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Which Animals Roll Into a Ball to Escape Predators

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Which Animals Roll Into a Ball to Escape Predators

Practice: 5 MCQs



A hedgehog with its back spines raised. The spines are made of keratin. Photo by Clinton & Charles Robertson, Wikimedia Commons, CC BY 2.0.

Some animals curl into a ball when danger comes. This article explains which ones do it, and why the trick works for some and not for others. It covers hedgehogs, pangolins, armadillos, pill bugs and one very old fossil.

- **Roll up:** the hedgehog and the pangolin. The marmot does not.
- **Armadillos:** the Smithsonian names the La Plata three-banded armadillo as the armadillo that closes into a complete ball.

- **Oldest case:** a trilobite, about 510 million years ago.
- **Pangolin:** its scales are keratin. Rolling up makes it easier for poachers to collect.
- **Exam:** UPSC CSP 2021, GS Paper I, Q23.

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1. Which animals roll into a ball, and which only run?

Three animals appear in the exam question. They are the hedgehog, the pangolin and the marmot. Two of them roll into a ball. One does not. The difference lies in what each animal wears on its back.

1.1 How does a hedgehog roll into a ball?

A hedgehog has a muscle around its body. When the muscle tightens, the hedgehog curls up. It works a bit like a **drawstring bag** pulling shut. The result is a tight, spiky ball.

- An adult hedgehog has **5,000 to 7,000 spines**.
- The spines are made of **keratin**, the same material as human hair and nails.

- A sheet of back muscle, the panniculus carnosus, lets all the spines stand up at once.
- The spines cover the back. The cheeks, throat, belly and limbs have no spines, so curling hides them.

1.2 How does a pangolin roll into a ball?

A pangolin is covered in scales. When it feels threatened, it rolls into a ball. The scales stay on the outside.

- The scales are made of **keratin**, the same material as fingernails, hair and horn.
- An Indian pangolin tucks its limbs into the middle of the ball. Only the scales of the body and tail show.
- Scales make up a quarter to a third of an Indian pangolin’s body weight.
- A pangolin can also release a bad-smelling fluid from a gland at the base of its tail.



An Indian pangolin. Its scales stay on the outside when it rolls up. Photo by D'Cruze N, Singh B, Mookerjee A, Harrington LA, Macdonald DW, Wikimedia Commons, CC BY 4.0.

