The Inquirer SMTWTFS June 25, 1999

National

What likes it hot? Plants and bugs

Study takes a new look at climate's effects.

By Mark Jaffe

INQUIRER STAFF WRITER

Hot weather is good for plants and good for the bugs that eat them. It's true today, and it was true 55 million years ago.

Insects and plants make up the bulk of life on Earth, and the interplay between them and climate is of increasing scientific interest as concern grows over the prospect of future global warming.

So, two Smithsonian Institute researchers looked back at a time when the world was the hottest it has ever been to see how plants and insects behaved.

As the temperature warmed in prehistoric Wyoming - the land went from temperate to tropical - bug predation increased dramatically.

More heat. More plants. More bugs.

"What this shows is that the effect of climate change on the living record is really dramatic," said Peter Wilf, a paleobotanist. The findings were published today in Science magazine.

Numerous studies have compared the diversity of plants and insects at different latitudes and found that the closer to the equator, the greater the variety of species.

"Look at a temperate forest filled with sugar maples and a tropical forest where you'd be hard-pressed to find two trees alike," Wilf said.

But instead of making a geographic comparison, Wilf and his colleague

Conrad Labandeira studied one place over time.

By collecting and analyzing fossil leaves, they traced the changes in insect appetites during three million years.

The study, which entailed four years of fossil hunting, is the first of its kind.

The two researchers counted the insect bites on fossil leaves from the late Paleocene to the early Eocene - 56 to 53 million years ago.

During those three million years the annual temperature of the Rocky Mountain region warmed by 13 degrees Fahrenheit to an average of 70 degrees, and the area's climate was transformed from cool temperate to humid near-tropical.

(By way of comparison, the World Meteorological Organization estimates that the average annual temperature has risen about 1.2 degrees Fahrenheit in the last 100 years, and computer models project an increase of another 2 to 7 degrees in the next 50 years.)

Wilf and Labandeira found that as the climate warmed, the bugs became more ravenous.

Even though plant life increased along with the heat, the researchers were able to document as much as a 15 percent increase in "herbivory" for some plant species.

They were even able to get an idea of what kinds of insects were eating which kinds of plants 55 million years ago.

The cutting of trails through the leaves, known as "leaf mining," was the work of caterpillars. Scraping the top of leaves and sucking out the inside while leaving the bottom was the sign of the leaf beetle.

The insects appeared to be particularly fond of birch, poplar and alder leaves. They also munched on ginger and a tree from the chocolate family.

Ironically, as the Earth later cooled and the Rocky Mountains continued to rise, Wyoming became drier, and the luxuriant forests were replaced with red rock deserts.

"What we saw was that as temperature in this one corner of Wyoming increased, the diversity increased there too," Wilf said. "It was very dynamic."

But Wilf cautioned that prehistoric Wyoming may not hold any direct glimpse of future global warming.

"We studied something that happened a long time ago over several

million years," he said. "Now we are looking at climate change in a couple of hundred years."

"All we can say," Wilf said, "is that climate affects species and affects them in a big way."