

## Hair in Dominican amber: Evidence for tertiary land mammals in the Antilles

G. O. Poinar Jr

Department of Entomological Sciences, University of California, Berkeley (California 94720, USA), 28 September 1987

**Summary.** A piece of amber from the Dominican Republic contained approximately 50 strands of mammalian hair. Based on its characteristics and the identification of two species of fossilized ectoparasites that were also present, it is probable that the hair belonged to a rodent. This find represents the earliest fossil remains of land mammals in the Antilles and lends support to the vicariance model of West Indian biogeography.

**Key words.** Fossil hair; amber; Dominican Republic; fossil ectoparasites; West Indian biogeography.

Chemical and physical tests performed on the amber piece verified that it was authentic<sup>1</sup>. The amber had been collected from mines located between Santiago and Puerto Plata in the Cordillera Septentrional. These mines are located in the Altamira facies of the El Mamey formation, a shale-sandstone interspersed with a conglomerate of well-rounded pebbles which has been assigned to the upper Eocene<sup>2</sup>. Earlier dating of amber from the Palo Alto mine in the Cordillera Septentrional based on an analysis of foraminifera counts suggested a lower Miocene age<sup>3</sup>. Thus, sedimentary and geological evidence indicate a range of lower Miocene to upper Eocene for the amber mines in the Cordillera Septentrional.

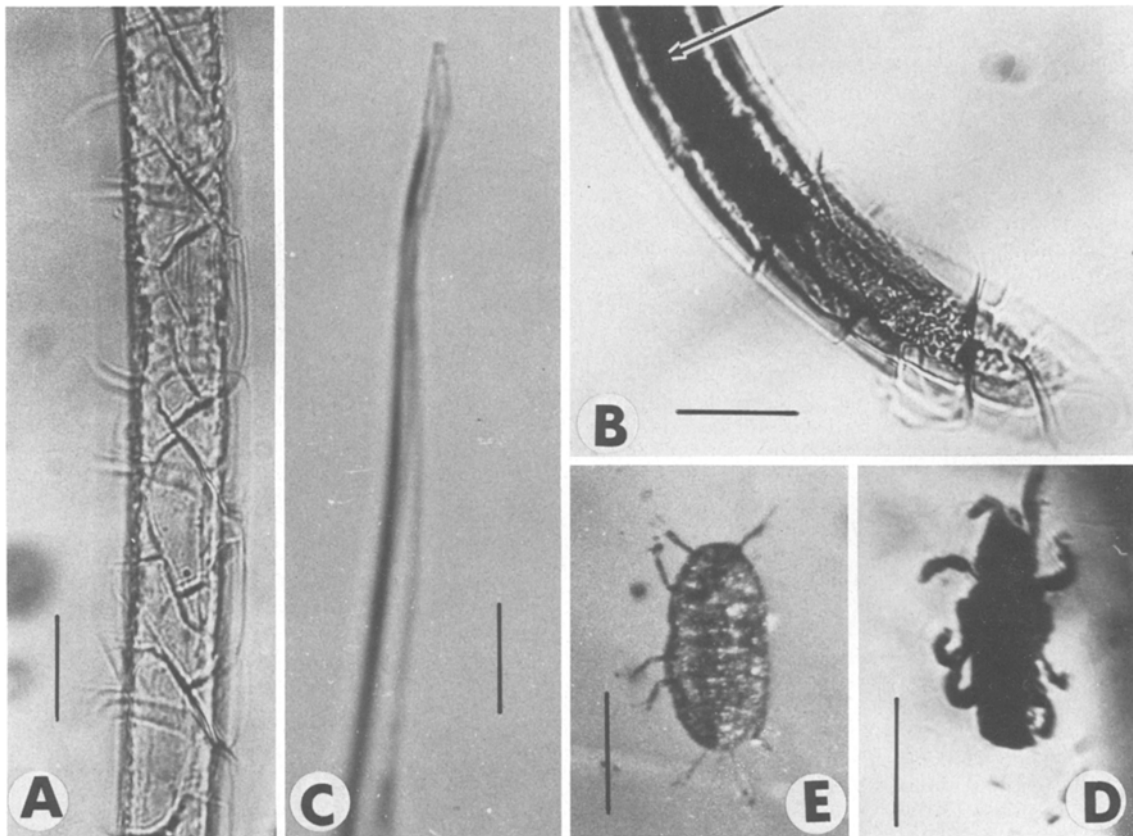
The hairs contained in the studied piece ranged from 10 to 30 mm in length and fell into two width categories, one ranging from 13 to 17  $\mu\text{m}$ , the other from 25 to 32  $\mu\text{m}$  in diameter. The cuticle had deteriorated and it was not possible to detect any scale pattern. Cracks on the cuticle were similar to those observed on human hair exposed to the environment for 1–2 years (fig., A)<sup>4</sup>. The medulla, when visible, was unbroken and occupied 44–80% of the shaft diameter (fig., B).

Normal mammalian hair tips and roots were observed (figs., B and C).

The above-mentioned characters are not distinctive enough to place the hair in any mammalian order; however, two species of ectoparasites were associated with the hair. Two specimens of fur mites were identified with the family Listrophoridae (fig., D), and two staphylinoid beetle larvae (fig., E) were also present. Listrophorid fur mites are permanently attached to mammalian hairs and the majority of present-day species occur on rodents<sup>5</sup>. The Staphylinidae contain representatives which occur as larvae on the fur of mammals with the great majority of present day species on rodents<sup>6</sup>.

On the basis of hair size and knowledge of contemporary hosts of the two ectoparasites, the hair probably belonged to a member of the order Rodentia.

