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Lizards succumb to global warming



■ Introduction

Evolutionary biologists such as Dr. Barry Sinervo research the origin of species and how they adapt to their environments. Dr. Sinervo specializes in lizard species. His team went to various sites where a particular lizard species lives. He and his team were investigating the effect of the lizard's colorful appearance on its evolution. Unfortunately, the lizard species they were looking for turned out to be hard to find. Thus, the focus of their research changed from "How did the lizard's appearance help it survive and evolve?" to "Why is this species going extinct?" Habitat destruction is the most common reason for species to disappear from the Earth. However, the lizards were living in protected areas which were untouched by human activity. Thus, the team investigated alternative explanations for the disappearance of the lizards. By using a model lizard, they measured the temperature that real lizards encountered in their environment throughout the year. They found that warmer temperatures in the spring meant that lizards had to spend more time in that season searching for shade instead of searching for food. Female lizards that cannot obtain enough food in the springtime are unable to reproduce, and the local population soon crashes. Global warming is thus apparently causing sun-basking lizards, animals that we would normally expect to welcome warmer weather, to vanish from the Earth.

■ Main Article

Climate change is already sending reptile populations extinct worldwide

by Richard Lovett

By 2080, global warming could result in one-fifth of the world's lizard species becoming extinct, a global study has found.

5 Even under the most optimistic scenarios for curbing carbon dioxide emissions, the analysis by an international team shows that one-fifth of the globe's lizard populations, corresponding
10 to 6% of all lizard species, may go extinct by 2050.

“We've committed ourselves to that,” says Barry Sinervo, an evolutionary biologist at the University of California,
15 Santa Cruz, who led the study. He and his colleagues found that climate change has already driven 12% of the populations of Mexico's colourful *Sceloporus* lizards extinct since 1975.

20 If emissions continue at current levels, he predicts that by 2080, 39% of the world's lizard populations will have vanished, corresponding to a 20% loss in species. The study is published in
25 *Science* this week¹.

It's a stunning finding, says Raymond Huey, an evolutionary physiologist at the University of Washington, Seattle, who

wasn't part of the study team. “Lizards
30 are animals that should be very tolerant of climate warming,” he says.

Wave of extinction

Sinervo wasn't intending to study extinctions. Rather, he had planned to use a Eurasian lizard, *Lacerta vivipara*,
35 to examine the role of coloration in lizard evolution. But when he went to sites in France, Italy, Slovenia and Hungary where *Lacerta* had been studied, the lizards weren't always there. A few years
40 later, he found that Mexico's *Sceloporus* lizards were also vanishing.

Concerned, he assembled a team to examine the issue globally. Studying reports of extinctions on five continents,
45 the scientists concluded that the problem is widespread.

“It's happening really, really fast,” Sinervo says. “We're seeing a massive extinction wave sweeping across the
50 planet.”

Huey warns that not seeing lizards doesn't mean that they're not there. They may just have been overlooked. “Populations go up and down,” he

55 says. Still, he notes, *Sceloporus* is very
conspicuous. “It would be hard to
miss.”

“These kinds of studies take a lot
of work, and people have just recently
60 started to do them,” says Anthony
Barnosky, a palaeoecologist at the
University of California, Berkeley, and
author of *Heatstroke: Nature in an
Age of Global Warming* (Island Press,
65 2009).

Of the handful of similar analyses,
a 2008 study found population losses
in amphibians living in Yellowstone
National Park in Wyoming², and another
70 found that small mammals in Yosemite
National Park in California had tracked
warming temperatures in the past
century by shifting their range³.

Feeling the heat

Lizard disappearances in the areas
75 the team studied can’t be due to habitat
destruction because they’re occurring
where habitat has been protected.
Rather, hotter sites close to the equator
or at low altitudes are most likely to lose
80 their lizards.

