East Polynesia colonized faster and more recently than previously thought

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New research by an international team of scholars shows early human colonization of Eastern Polynesia took place much faster and more recently than previously established.

The team of scholars describe their discoveries in a December 27 Proceedings of the National Academy of Sciences *Early Edition* article titled "High-precision radiocarbon dating shows recent and rapid colonization of East Polynesia." The study is co-authored by UH M?noa professor of anthropology and director of the UH M?noa Honors Program, Terry Hunt; team leader and paleoecologist Janet Wilmshurst of Landcare Research in Lincoln, New Zealand; Carl Lipo, associate professor of anthropology at California State University, Long Beach; and Atholl Anderson, professor of prehistory, archaeology and natural history at Australia National University's College of Asia and the Pacific in Canberra.

The study was based on an analysis of the validity of more than 1,400 radiocarbon dates from 47 islands in the region collected from their own and other researchers' published studies.

Polynesian ancestors settled in Samoa around 800 B.C., then much later moved to colonize the region in two distinct phases-earliest in the central Society Islands between A.D. 1025 and 1120, four centuries later than previously assumed. Then, between 70 and 265 years later, dispersal continued in one major 'pulse' to all remaining islands including New Zealand, Hawai`i and Easter Island (Rapa Nui) between A.D. 1190 and 1290. The timing and sequence of this remarkable event has been highly debated and poorly resolved, precluding the understanding of cultural and ecological change that followed.

"This is an amazing feat of Polynesian sea voyaging and discovery, and represents a rate of dispersal unprecedented in oceanic prehistory," Wilmshurst said. "It's even more incredible given that these isolated islands are spread across a vast area of the Pacific Ocean from the subtropics to the sub-Antarctics. Nearly all of the 500 or so islands were discovered, despite being scattered across an area of ocean the size of North America." The team noted that the voyagers probably benefited from improved canoes and sailing vessels as well as favorable winds resulting from frequent El Niño weather conditions.

Over the last decade, Hunt, joined by Lipo, has done extensive field research on Rapa Nui (Easter Island), where their work revealed that the timeframe of its earliest colonization was similar to New Zealand, which had been studied in depth by Wilmshurst and Anderson. The four researchers met in Hawai`i last spring to collaborate on this new study.

The study sorted all radiocarbon-dated materials into sample categories of short-lived plant remains such as seeds or small twigs, unidentified wood charcoal, bone and marine shells, which Hunt said are the least likely sample materials to suffer from dates being erroneously too old from what scientists call "in-built age problems." Newer radiocarbon dating equipment and techniques also contribute to greater accuracy.

"An example of a most reliable sample would be something like a rat-gnawed seed," Hunt said. "It's not just the seed, because the seed could fall off the tree and often be preserved well in caves for hundreds of years. But we know that rats came with Polynesian colonists and rats love seeds, so such gnawing on seeds is a sure sign of human arrival.

"This study recognizes that we can't just accept dates for just whatever they are; we have to link them to what's being dated and the actual human event," he continued. "That's true, say, for a piece of wood charcoal. You can date the charcoal, but the question is when did the wood actually die? If

ancient Polynesians used wood from an old tree, or worse, driftwood, the age would be centuries too old. It matters because of the big difference in age. When you want to know when people arrived on an island, you have to be careful what materials you choose to date."

As a result, the team developed a model that better predicts a more accurate time span that can be applied to radiocarbon dating elsewhere in the world.

The new research now provides an updated timeline and sequence for the region's colonization, and means existing models of human colonization, ecological change and historical linguistics for the region now require substantial revision. "The work resolves longstanding paradoxes and offers a robust explanation for the remarkable uniformity of East Polynesian culture, human biology and language," said Wilmshurst.

Anderson said the team chose an objective 'top-down' approach to evaluate the entire archaeological radiocarbon database for East Polynesia as a single entity. "This allowed all radiocarbon dates, irrespective of their context within an archaeological deposit, to be categorized according to their reliability to provide an accurate and precise age for initial colonization on each island," he said.

"Unidentified charcoal, bones and marine shell contain a substantial risk of error associated with them which can make the age of the sample appear older than it really is. These are the very materials commonly used by some researchers to date the age of an archaeological site and to support longer, but unreliable chronologies," said Hunt.

Anderson added that, "As the probability of just one type of sample material providing only younger radiocarbon dates is low, our new results are robust and objective. It has been nearly 20 years since the last appraisal of the timing and pattern of initial human colonization in east Polynesia. Now we have more than 10 times the number of radiocarbon dates available to us, and from a larger number of islands, so the time was ripe for a new and rigorous, systematic analysis."

Hunt said the remarkable similarities in artifacts documented in the "archaic East Polynesian" assemblages of the Societies, Marquesas, New Zealand, and other islands reflect the same related forms, such as in fishhooks, adzes and ornaments, with late and rapid dispersals over the region.

Hunt said linguistic similarity, often used to trace relationships of populations in East Polynesia according to a longstanding model of relatively slow, incremental expansion now needs to be reconsidered.

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