It is not known when terrestrial mammals first colonized the Antilles but all known fossil remains date from 100,000 BP or later<sup>7</sup>. Thus this report represents the earliest fossil remains of land mammals in the Antilles.



A Deterioration cracks on fossil hair cuticle (bar = 30  $\mu\text{m}$ ); B Fossil hair root (bar = 30  $\mu\text{m}$ ) (arrow = medulla); C Fossil hair tip (bar = 30  $\mu\text{m}$ );

D Listrophorid mite (bar = 60  $\mu\text{m}$ ); E Staphylinoid larva (bar = 170  $\mu\text{m}$ ).

Two principal models have been proposed to account for the present faunal distribution in the West Indies. The vicariance model proposes that the distribution of present-day biota in the Antilles is the result of a 'Proto-Antillean archipelago' located between North and South America which was colonized by ancestors of the recent fauna in the Late Cretaceous or Early Tertiary<sup>8</sup>. The more traditional dispersal model proposes that the islands were colonized recently from the mainland<sup>9</sup>.

If the Caribbean Islands had reached their modern position and configuration by the Miocene<sup>10</sup> and Dominican amber from the Cordillera Septentrional dates from the lower Miocene to the upper Eocene, then the present find suggests that some mammals were already established on the islands before the latter reached their recent position, lending support to the vicariance model of West Indian biogeography.

1 Poinar, G. O. Jr., *Gems and Minerals* 534 (1982) 80.

2 Eberle, W., Hirdes, W., Muff, R., and Pelaez, M., in: *Proceedings of the Ninth Caribbean Geological Conference*, p. 619. Santo Domingo (August 1980).

3 Baroni-Urbani, C., and Saunders, J. B., in: *Proceedings of the Ninth Caribbean Geological Conference*, p. 213. Santo Domingo (August 1980).

4 Lasko, P., in: *Handbook of Forensic Archaeology and Anthropology*, p. B.1. Eds D. Morse, J. Duncan and J. Stoutamire. Florida State University Foundation, Tallahassee 1983.

5 Fain, A., and Hyland, K. E. Jr., in: *Coevolution of Parasitic Arthropods and Mammals*, p. 641. Ed. K. C. Kim. John Wiley & Sons, New York 1985.

6 Kim, K. C., and Adler, P. H., in: *Coevolution of Parasitic Arthropods and Mammals*, p. 157. Ed. K. C. Kim. John Wiley & Sons, New York 1985.

7 Morgan, G. S., and Woods, C. A., *Biol. J. Linn. Soc.* 28 (1986) 167.

8 Rosen, D. E., *Syst. Zool.* 24 (1975) 431.

9 Buskirk, R. E., *J. Biogeogr.* 12 (1985) 445.

10 Donnelly, T., in: *The Great American Biotic Interchange*, p. 89. Eds F. G. Stehli and S. D. Webb. Plenum, New York 1985.

0014-4754/88/010088-02\$1.50 + 0.20/0

© Birkhäuser Verlag Basel, 1988

## Scientists declaration organised by Friends of the Earth (UK) and presented to the meeting of The International Commission on Radiological Protection held in Como (Italy), September 8–17th 1987

We the undersigned, are concerned by the current International Commission on Radiology Protection's evaluation of the risks to "man" from exposure to ionising radiation. We call upon the members of the International Commission on Radiological Protection (ICRP) to consider the following areas of concern:

1) Recent data, from studies of the Atomic Bomb Survivors and of occupationally exposed radiation workers, indicate that the current International Commission on Radiological Protection risk estimates for fatal cancer underestimate the true risk from exposure to ionising radiation by between 2 and 5 times.

2) The current system of radiological protection recommended by the International Commission on Radiological Protection pays insufficient attention to the risks of inducing a non-fatal cancer in an exposed person. These risks may be up to ten times greater than the current International Commission on Radiological Protection's fatal cancer risk estimate (The International Commission on Radiological Protection does not give a risk estimate for non-fatal cancer in their 'Publication 26').

3) We therefore believe that the International Commission on Radiological Protection's recommended dose limits for radiation workers are too high. An immediate five-fold reduction would seem imperative, with a target of ten-fold reduction within a reasonable period of time.

4) The introduction of "Organ Weighting Factors" in the 'International Commission on Radiological Protection Pub-

lication 26' allowed substantial increases in individual organ exposure. Organ specific dose limits should be introduced which reflect the five-fold reduction in the whole body dose limit and which pay proper attention to the risk of non-fatal cancer.

5) The risk of inducing a cancer in the gonads should be included in the effective dose-equivalent concept, but genetic risks should be considered separately. Data within reports by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and the United States National Academy of Sciences Committee on the Biological Effects of Ionising Radiation (BEIR III) suggests that the genetic risk to all generations may be 5 to 10 times greater than the risk estimate given in the 'International Commission on Radiological Protection Publication 26'. The weighting factor currently used for the gonads ignores the cancer risk and underestimates the genetic risk.

6) There are particular reasons to be concerned by the risk to the fetus from exposure to ionising radiation. In particular it is now known that exposure to ionising radiation during pregnancy, particularly from weeks 8–15, is associated with mental retardation in the offspring, and that this effect may be without threshold. In addition, some studies of exposure to diagnostic radiation during pregnancy indicate that the doubling dose for childhood cancer may be less than 10 mSv (1 rem). Although the epidemiological data shows inconsistencies, it is clear that recommendations should err on the side of caution. We believe that the recommendations relating to women workers who may be of "child-bearing age" or who have diagnosed pregnancies are insufficient.