To see how hotter climates damaged
the reptiles, Sinervo’s team created a
dummy lizard, set it out in the sun at
sites in the Yucatán Peninsula where
85 *Sceloporus* is found and where it had

gone extinct, and monitored its tempera-
ture. Like all organisms, lizards must
avoid overheating and keep their body
temperature within a certain range to
90 survive.

The problem, the team found, seems
to be warmer springtimes, rather than
higher maximum temperatures at
midday or in midsummer.

95 Higher temperatures in spring mean
that the animals spend less of the
breeding season out foraging and more
time in the shade. “That is the time of
year that females need the maximum
100 amount of food,” says Huey. “If the
temperature gets higher in the spring,
then the lizards restrict their activity.
They simply may not have enough active
time to catch enough food.”

105 Underfed females do not have
the resources needed to make young,
causing populations to crash.

The ecological consequences of lizard
extinctions are unknown. “If Barry’s
110 right or even close to right,” Huey says,
“the world as we know it will be very
different. Lizards are primarily insect
eaters. So if a population goes extinct,
that will affect the insects living there.
115 Lizards are also prey for many snakes,
birds, mammals and some other lizards.
But how serious those [effects] will be is
going to be very difficult to predict.”

References

1. Sinervo, B. et al. *Science* 328, 894-899 (2010).
2. McMenamin, S. K., Hadly, E. A. & Wright, C. K. *Proc. Natl Acad. Sci. USA* 105, 16988-16993 (2008).
3. Moritz, C. et al. *Science* 322, 261-264 (2008).

Source

<http://www.nature.com/news/2010/100513/full/news.2010.241.html>

Notes

succumb to 「強敵に屈する」 **3. extinct** 「絶滅した」 **10. go extinct** 「絶滅する」、**send... extinct** 「...を絶滅させる」 **6. curb** 「抑える」、「歯止めをする」 **6. carbon dioxide** 「二酸化炭素」 **7. emissions** 「放出」、「排出」動詞 **emit** 「放出する」、「排出する」 **14. the University of California, Santa Cruz** 「カリフォルニア大学サンタクルーズ校」カリフォルニア大学の一キャンパスで、実験的教育・研究をすることで知られている。カリフォルニア大学Berkeley校(UCB)やLos Angeles校(UCLA)は世界的にも有名。**13. evolutionary biologist** 「進化生物学者」学問分野の名称はevolutionary biology 「進化生物学」 **18. Sceloporus lizards** 「学名:主として北米と中米に生息するイグアナ科のトカゲの総称」 **22. will have vanished** 「無くなっているであろう」未来完了形。 **25. Science** 『サイエンス誌』ノーベル賞受賞者をはじめ著名な科学者の論文を掲載している。 **26. stunning** 「驚くべき」 **30. tolerant** 「耐性のある」 **be tolerant of...** 「...に対して耐性のある」の意味。 **27. evolutionary physiologist** 「進化生理学者」学問分野の名称は evolutionary physiology 「進化生理学」 **34. Lacerta vivipara** 学名: 爬虫綱有鱗目カナヘビ科のトカゲ。ヨーロッパ中部からシベリア、北海道北部に広く分布する。 **35. coloration** 「変色」ここではカメレオンのように周囲に合わせて色を変えること。 **42. Concerned** 「懸念して」分詞構文、Being concerned または Having been concerned を省略したもの。 **55. Still** 「とは言え」副詞。 **56. conspicuous** 「人目に付く」 **61. pal(a)eoecologist** 「原始エコロジスト」学問分野は pal(a)eoecology 「原始エコロジー」、接頭辞 paleo-/palaeo- 「原始の」 **66. analyses** analysis 「分析」の複数形。 **68. Yellowstone National Park in Wyoming** 米国ワイオミング州にあるイエローストーン国立公園で有名な大間欠泉がある。 **70. Yosemite National Park in California** カリフォルニア州にあるヨセミテ国立公園。 **71. track** ここでは「印をつける」「足跡を残す」、mark の意味に近い。 **73. range** ここでは「生息域」の意味。 **68. amphibians** 「両生類」 **83. dummy lizard** 「人造のトカゲ」、「トカゲのダミー」 **84. the Yucatán peninsula** メキシコ南東部にあるユカタン半島 **96. spend... out** 「外で過ごす」この out は前置詞ではなく副詞で「(家の)外で」を意味する。例: Let's eat out tonight. (今晚は外で食べよう)。 **75. habitat** 「生息地」 **82. reptile** 「爬虫類」 **97. foraging forage** 「食料を探す」の動名詞形。 **105. Underfed** 「餌を十分に与えられていない」、「十分な餌にありついていない」 **115. prey for...** 「...の餌食」

