



Charles Darwin *In Memoriam*

Evolutionary looks at the why of biological and cultural phenomena.

Why are there no onychophorans in Cuba?

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ABSTRACT: I propose here that there are no onychophorans in Cuba because the predominant marine currents - which could bring onychophorans from the Southern lands - mainly reach Jamaica and Hispaniola (island that contains Haiti and the Dominican Republic). I present five new predictions about the dispersal history of Caribbean species that, hopefully, will inspire new generations of geneticists to test them.

KEYWORDS: biogeography, velvet worms, living fossils, marine currents.

Velvet worms are also called onychophorans and “peripatus”. One of the great mysteries of velvet worm biogeography is why they have never been found in Cuba. Here I propose five hypotheses to explain this absence in Cuba and presence in the rest of the Caribbean.

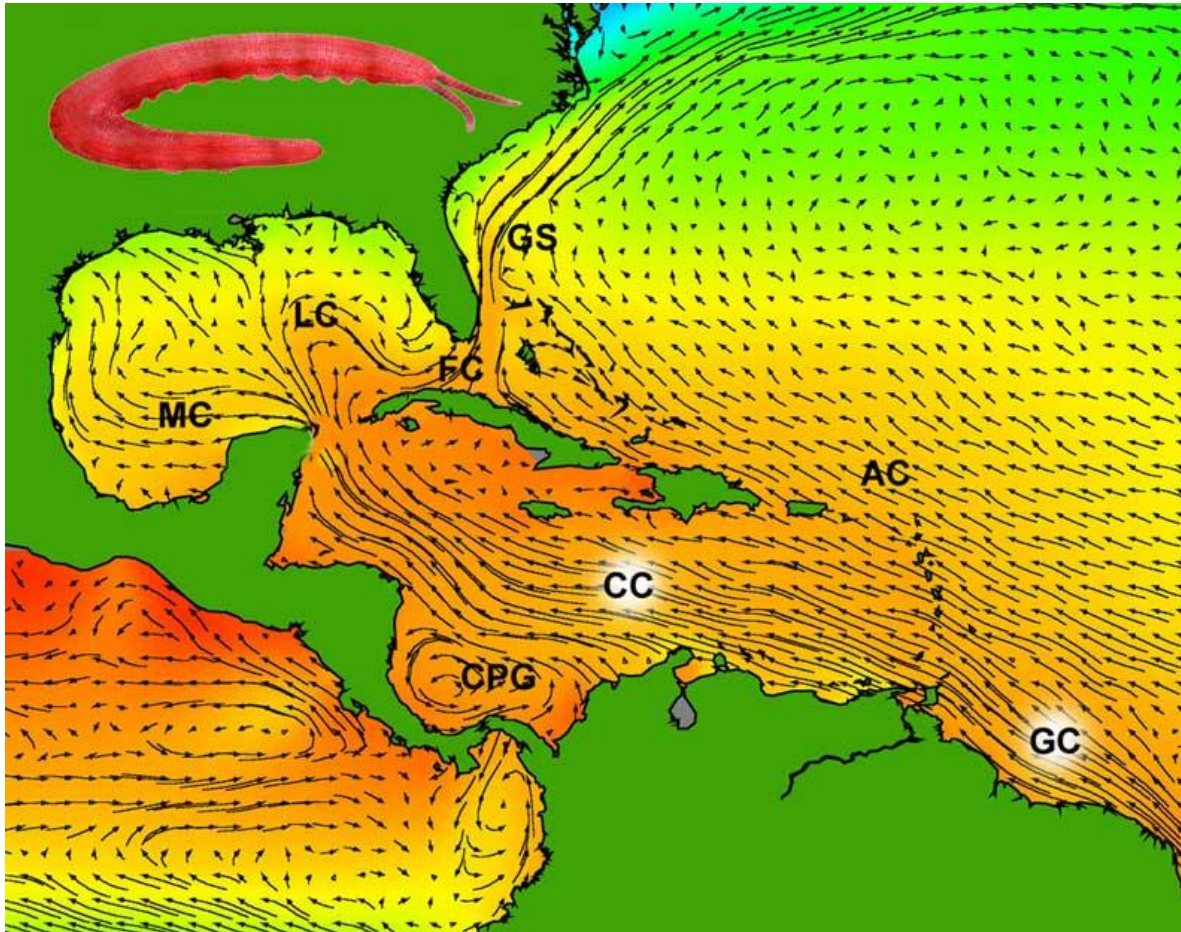
[Velvet worms](#) occur in Jamaica, Haiti and the Dominican Republic. From there the populations of these "living fossils" form an almost continuous arc through the rosary of small islands that form the Lesser Antilles, all the way to Trinidad, on the Venezuelan coast.



