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DNA barcoding effective tool, new study finds

Guelph, ON - New research confirms that DNA barcoding is an effective tool for both identifying and discovering species. The study is the cover story in the latest Proceedings of the National Academy of Sciences.

The work was conducted by Guelph post-doctoral researcher Mehrdad Hajibabaei and integrative biology professor Paul Hebert, along with researchers at the Smithsonian's National Museum of Natural History and the University of Pennsylvania.

The research reveals that DNA barcoding - the process of using a short DNA sequence from a standardized gene region to identify species - successfully recognized some 521 different species of moths and butterflies in Costa Rica. In addition, the researchers found evidence that 13 currently recognized species each actually represent two or more species.

DNA barcoding is now being used by scientists around the world and has already led to the discovery of new species of birds, butterflies and fishes. But this paper represents the first time the approach has been tested to determine if it can discriminate among species in extremely diverse tropical regions.

It's also the largest study to date involving DNA barcoding in terms of both species coverage and specimens. "This makes the findings particularly significant," said Hajibabaei. "It shows that even in a group with a well-established taxonomy, DNA barcoding enables both rapid species detection and the discovery of new species."

The researchers focused their efforts on Costa Rica because biodiversity in this region has been studied for some 200 years and its numerous species are well-known and classified. "It provided the perfect template against which to test the accuracy of DNA barcoding," said Dr Hebert.

Dr Hebert proposed that a short DNA sequence can be used to identify species. The technique relies on analysing a portion of a mitochondrial gene (cytochrome c oxidase I or COI), which plays a key role in cellular energy production. He called the system "DNA barcoding" to reflect the fact that analysis focuses on a short, standard gene region. Just as retail barcodes allow the quick identification of millions of items on store shelves, so too will DNA barcodes allow the rapid identification of species.

The latest study also confirms that DNA barcodes can regularly deliver species-level identification. That which should allay any concerns that barcoding would be unable to identify species at a level below the classifications of genus or family.

Currently, Dr Hebert leads the Canadian Barcode of Life Network, the world's first national network dedicated to large-scale DNA barcoding. The Biodiversity Institute of Ontario, which is under construction on the west side of the University of Guelph campus, will host the core analytical facility for the network. The institute will provide researchers with the facilities and equipment needed to conduct analysis on species from around the world.

Dr Hebert estimates that in about 20 years, DNA barcoding will enable completion of a catalogue of the estimated 10 million species of animals on the planet, of which only 1.2 million have been formally identified over the past 250 years.