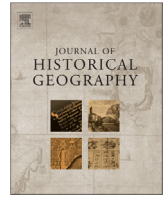


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Particularizing the Columbian exchange: Old World biota to Peru



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Abstract

The sixteenth-century transfer and establishment of plants and animals from Spain to Peru represents one segment of the Columbian exchange that transformed landscapes, diets, economies, and demographic profiles in the New World. Despite the importance of this historic movement, scholars have revealed few details of the how, when, where and why the organisms first transfer to, and then, in a separate process, their successful establishment in Western South America. Specifics are covered for the transfer and establishment of seven domesticates (wheat, broad bean, grapevine, banana, sheep, chicken, and honeybee), one commensal species, the black rat, and the epizootic pathogen *Plasmodium*. Focusing on these two processes to the Central Andean realm checks the temptation to overgeneralize transoceanic movement and adoption involving motley elements, discrepant pathways and dissimilar destinations. Harvesting particularized information acknowledges the complexity of the Columbian exchange, the evidence for which goes beyond archival documents. Most organisms came to Peru by way of the Panamanian Isthmus following a route that involved two ship voyages separated by a land crossing made on flatboat and/or mule carriage. Four of the nine items were most probably picked up in intermediate locations where Spaniards had settled or from where slaves were taken. Once in Peru, plants and animals underwent a decades-long process of acceptance that for most organisms had concluded by 1575. In both processes of transfer and introduction, the documentary record is vastly incomplete. To advance inquiry on this topic, the article proposes for each plant and animal retrieval of complementary knowledge and suppositions about the organisms, places, cultures and journeys that combine with the documentary record.

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Introduction

The movement of plants and animals between the Old and New Worlds has had enduring effects, but the detailed and difficult questions about the Columbian exchange have scarcely been asked and certainly not answered. Whether an organism succeeded is easy enough to determine after the fact, but the specific processes of biotic transfers and their patterns of acceptance remain largely unexamined.¹ An understanding of the intercontinental biotic movements primarily in the sixteenth century requires elucidating the routes taken, the time of transfer, and the biological, ecological, cultural and economic factors that allowed some plants and animals to become introductions and others not.

Alfred Crosby's much-cited study broke new ground in its broad conceptualization of the Atlantic exchange as a two-way process. However, Crosby's work did not provide information about timing, direction of movement of specific biotic material or the difference between intent and success.² In Crosby's account, only the destination, not the journey, mattered. That transfer may or may not have succeeded or may or may not have led to introduction, that is, acceptance and reproduction, should be part of the exchange narrative. How a successful transfer becomes a bona fide introduction poses a distinct question in the diffusion puzzle. Part of the transfer did not involve human volition even though human action was involved. The movement and expansion of commensals, adventives and pathogens were inadvertent and their numbers far surpassed any human effort to control them. The temptation to

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¹ A.W. Crosby, *The Columbian Exchange: Biological and Cultural Consequences of 1492*, Westport, CT, 1972; 2003; N. Nunn and N. Ian, The Columbian exchange: a history of disease, food and ideas, *Journal of Economic Perspectives* 24 (2010) 163–188; J.A.G. Robertson, Some notes on the transfer by Spain of plants and animals to its colonies overseas, *The James Sprunt Historical Studies* 19 (1931) 7–21; H.J. Viola and C. Margolis (Eds), *Seeds of Change*, Washington, 1991; D. Brothwell, On biological exchanges between the two worlds, *Proceedings of the British Academy* 81 (1993) 233–246.

² Contrary to Radkau's assertion, Crosby did not "prove the transfer of many individual species and the part this played in the displacement of autochthonous species." [J. Radkau, *Nature and Power: A Global History of the Environment*. (Trans.) T. Dunlap. Washington-New York, 2008, 158]. From 300 to 400 years earlier, colonial Spanish chroniclers had documented those introductions, which Crosby used mainly in English translation.

view the Columbian exchange as a form of ‘ecological imperialism’ or, more extremely, as biological determinism, is lessened when all of the biotic movement included in the Columbian exchange is assessed in terms of human agency.³ As Sureka Davies stated, ‘... understanding of human agency and historical contingency slips through Crosby’s fingers like so many grains of sand.’⁴

J.R. McNeill posited the Columbian exchange as one of the six major turning points in environmental history.⁵ Considering its importance, remarkably few details are actually known about the Columbian exchange. Intimidating gaps in the historical record of the sixteenth century hinder the reconstruction of how, when and where biotic organisms were moved or established. Much of what is known comes from the published colonial chronicles, not unpublished archival documents.⁶ Substantiation of the twinned processes that start with diffusion and end with adoption cannot rely exclusively, or in some cases even primarily, on this elusive documentary trail. Information about plants, animals and diseases is never recorded with the same detail as that of people and precious metals. However crucial they were in establishing Spanish life in the New World, seeds and live beasts were in many cases not deemed worthy of mention. Few colonists of farming background, much less African slaves, had the ability to write their experiences or personal inventories.

Sparse documentary evidence requires the use of other kinds of information if one is to better understand the compelling story of biotic transfer and establishment. The behavior and tolerances of biological organisms can sometimes account for the difficulties of movement and the failure of the organisms to gain acceptance. Although the historian Collingwood argued that knowledge of nature is not history, that knowledge is often relevant to the human experience as it relates to the Columbian exchange.⁷ Molecular genetic analysis provides the possibility of identifying the immediate and ultimate origins of an introduced organism.⁸ An understanding of both the donor and recipient cultures, and the donor and recipient regions, gives insight into how and why a plant or animal was accepted or not.