In 1995 I mentioned that, some 87 million years ago, the islands of the Caribbean had been located where Central America is today, forming an arc between Colombia and Mexico. Maybe, when Cuba was close to other lands, they still lacked onychophorans¹. I am assuming that onychophorans have never occurred in Cuba.

My article ended by saying that if Jamaica's onychophorans were less than 20 million years old, as suggested by their genetics, it was more likely that a good part of the onychophorans fauna of the Antilles would have gradually colonized the Caribbean arch from South America. They might travel in rafts of floating vegetation that reach the sea and originate in large rivers such as the Amazon, as [Henry Walter Bates](#) proposed for other species in the 19th century. At that time I invited geneticists to use DNA sequencing to understand the distribution of Caribbean onychophorans.

A quarter of a century has passed and now there are other technologies. A few days ago, looking at the marine currents, which have basically been the same since the Pleistocene, I realized that the prevailing currents do not favor the onychophoran arrival in Cuba from the nearest onychophorans sources, which are Haiti and Jamaica.



So, for the moment, the answer to the big question is that there are no onychophorans in Cuba because the *predominant* marine currents - which can bring onychophorans from the southern lands – mainly reach Jamaica and Hispaniola (the island that contains Haiti and the Dominican Republic).

But the currents tell us much more, and here I present five new predictions about the origin of Caribbean onychophorans that, I hope, will inspire new generations of geneticists to test them:

1. If South American onychophorans reached the Caribbean coasts of Costa Rica and Panama by sea, they probably came from the Magdalena River basin in Colombia.
2. The onychophorans of the Lesser Antilles and Puerto Rico, must come from Brazil, thanks to the powerful currents originating in the Amazon, Xingú and Parnaíba rivers.
3. Contrary to expectations, Jamaican onychophorans are more likely to come from Venezuela, courtesy of the Orinoco River.
4. Haiti and the Dominican Republic, meanwhile, are well placed to receive onychophorans from both Venezuela and Brazil.
5. The huge *Macroperipatus torquatus*, from the island of Trinidad, does not need this model of marine rafts, because the island of Trinidad was, during the Pleistocene, a peninsula of Venezuela, and it is most likely that the onychophorans from Trinidad arrived by land before the last ice melting about 10,000 years ago.



It is likely that the biogeographic history of the onychophorans bears some resemblance to the history of the spider mites *Deinopis*, recently studied by L. Chamberland and collaborators, who found that it combines terrestrial colonization of the continents from the time of [Pangea](#), and recent colonization of the islands by sea². For the Caribbean, the idea of the land bridge is obsolete, and to celebrate the first 100 years of the pioneering study by William Diller Matthew, paleontologist of the American Museum of Natural History ([AMNH](#)), I want to honor his vision. He said that if Cuba had been connected to the continent by land, it would not have that impoverished fauna, typical of oceanic islands. On pages 180 to 181, after weighing each hypothesis against the fossil and current evidence, he concludes: “The only explanation that seems to me conformant with all the data, physiographic, geologic and faunal, is that the islands have been populated by colonization through storms and ocean drift without land connection with the continents, but aided by extension of the land areas to or near the borders of the continental shelf in the Pliocene and Pleistocene, and perhaps by some further connections between the greater Antilles”³.

Thanks to my wife, Zaidett Barrientos, and my colleagues Pablo Barquero and Bernal Morera, for their fascinating conversations on this subject.

Images

A Nicaraguan species of onychophoran, still undescribed. Photograph by Julián Monge-Nájera.

Marine currents in the Caribbean. Map by the [Smithsonian Tropical Research Institute](#); onychophoran painting by Julián Monge-Nájera.

Potential areas of influence of vegetation rafts from the Magdalena (1), Orinoco (2) and Amazon (3) rivers. Image by Julián Monge-Nájera.

REFERENCES

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²Chamberland, L., et al. (2018). From Gondwana to GAAR land: Evolutionary history and biogeography of ogre-faced spiders (Deinopis). *Journal of Biogeography*, 45(11), 2442-2457.

³Matthew, W. D. (1919). Recent discoveries of fossil vertebrates in the West Indies and their bearing on the origin of the Antillean fauna. *Proceedings of the American Philosophical Society*, 58(3), 161-181.

NOTE: this article was originally published in Spanish [here](#).



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