M.R.C. by Roberto Rodríguez Suárez of the Laboratorio de Arqueología, Museo Antropológico Montanè [MAM]). The collagen method is chemical rather than radiometric, and relies on the assumption that loss of organic material in an archaeological or paleontological bone sample occurs at a more or less linear rate. However, because results can be strongly affected by temperature and preservation factors (Vento Canosa et al., 1981), collagen method age estimates have to be treated with caution. A different sample of human bone from Boca del Purial, submitted by one of us (M.R.C.) in 1990 to the Laboratori de Datació per Radiocarbon, Universitat de Barcelona, yielded an uncalibrated date of 3060 ± 180 14C B.P. (UBAR-169) (Rivero de la Calle, no date). Neither bone sample has a known provenience within the cave.

While we agree that some degree of significant antiquity is certainly indicated for cultural remains recovered at Boca del Purial, existing dates and artefacts are irrelevant to the present issue because they cannot be tied unambiguously to the monkey teeth. Patterns of sedimentation within caves are often dramatically different from those seen in regional basins, and the mere fact that the teeth were found deeply buried in sediment beneath a speleothem of unknown origin is not a decisive indication of great age.

Clearly, the only unambiguous way to ascertain the age of the holotype of Ateles anthropomorphus would be to directly date a representative piece from the hypodigm. With the agreement of the Universidad de La Habana, the root of the right canine (Figure 1) was selected as the target for an accelerator mass spectrometry (AMS) 14C age determination. This tooth was chosen because its large size ensured that an adequate amount of collagen would be retrieved. Root closure had not been completed at the time of the animal's death, which is why
Figure 1. Right mandibular canine, *Ateles anthropomorphus* MAM 1376, before [(A) mesial aspect] and after [(B) lingual aspect] removal of root for accelerator mass spectrometry $^{14}$C dating. In (B), shaded portion is exact plastic replica of root. Eight of the 16 teeth comprising the holotype of *Ateles anthropomorphus* are in the collections of the Laboratorio de Osteología y Radiología, Facultad de Biología, Universidad de La Habana.

These teeth comprise the entire right mandibular dentition except for the central incisor [see illustrations in Miller (1916) and Arredondo & Varona (1983)]. The disposition of the other eight teeth recovered by Montane is not known. The teeth in the Museo Antropológico Montane collection are perfectly preserved except for minor abrasions and display no mineral staining, which would be unusual only if they had been buried a long time, as alleged.

Table 1 $^{14}$C age estimate, mandibular canine of *Ateles anthropomorphus*

<table>
<thead>
<tr>
<th>Lab. no.</th>
<th>$^{14}$C/$^{13}$C</th>
<th>Uncalibrated $^{14}$C age ± 1 S.D. ($^{14}$C B.P.)</th>
<th>$^{14}$C adjusted $^{14}$C age ± 1 S.D. ($^{14}$C $^{13}$C adj. B.P.)</th>
<th>Calibrated $^{14}$C age ± 2 S.D. (range, in calendar years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B72393</td>
<td>20-6%</td>
<td>0 ± 70</td>
<td>70 ± 70</td>
<td>A.D. 1070 to &quot;present&quot;</td>
</tr>
</tbody>
</table>

Analysis of Beta Analytic, Inc. $^{14}$C adjusted $^{14}$C age is based on standard correction for isotopic fractionation ($^{18}$O = 25% with respect to PDB standard [see Taylor 1987]; calibrated age range based on 20-year tree-rag curves, reported at 95% probability level (±2 S.D.). Radiocarbon age determinations are expressed in radiocarbon years before present (i.e. 1950). The true value for "present" is obviously 1950, not 1930, because the teeth can be no younger than the date of their collection.

the root appears truncated in Figure 1. The root was removed, separately moulded, and an epoxy cast of the root affixed to the original crown to preserve original morphological details [Figure 1(B)].

