Hundreds of barrier islands newly identified in global survey

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Earth has 657 more barrier islands than previously thought, according to a new global survey by researchers from Duke University and Meredith College.

The researchers identified a total of 2,149 barrier islands worldwide using satellite images, topographical maps and navigational charts. The new total is significantly higher than the 1,492 islands identified in a 2001 survey conducted without the aid of publicly available satellite imagery.

All told, the 2,149 barrier islands measure 20,783 kilometers in length, are found along all continents except Antarctica and in all oceans, and make up roughly 10 percent of the Earth's continental shorelines. Seventy-four percent of the islands are found in the northern hemisphere .

Barrier islands help protect low-lying mainland coasts against erosion and storm damage, and can be important wildlife habitats. The nation with the most barrier islands is the United States, with 405, including those along the Alaskan Arctic shoreline.

The survey results appear in the current issue of the peer-reviewed *Journal of Coastal Research*.

"This provides proof that barrier islands exist in every climate and in every tide-wave combination," says Orrin H. Pilkey, James B. Duke

Professor Emeritus of Geology at Duke's Nicholas School of the Environment. "We found that everywhere there is a flat piece of land next to the coast, a reasonable supply of sand, enough waves to move sand or sediment about, and a recent sea-level rise that caused a crooked shoreline, barrier islands exist."

Barrier islands often form as chains of long, low, narrow offshore deposits of sand and sediment, running parallel to a coast but separated from it by bays, estuaries or lagoons. Unlike stationary landforms, barrier islands build up, erode, migrate and rebuild over time in response to waves, tides, currents and other physical processes in the open ocean environment.

The 657 newly identified barrier islands didn't miraculously appear in the last decade, explains Matthew L. Stutz, assistant professor of geosciences at Meredith, located in Raleigh, N.C. They've long existed but were overlooked or misclassified in past surveys.

Previously, for instance, scientists believed barrier islands couldn't exist in locations with seasonal tides of more than four meters. Yet Stutz and Pilkey's survey identifies the world's longest chain of barrier islands along a stretch of the equatorial coast of Brazil, where spring tides reach seven meters.

The 54-island chain extends 571 kilometers along the fringe of a mangrove forest south of the mouth of the Amazon River. Past surveys didn't recognize it as a barrier island coast partly because older, low-resolution satellite images didn't show a clear separation between the islands and mangrove, Stutz says, but also because the chain didn't match the wave-tide criteria used to classify barrier islands in the United States, where most studies have been conducted. Scientists failed to consider that supplies of replenishing sand are so plentiful along the equatorial Brazilian coast that they can compensate for the erosion caused by

higher spring tides.

Stutz and Pilkey say the survey's findings – which formed part of Stutz's dissertation when he was a doctoral student at Duke – illustrate the need for a new way to classify and study barrier islands, one that takes into account the complex interplay of local, regional and global variables that shape where the islands form and how they evolve.

"Are there clues there to predict which of today's islands might be in danger of disappearing in the near future?" Stutz asks.

The potential for significant climate and sea level change this century "underscores the need to improve our understanding of the fundamental roles these factors have played historically in island evolution, in order to help us better predict future impacts," Pilkey says.

"Barrier islands, especially in the temperate zone, are under tremendous development pressure, a rush to the oceanfront that ironically is timed to a period of rising sea levels and shoreline retreat," he says.

A developed barrier island, held in place by seawalls, jetties or groins, can't migrate. "It essentially becomes a sitting duck unable to respond to the changes occurring around it."

More information: "Open-Ocean Barrier Islands: Global Influence of Climatic, Oceanographic, and Depositional Settings," Matthew L. Stutz and Orrin H. Pilkey. Journal of Coastal Research: Volume 27, Issue 2: pp. 207 – 222. (2011) doi: 10.2112/09-1190.1

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