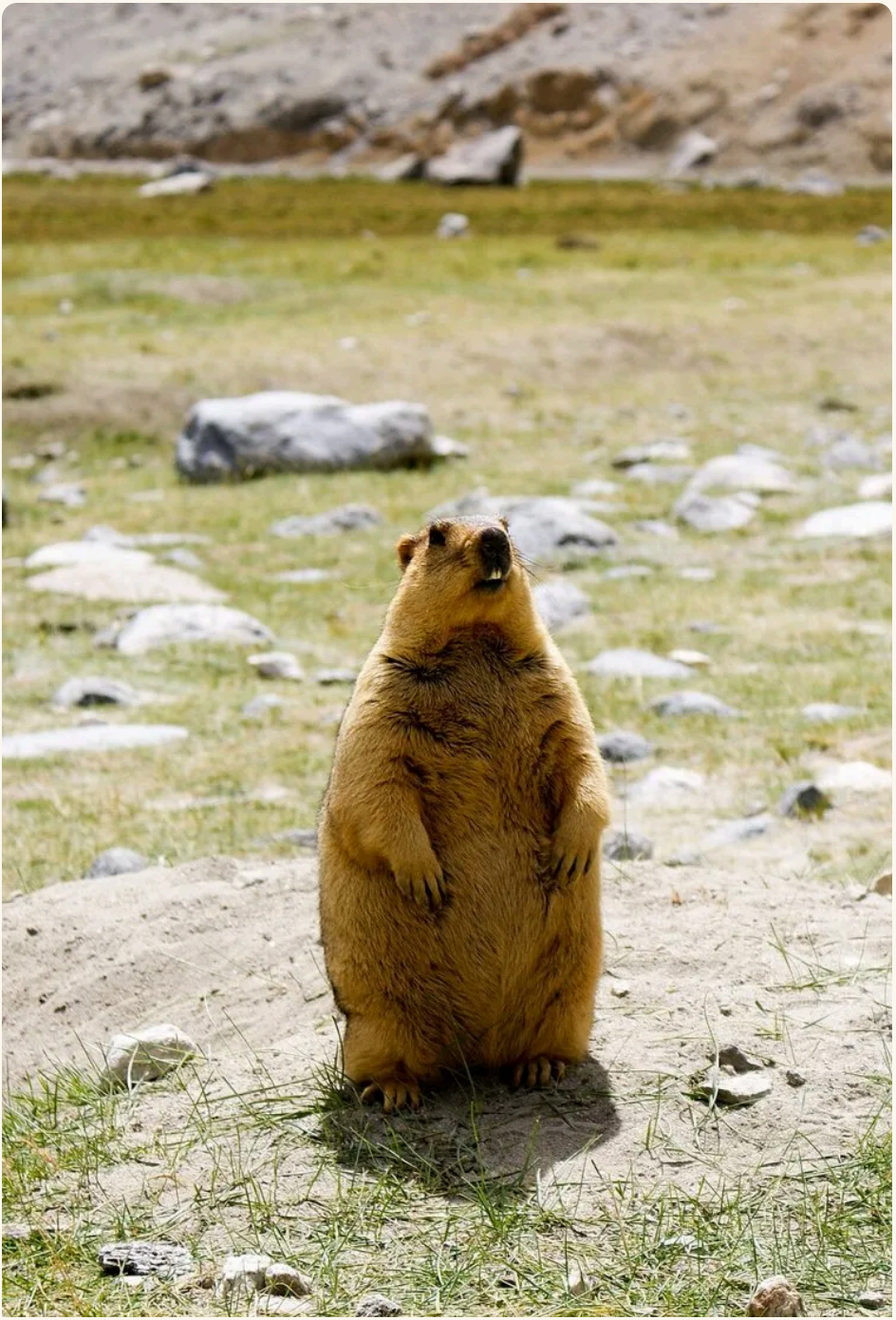
1.3 Why does the marmot not roll up?

The marmot is a large ground squirrel. It is a burrowing rodent with a fur coat. Neither source describes spines or scales on it.

Its defence is different. It calls and goes underground.

- The Himalayan marmot gives **alarm calls** when a predator is detected.
- In the yellow-bellied marmot of the United States, one animal stands as a sentinel and **whistles** sharply when danger is near.

- In that species, this gives colony members a chance to escape into the nearest burrow.
- The Himalayan marmot lives in the Himalaya of India, Nepal and Pakistan. Its burrows are usually 2.0 to 3.5 m deep.





A Himalayan marmot in Ladakh. A Himalayan marmot gives alarm calls when danger comes. Photo by Subhrajyoti Parida, Wikimedia Commons, CC BY 4.0.

1.4 What is the simple rule behind all three?

A ball only helps when its outside is harder to bite than its inside. The hedgehog's outside is spines. The pangolin's outside is scales. The Himalayan marmot has neither, and it gives alarm calls. This rule is a study aid, not a line from any source.

What is on the outside?

Hedgehog	Spines
Pangolin	Scales
Three-banded armadillo	Bony plates
Marmot	Alarm call

Study aid based on the sources above.

Outer layer of each animal. Original explanatory diagram.

Sources:

- Hedgehog Street, hedgehog biology

- National Geographic, pangolin facts
- US National Park Service, marmot
- Animal Diversity Web, European hedgehog
- Animal Diversity Web, Indian pangolin
- Animal Diversity Web, Himalayan marmot

A marmot rolls into a ball when a predator comes.
Think it through: why can't a marmot use a ball defence?
A ball only works if its outside is hard to bite. The Himalayan marmot gives alarm calls instead.

2. Which armadillo can roll into a full ball?

Armadillos all wear bony armor. Yet the Smithsonian names just one that can curl into a complete ball. It is the La Plata three-banded armadillo.

2.1 Which armadillo can roll into a complete ball?

The La Plata three-banded armadillo is also called the southern three-banded armadillo. The Smithsonian's National Zoo says it is "the only armadillo that can curl up into a complete ball." Its Latin name is *Tolypeutes matacus*. Its relative, the Brazilian three-banded armadillo, *Tolypeutes tricinctus*, is also widely known for rolling into a tight ball.