Different plants and animals followed different oceanic trajectories. Therefore biotic exchange is most appropriately analyzed in discrete regional segments and in one direction at a time. Seven major donor/recipient pairs of regions can be identified; the donor was the source of people, plants and animals and the recipient accepted them. These historical-geographical dyads, based on their importance as sources of biotic material, are as follows: Spain/Mexico, Spain/Peru, Spain/Chile, Spain/Rio de la Plata, Portugal/Brazilian Coast, and Africa/Northeast Brazil. This paper emphasizes biotic elements sent to Peru from Spain and, more peripherally, from West Africa. As a colonial destination Peru stands out for its images of wealth, its temperate environments that shared certain similarities with the Iberian homeland, and the difficulty of reaching it from the eastern Atlantic shore. It was a two-way flow, for the conquerors also moved a number of Andean

elements in the opposite direction. It is the Spanish and African flow to Peru and its impact on Peru on which this narrative focuses. The flow of biota to Peru had a historical geography different from elsewhere in the New World. Beginning three decades after the death of Columbus meant that a colonization protocol had more or less been worked out. But, compared to the Caribbean or even Mexico, the journey was excruciatingly long and difficult. Peru represented a notable insertion into a densely populated land of indigenous civilization, but one that, unlike Mexico, had before the Conquest been incorporated into just one polity, the Inca Empire.

The biotic transfer process: Old World to Peru

The stage was set for the transfer and introduction of Old World plants and animals to Peru four decades before the Conquest of 1532. In that period of colonization of the Indies since Columbus, Spaniards gained knowledge and experience that was then applied to colonizing Peru, which has a sharply differentiated configuration of coast and highland that corresponds to climatic differences. Within the highlands, each valley holds numerous thermal environments. On the eve of the Spanish invasion, Peru had achieved a productive, sustainable agriculture based on a wide inventory of crops and several domesticated animals. Irrigation had been developed to a fine art well beyond what was known in Europe. The native people of the Central Andes had an unusually strong attachment to their material culture that to a considerable extent survives up to the present.⁹

Direct overseas transfer of people and organisms from Spain and other parts of the Atlantic world to Peru involved a three-step movement. Vessels sailed from Spain to the Panamanian Isthmus. A water and land trip across that strip conveyed people and goods to the Pacific port of Panama. From there, ships made the third leg to the port of Callao far to the south. Successful biotic transfer had to surmount the challenges of the sheer length of the voyage, movement across a hot, humid and hostile strip of land, and a second sea voyage. In that sea-to-land-to-sea-to-land trajectory, seeds, cuttings, and live animals confronted cramped conditions, environments unfavorable to survival, predation and theft. Those transfers are better appreciated and understood by examining how, when and where biotic elements arrived in Peru.

The sea voyage of biota and their human carriers

Between 1530 and 1560, the small size of sailing ships headed for Peru restricted the diversity and quantity of transported objects. Caravels, weighing between 80 and 200 tons with rounded hulls and lateen sails on the mizzen, carried approximately 60 passengers and 15 crew members.¹⁰ A larger three-mast vessel, the nao, had room for about 100 paying passengers and 20 crew members. Having more cargo space than the caravels, the nao was preferred

³ A.W. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900–1900*, New York, 1986.

⁴ S. Davies, Agency and awareness in cross-cultural encounters, *Terrae Incognitae* 24 (2001) 6.

⁵ J.R. McNeill, The first hundred thousand years, in: F. Uekoetter (Ed), *The Turning Points of Environmental History*, Pittsburgh, 2010, 13–28.

⁶ Though useful for contextual purposes, my searches in the two most relevant repositories, the Archivo General de Indias (AGI) in Seville and the Archivo General de la Nación (AGN) in Lima yielded little documentation on the movement of biota from Spain to Peru in the sixteenth century. Partly for that reason, the monumental eight-volume work of P. Chaunu and H. Chaunu, *Séville et l’Atlantique, 1504–1650*, Paris, 1955–1959, is largely silent on the question of biotic transfers. The void is also suggested by a work focused on food in Peru in the early colonial period. J.C. Super, *Food, Conquest and Colonization in Sixteenth-Century Spanish America*, Albuquerque, 1988, made no reference to transfer or introduction of the crops and animals discussed.

⁷ R.G. Collingwood, *The Idea of History*, rev. ed. J. Van der Dussen (Ed), Oxford, 1993.

⁸ A recent demonstration of the possibilities of this kind of molecular approach was the genetic research that not only identified African rice as an independent domestication, but also localized its place of domestication along the Niger River. See M. Wang et al., The genome sequence of African rice (*Oryza glaberrima*) and evidence for independent domestication, *Nature Genetics* 46 (2014) 982–988.

⁹ D.W. Gade, Landscape, system, and identity in the Post-Conquest Andes, *Annals of the Association of American Geographers* 82 (1992) 461–477.

¹⁰ C.H. Haring, *Trade and Navigation between Spain and the Indies in the Time of the Hapsburgs*, Cambridge, MA, 1918.

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