

Arms Race

By Kirsten Weir

Male animals are developing bigger weapons to fight for female attention.

Sawfish with frightening blades jutting from their faces. Stag beetles whose horns almost match the length of their bodies. Fiddler crabs with claws so grossly oversized they equal half their body weights.



Mark Moffett/Minden Pictures/National Geographic Stock

Two antlered flies go mano-a-mano in a contest for access to a hole in a log and the female fly that nests there.

Such strange features have fascinated University of Montana biologist Douglas Emlen since he started studying science. Many animals have tusks, claws, or horns. In some species, though, those weapons are hugely exaggerated. "They're so bizarre," Emlen says. "You look at them and think, 'How can that thing possibly exist?'" Over years of research, he's managed to find out.

Getting The Girl

Flashy features such as bright feathers and giant claws usually show up on males. That's because such traits are almost always the product of *sexual selection*, says Emlen. They were shaped by competition for mates.



Todd Goodrick and Cary Shimek for the UM publication *Research View* University of Montana biologist Douglas Emlen holds a Japanese rhinoceros beetle, one of the insects he studies for his work on animal weaponry.

In most species, females are the choosy ones. Some female birds are drawn to males with brightly colored tails, for example. So the male birds with the brightest tails stand the greatest chance of mating and passing on their colorful genes to their offspring. Over time, via sexual selection, males evolve ever-bolder tail feathers. That's how the male peacock's magnificent tail developed.

Sexual selection is an example of *natural selection*. That's the principle that animals with advantageous traits are more likely to survive and pass those traits to the next generation. Natural selection drives evolution.

Female choice is only one kind of sexual selection. Another is male competition—males battling one another for access to females. Picture two elk duking it out with their antlers.

Most exaggerated weapons are the product of that type of physical competition, Emlen says. The elk with the bigger antlers wins the fight and gets the girl. Over time, the offspring of victorious males evolve weapons that are more and more outrageous.

Males with jumbo claws or massive horns almost always use them to battle males of their own species. Rarely are outsize weapons employed to take down prey or to fend off predators. "Predators have cool weapons too," Emlen says. Think razor-sharp claws and teeth. "But they almost never get exaggerated."

Beetle Battle

If oversize weapons are so useful, why don't all animals have them? Emlen found an answer studying *dung beetles*—beetles that feed on animal droppings. Some species have prominent horns; others have no horns. Emlen realized that the species with horns had something in common. All of them dig tunnels where the females lay their eggs.



Piotr Nasrecki/Getty Images
A male fiddler crab has one claw larger than the other.

In those species, males guard the tunnel entrances and fight one another for access. The male that wins the battle gets to mate with the female inside the tunnel. Over many generations, males have evolved horns to aid them in combat.



James Hager/Robert Harding
World Imagery/Corbis
Two bull elk lock antlers in a duel for supremacy.

In species that don't dig tunnels, females are free to roam where they please. It's almost impossible for males to guard the wandering ladies from other males, so they don't compete in physical fights. No horns have evolved.

Flies With Antlers

Among certain dung beetles, tunnels are a limited resource worth fighting for. Something similar occurs among antlered flies, Emlen says. The tiny insects live in the tropical forests of New Guinea, where females lay their eggs in small holes in fallen logs. Good holes are in short supply, however. "Males find the holes, and they guard them," Emlen says. They fight fierce battles for those holes—and for access to the females that nest inside. Over time, the males have evolved huge horns that look like bug-sized versions of deer antlers.

Males that sport outsize weapons tend to live in places with limited resources, says Emlen. And those resources are usually in distinct locations that are easy to defend, such as cozy burrows or tasty sap-producing trees.

Although big weapons are good for fighting, it takes a lot of energy for males to grow and maintain such heavy body parts. Within a given species, some males will be well nourished enough to develop huge claws or horns, Emlen explains. Males that aren't as well fed may have no oversize features. "Weapons are extremely variable," Emlen says. "A wimpy guy can't produce a huge weapon."

So weapons can be a good indicator of health and vigor—a fact that some females have caught on to. They choose the guys with the biggest horns or claws. Female fiddler crabs, for instance, prefer to mate with males that have large claws. In some species, weapons are a factor in both types of sexual selection: female choice and male combat.

Sometimes humongous weapons are so intimidating that males rarely fight at all. A puny-clawed crab will take one look at a crab with a colossal claw and know better than to pick a fight. He's still a loser; he doesn't get to mate and pass on his genes to another generation. But he escapes with his life and the prospect of winning a contest with an even smaller crab.

Even if weapons are rarely used, they still have to function. When it comes to sexual selection, combat is a law of nature. "The only way to find out if someone is bluffing," says Emlen, "is to challenge them."



Left: Douglas Emlen; Right: B. Ewen-Campen and Douglas Emlen
Male dung beetles use their prominent horns to battle one another for access to female beetles.

Name: _____

Date: _____

1. What weapons do stag beetles have?

- A tusks
- B horns
- C claws
- D blades

2. Male animals are developing bigger weapons. All of the following are effects of this occurrence EXCEPT

- A they win more fights for female attention
- B they are more likely to survive
- C they pass their traits to the next generation
- D they are competing in fights with females

3. Why did the author include the first paragraph (“Sawfish with frightening blades...”) in the passage?

- A to persuade kids to become biologists when they grow up
- B to describe the reason why male animals have weapons
- C to give examples of animals with exaggerated weapons
- D to compare and contrast ocean animals and insects

4. Read this sentence from the passage: “Over time, the offspring of victorious males evolve weapons that are more and more outrageous.”

In this sentence, the word **offspring** means

- A a family member
- B an older competitor
- C an animal’s young
- D a leap of joy

5. The primary purpose of this passage is to describe

- A the strange features of fiddler crabs, dung beetles, and sawfish
- B why many male animals that are well fed have larger weapons
- C how natural selection is changing animal weaponry
- D the interaction between the males and females of a species

6. What does Douglas Emlen do for a living?

7. According to the rules of natural selection, what will most likely happen to males that have smaller weapons? How do you know?

8. The question below is an incomplete sentence. Choose the word that best completes the sentence.

Antlered flies are tiny insects that live in the tropical forests _____ New Guinea.

- A for
- B or
- C and
- D of

9. Answer the following questions based on the sentence below.

Over the years, Douglas Emlen has studied animals to learn more about their weaponry.

Who? Douglas Emlen

(has done) What? _____

Why? _____

When? _____

10. **Vocabulary Word:** traits: characteristics that are inherited.

Use the vocabulary word in a sentence: _____

Teacher Guide and Answers

Passage Reading Level: Lexile 950

Featured Text Structure: Cause/Effect – the writer presents the reason an event happened and its results

Passage Summary: “Arms Race” describes how male animals are developing bigger weapons to fight for female attention.

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6. What does Douglas Emlen do for a living?

Suggested answer: Emlen is a biologist at the University of Montana. [paragraph 2]

7. According to the rules of natural selection, what will most likely happen to males that have smaller weapons? How do you know?

Suggested answer: The males with smaller weapons are less likely to survive and pass their traits to the next generation. The passage says that "animals with advantageous traits are more likely to survive and pass those traits to the next generation." [paragraph 5]

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(has done) What? **has studied animals**

Why? **to learn more about their weaponry**

When? **over the years**

10. **Vocabulary Word:** traits: characteristics that are inherited.

Use the vocabulary word in a sentence: answers may vary.