**One begat two.**
The Kentia palm gave rise to the curly palm in an example of sympatric speciation.

Credit: WILLIAM BAKER/ROYAL BOTANIC GARDENS, KEW

## Speciation in Place

By Elizabeth Pennisi
*Science*NOW Daily News
8 February 2006

Kentia palms live on an island in the South Pacific, yet some of them somehow evolved--right there in the same gene pool--into the curly palm. Likewise, the Arrow cichlid fish of Nicaragua evolved as a sister species to the Midas cichlid without any physical barrier to gene flow. These unusual cases, described online 8 February in *Nature*, help bolster support for a controversial idea called sympatric speciation: speciation that occurs without geographic isolation.

Typically, one species splits into two new species only when some of its members wind up isolated in a different location. Many theorists have predicted that sympatric speciation is also possible, but the phenomenon has been difficult to prove. Now there are two case studies.

Axel Meyer, an evolutionary biologist at the University of Konstanz in Germany, visited an isolated 5-kilometer-wide crater lake in Nicaragua. Early in its 23,000-year history, the lake was settled by the Midas cichlid. When the team compared its mitochondrial DNA and other genes to those of an endemic fish called the Arrow cichlid, they found that the Arrow cichlid--which evolved from the Midas cichlid fewer than 10,000 years ago--was different enough to warrant its current status as a separate species. There were other signs that the fishes had gone their separate ways: One is a bottom feeder whereas the other isn't, and they can't interbreed successfully. Meyer thinks this sympatric speciation may underlie at least some of the hard-to-explain vast diversity of African cichlids.

Vincent Savolainen and William Baker of the Royal Botanic Gardens, Kew, in

Richmond, U.K., went to Lord Howe Island in the Pacific Ocean--a 12-square-kilometer speck of volcanic rock, 580 kilometers east of Australia. They and colleagues built a DNA-based family tree that included the two palms. They found that the curly palm descended from the Kentia palm (a common houseplant) about 1 million to 2 million years ago. Although the two species coexist in 20% of the sites surveyed, they flower 6 weeks apart. Kentia palms thrive in basic soil, whereas curly palms stick to acidic soils. Savolainen and his colleagues suggest that as the Kentia palm spread into different soils, flowering time was delayed, possibly because the genes needed to adapt to the altered pH affected the transmission of those involved in flowering. Eventually, plants in basic soil could no longer pollinate trees in acidic soil and vice versa.

"These papers are important because they are very convincing, and they are timely," says Giacomo Bernardi, an evolutionary biologist at the University of California, Santa Cruz. Now evolutionary biologists have real data with which to evaluate theoretical models of this process. Indeed, adds Jeffrey Feder, an evolutionary biologist at the University of Notre Dame in Indiana, sympatric speciation “may not be as uncommon as some presume."



**Related sites**

- Axel Meyer's home page
- More about cichlids
- Lord Howe Island
- Kew Gardens