⚡ EXERCISES

Exercise 1

Answer the following questions.

1. How many lizards may go extinct by 2050, according to the reseachers?

- (1) One-fifth of all lizards
- (2) 6% of all lizards
- (3) 12% of all lizards

2. Barry Sinervo warns that, if global carbon dioxide emissions continue at present levels,

- (1) 12% of the lizard populations in Mexico will have died out by 2080.
- (2) 20% of all lizard species will be gone by 2080.
- (3) The *Sceloporus* lizard population in Mexico in 2080 will be reduced by 39%.

3. Raymond Huey was shocked at Sinervo's finding because

- (1) he himself faced this finding as a member of Sinervo's research team.
- (2) lizards are considered to be not vulnerable to global warming.
- (3) lizards had never been studied as part of his research program.

4. According to the article, which one of the following statements is not true?

- (1) At first, Sinervo was not planning to study *Sceloporus* since he was interested in the role of coloration in lizard evolution.
- (2) Having scarcely found *Lacerta* in France, Italy, Slovenia, and Hungary, Sinervo decided to examine the populations of *Sceloporus* lizards in Mexico.
- (3) Sinervo went to France, Italy, Slovenia, and Hungary, and found that plenty of *Lacerta* lizards were still surviving in each of those places.

5. Which one of the following statements is true?

- (1) Huey thinks that Sinervo did not fail to count most *Sceloporus* lizards, since they were easy to find.
- (2) Another researcher, working on amphibians in 2008, disagrees with Sinervo because no loss was found in their populations.
- (3) Another study on mammals, in Yosemite National Park, suggests that *Sceloporus* may be surviving by moving to a new habitat.

6. Sinervo and his team attempted to examine how warming climates affect the reptiles that they were studying. What did they find out?

- (1) Differences between daytime temperatures and night-time temperatures prevent the reptiles from collecting enough food.

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- (2) Higher temperatures in spring prevent female reptiles from finding enough food for successful breeding.
 - (3) Lizards must avoid overheating and keep their body temperature within a certain level to survive.

7. What may happen if Sinervo's findings prove to be true?

- (1) Despite facing higher temperatures in spring, lizards may manage to survive by changing their diet. Lizard extinctions are thus not likely to occur.
- (2) If lizard species go extinct, then the populations of other insect eaters, such as snakes, birds, and mammals will increase. This will create serious ecological effects.
- (3) Since lizards feed on insects while other creatures prey on lizards, lizard extinctions may bring forth serious ecological effects. The exact effects are unpredictable.

Exercise 2

Choose the correct word or expression to best complete each sentence.

- 1. If carbon dioxide emissions continue at present levels, many lizard species ___ by 2080.**
(1) vanish (2) vanishing (3) will have disappeared
- 2. Global warming could be very bad for lizards, although reptiles are generally ___ warm weather.**
(1) tolerant of (2) due to (3) corresponding to
- 3. *Sceloporus* lizards, which are known to be colorful and therefore ___, live in Mexico.**
(1) stunning (2) conspicuous (3) active
- 4. Barry Sinervo is introduced here as ___.**
(1) a palaeoecologist (2) an evolutionary physiologist (3) an evolutionary biologist
- 5. Warmer temperatures in spring prevent female lizards from ___ enough since they are forced to stay in the shade for longer periods of time.**
(1) foraging (2) breeding (3) overheating
- 6. *Lacerta vivipara* is a Eurasian lizard. It will probably not ___ global warming.**
(1) notice (2) succumb to (3) contribute to

✦ EXERCISES (cont'd)

7. Small mammals in Yosemite National Park in California are affected by global warming. _____, they seem to be surviving by shifting their range.

