Biogeography and extinction of new world passerines: evidence from Pleistocene fossils

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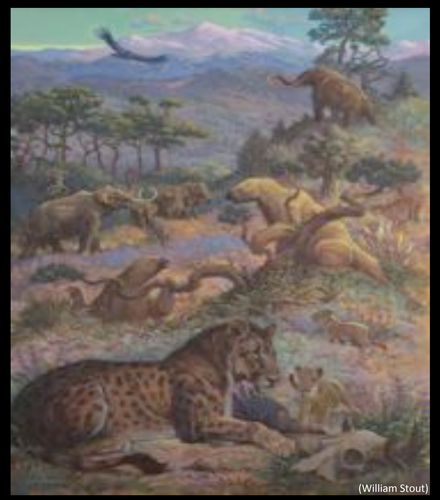
Introduction

- Today the Neotropics (tropical Central and South America) are home to the highest biodiversity in the world. Most of vertebrate diversity is made up of small vertebrates e.g. rodents, lizards, passerines (songbirds).
- The 22 glacial-interglacial intervals over the past ca. 2.5 million years have been implicated as major drivers of modern biodiversity (speciation and extinction).
- Despite extreme variation in climatic conditions over this time it was only at the last transition to the modern interglacial at the end of the Pleistocene, ca. 12,000 years ago, that a major mass extinction occurred.
- It was at this time that humans became widespread and established in the Americas.

Across the Americas this extinction event resulted in a loss of:

- 50 genera of megammammals:

- 14 genera of large birds species, e.g. vultures, eagles, ducks, flamingos



How were small vertebrates affected by the loss of the megamammals and the causes of megamammal extinction? Because small vertebrates are sensitive to perturbations, we would *predict* that extinction and range shifts would be prevalent in these groups. However, North American rodent and lizard fossils indicate they responded only by shifting ranges and their local abundance. Four extinct species of passerines within the famiLty Icteridae (blackbirds) *Pyelorhamphus molothroides*[1], *Pandanaris convexa*[2], *Euphagus magnirostris*[3], *Cremaster tytthus*[4] have been discovered in the Southern United States.

It is unknown from fossil evidence how the modern biodiversity of Neotropical passerines and ranges were affected by the megamammal extinctions and the causes of those megamammal extinctions 12,000 years ago.

We investigated this by identifying the first late Pleistocene passerine fossils from the Neotropics and from a site in Northern Mexico

Methods

With modern skeletons we used comparative osteology (Figure 1a) to identify songbird fossils from three late Pleistocene fossil sites (Fig. 1b).

1a.Mandibles of cowbirds from four species. Characters that can be used for species-level identification are circled on the right most mandible.

1b. Location of the Passerine fossil sites under study.

Results (Table below)

1. Range contractions are evident in a large number of species
2. Species of Icteridae dominate all three fossil sites.
3. Extinct species were discovered in all three sites
4. First evidence that migratory North American passerines migrated to South America during last glacial maximum
5. Evidence that modern aridity in parts of northern Mexico and N.W. Peru is a recent phenomena

Locality (see Fig. 1)	Modern Habitat	Late Pleistocene habit based on species identified	Number of identifiable Passerine fossils	Number of extinct species	Number of extant Species	Notable findings
Térapa, Sonora, Mexico	Thornscrub	Marsh	27	1: *Pandanaris convexa*	7	• All species indicate a marshy habitat at the now semi-arid site. • The most common species identified is the extinct large cowbird (Icteridae) *Pandanaris convexa*, represented by nine fossils
Inciarte, Venezuela	Semideciduous forest	Semideciduous forest	22	1: *Euphagus magnirostris*	16	• Discovery of three North American migratory species: Gray Kingbird, Cliff Swallow, and Orchard Oriole • The Amazonian species Oriole Blackbird had a wider distribution • Discovery of the extinct blackbird *Euphagus magnirostris* extends its historical range 5,300 km to the south.
Talara, Peru	Desert	Savanna, gallery forest, semideciduous forest, arid scrub	800	1: *Euphagus magnirostris*	17	• A large number of species e.g. Streaked Saltator, Troupial, Peruvian Meadowlark, and Shiny Cowbird indicate range shifts and loss of savanna and forest at the site • Discovery of the extinct blackbird *Euphagus magnirostris* indicates that it was wide ranging in South America

Conclusions

The Neotropics, a region with the highest biodiversity in the world, was even more diverse in the recent past, during the late Pleistocene, compared to today.

In contrast to other small vertebrates, passerines suffered extinction at the end of the Pleistocene. They also experienced range contractions. This is particularly evident in blackbirds.

Climate change and trophic cascades may have resulted in the extinction of blackbird species.

The prevalence of savanna, dry forest, and marsh habitats during the late Pleistocene may have been favorable to these species; most of these habitats are absent at these sites today.

Many extant blackbird species are found in association with modern analogs of megamammals e.g. cows, horses, so the loss of Pleistocene megamammals may have resulted in the extinction of *Pandanaris convexa* and *Euphagus magnirostris*

Literature cited

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