Table 1 reports radiometric age determination results in the format recommended by Taylor (1987) and others. As can be seen, the mean unadjusted radiocarbon date ($^{14}$C B.P.) for the canine root is centred on the radiocarbon zero datum [calendar (cal) A.D. 1950]; the collagen from the specimen is therefore analytically indistinguishable from modern collagen, at
least with respect to $^{14}$C activity. Age adjustment for $^{13}$C/$^{12}$C fractionation yielded an estimate of $70 \pm 70$ $^{14}$C (4.3 C adj B.P. which is statistically indistinguishable from the raw result at the 1 S.D. level (68% probability). The calibrated calendrical age range—cal A.D. 1670 to “present”—represents the 2 S.D. envelope (95% confidence level) around the $^{13}$C-adjusted radiocarbon age (cf. Talma & Vogel, 1993). The apparently wide width of the 2 S.D. envelope is due to the fact that the calibration curve is non-linear, so that single $^{14}$C B.P. dates sometimes correspond to more than one calendrical date (see Figure 2). It is conventional to combine such multiple “intercepts” and report the calibrated result as a single range (cf. Talma & Vogel, 1993).

This information indicates that there is an overwhelming probability that the canine tooth root from the Ateles anthropomorphus hypodigm is less than three centuries old. The implications of this determination are as follows:

1. Assuming that the other teeth in the hypodigm would provide a similar analytic result, we can reject the hypothesis that the specimens comprising the holotype of Ateles anthropomorphus came from a pre-Columbian monkey. This also means that the context dates for Boca del Puriel (1900 ± 40 B.P. by the collagen method and 3060 ± 180 $^{14}$C B.P. by conventional radiocarbon analysis) have no bearing on the antiquity of the monkey sample, whatever their possible archaeological significance. Instead, it now seems virtually certain that the monkey in question lived long after the appearance of the Spanish in the New World, and possibly as recently as the 19th Century.

2. It is completely improbable that naturalists of the calibre of Alexander von Humboldt, Felipe Poey and Ramón de la Sagra would have missed the existence of a population of naturally occurring, large-bodied anthropoids, had there actually been one extant during the period of European occupation. By contrast, it seems to us not at all unlikely that an imported
monkey could have escaped its captors, because this has happened before in the West Indies (Steane, 1707/1725; Hughes, 1750; Denham, 1897).

3. Although the Boca del Surial individual is large for *Ateles fusciceps*, as Miller (1916) noted it is not so large as to necessitate the conclusion that it represents something different. Its placement in *fusciceps* accords with the majority view and is here accepted.

Why should it matter very much whether or not *Ateles "anthropomorphus"* was an endemic Cuban primate? Tidy taxonomic bookkeeping is one imperative, but a more fundamental one concerns historical biogeography. Thanks to fossil discoveries in Cuba and Puerto Rico in recent years (MacPhee & Iturralde-Vincent, 1994, 1995a,b), it is now beyond doubt that land mammals—including platyrhines—were in the Greater Antilles by the end of the Paleogene, perhaps as early as the Eocene-Oligocene boundary. New evidence makes it increasingly probable that these faunal infusions were linked in time and space, i.e. there may have been a single, probably very narrowly-constrained period during which the ancestors of the taxa concerned were able to reach the islands. In the past, the Cuban spider monkey represented a potential problem for this interpretation, primarily because its similarity to extant spider monkeys implied the possibility of a separate and much more recent dispersal. Because every "fact" of history describes a unique event, there are no tests, other than consistencies among the facts themselves, which permit us to favour one historical explanation over another. It is therefore just as important to be able to defeat possible counterexamples to a preferred explanation as it is to provide new instantiations. We now have a few good reasons for inferring that the mammalian colonizations of the Greater Antilles were due to a common cause (MacPhee & Iturralde-Vincent, 1995a,b). With the removal of *Ateles "anthropomorphus"* from biogeographic scenarios, there is now one reason fewer to support the alternative view that the Antillean colonizations were causally and temporally unrelated, as has been argued recently for some other kinds of land vertebrates (Hedges et al., 1992).

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References


Rivero de la Calle, M. (no date). Estudio antropológico de la colección de materiales del Priaal, provincia de Sancti Spiritus, que se conservan en el Museo Antropológico Montané (ms. on file in Museo Antropológo Montané, Facultad de Biología, Universidad de La Habana).