- (1) Still (2) Even (3) Rather

8. Sinervo was originally examining *Lacerta vivipara* lizards in Europe, only to find them gone extinct. _____, he went back to Mexico to find *Sceloporus*.

- (1) Although (2) Committed (3) Concerned

9. Insects are prey _____ lizards, and snakes, birds, and other mammals feed on lizards in turn.

- (1) of (2) for (3) on

10. Lizards and many reptiles spend most of their time _____ finding food when it gets cooler, but have to stay _____ the shade when it gets too hot.

- (1) out - in (2) by - under (3) on - during

Exercise 3

Fractions (分数) : Following the examples, write out each fraction, and read it out loud.

Examples

$\frac{1}{2}$ → one half $\frac{1}{3}$ → one third $\frac{2}{3}$ → two thirds $\frac{1}{4}$ → a quarter $\frac{4}{7}$ → four sevenths or 4 over 7

$\frac{246}{821}$ → two hundred forty-six over eight hundred twenty-one $5\frac{3}{7}$ → five and three sevenths

1. $\frac{5}{6}$ _____

2. $\frac{2}{9}$ _____

3. $3\frac{2}{5}$ _____

4. $\frac{13}{4}$ _____

5. $\frac{127}{345}$ _____

✦ Further Ideas

1. Read and reflect on the following two passages.

SERENDIPITY

Although the article is about very serious topics, such as global warming and species extinction, it also highlights a very happy phenomenon: serendipity. Serendipity occurs when you are looking for one thing but find something else, something that is perhaps more valuable or interesting than what you originally looking for. For example, consider the story of Alexander Fleming, a renowned researcher who was investigating how the *staphylococcus* bacteria behaved. One day, he came back to his laboratory and found that some fungus had entered one of the containers of *staphylococcus* bacteria he was using in his experiments. Instead of just throwing away the contaminated sample, he took a close look at it, and noticed that the *staphylococcus* bacteria around the fungus had been killed. Intrigued by the bacteria-killing property of this mysterious fungus, Fleming quickly changed his research focus. The fungus he discovered, penicillin, is still one of the most effective medicines we have for battling infection. Yes, it would be easy to dismiss a discovery like that as being due to luck or blind chance. But a good researcher creates an atmosphere where luck can happen. If you keep your eyes and mind open, serendipity may well pay you a valuable visit too!

EXTINCTION

From the time that life first appeared on Earth, species have gone extinct. Extinction is a natural part of evolution. Species that are best at adapting to their environment survive. Other species are unable to adapt quickly enough—so they die off. So, why do endangered species get so much attention today? One reason is much of the extinction happening these days is unnatural. The leading reason for a species to become endangered is loss of habitat. As humans cut down forests for farmland, expand cities, or pollute waterways, to name a few ways that habitat is destroyed, animals, plants, and insects find it harder and harder to survive. Thus, the effect of humans on the natural world is causing species to become endangered, and, ultimately, go extinct. Another leading reason for a species to become endangered is climate change. For example, the lizards in this article could probably adapt to a gradual change in temperature. However, the rapid change in the climate, and the consequent decrease in lizard birthrate, threaten to doom many lizard species. If human activity is a major reason for climate change, then it would seem that we are changing our world far too rapidly for species to naturally adapt. Humans are highly adaptable, but most species need a lot of time to get used to changing conditions.

2. What do you think? Write a short essay based on the main article or something that was mentioned in one of the essays above. (200 words)