2.2 What does the closed armadillo ball look like?

The armor is a hard shell made of bony plates called **scutes**. The southern three-banded armadillo's shell is usually in **3 bands**. When it is frightened, it rolls up almost all the way.

- The armor forms a trap that snaps shut on a predator's hand or paw.
- It usually leaves a small space, which snaps shut on a hand or paw.

So the ball is tight, but it is not perfectly seamless.



A southern three-banded armadillo rolled into a ball. A small space remains between its armor sections. Photo by Tim Pierce, Wikimedia Commons, CC BY 2.0.

2.3 Why can’t other armadillos do the same?

The Smithsonian says some other armadillos cannot roll up because they have **too many plates to curl**. Animal Diversity Web describes the nine-banded armadillo this way.

- It usually has 9 visible bands. The number can range from 8 to 11.

- It curls up, but it cannot make a perfect ball like the La Plata three-banded armadillo.
- It prefers other escapes. It can jump straight up, sprint a short way, or dive into a burrow.



Which armadillos roll up. Original explanatory diagram.

Sources:

- Smithsonian's National Zoo, La Plata three-banded armadillo
- Animal Diversity Web, southern three-banded armadillo
- Animal Diversity Web, Brazilian three-banded armadillo
- Animal Diversity Web, nine-banded armadillo

Every armadillo species can roll into a complete ball.

Remember this: which armadillo can close into a full ball?

The La Plata three-banded armadillo, says the Smithsonian. Its armor forms a trap that snaps shut on a paw. The Brazilian three-banded armadillo is also widely known for rolling into a tight ball. The nine-banded armadillo curls up but cannot make a perfect ball.

3. Which other animals use the same trick?

Rolling into a ball is not only a mammal habit. A small land crustacean does it today. A sea animal did it about 510 million years ago.

3.1 Do pill bugs roll up too?

Yes. Pill bugs, also called woodlice, are small **crustaceans** that live on land. The common pill bug is *Armadillidium vulgare*. It curls into a tight sphere.

- Scientists call this rolling-up behaviour **conglobation**.
- Strong vibrations or pressure can trigger it.
- It protects the soft underside from predators such as shrews and spiders.
- In a lab test, rolling up cut water loss by 34.8%.

3.2 What is the oldest known case?

The oldest case comes from a **trilobite**, an armored sea animal. In 2013, Javier Ortega-Hernandez and colleagues described fossils of the genus *Mummaspis*. The fossils came from the early Cambrian Mural Formation in Jasper National Park, Alberta, Canada.

- The fossils are about **510 million years old**.
- The paper reports “complete but not encapsulating” enrolment. In plain words, the body curled up completely.
- It calls this the earliest direct evidence of the habit in this large group of trilobites.
- Later trilobites developed locking devices, so a rolled body stayed shut.

Scientists use the word **enrolment** for trilobites. The idea is the same as conglobation in pill bugs.

Rolling up, then and now

510 million years ago	Trilobite
Today	Pill bug

Sources: Biology Letters, J. Insect Sci.

An old trick, still in use. Original explanatory diagram.



A fossil trilobite, Drotops armatus, rolled up. This Middle Devonian specimen from Morocco is much younger than Mummaspis. Photo by Daderot, Wikimedia Commons, CC0.

3.3 Is this an example of convergent evolution?

It fits the idea. The Class 12 biology book explains convergent evolution as different structures evolving for the same function. Hedgehogs, pangolins, armadillos, pill bugs and trilobites are very different animals. Each reached a similar answer to the same problem. This link is a study aid. The sources above do not use the term.

Sources:

- Biology Letters abstract on Mummaspis (PMC)
- Conglobation in the pill bug (PMC)
- Animal Diversity Web, pill bug
- Sci.News report on the Cambridge study
- Smithsonian Magazine report on the trilobite fossils
- Class 12 biology book, chapter 6 (Evolution)

The oldest rolled-up fossil in the article is about 510 million years old.

Remember this: what is the oldest known case of rolling up?

A trilobite called Mummaspis, about 510 million years old. Its enrolment was complete, but not encapsulating.

4. Why is a pangolin's armor also its curse?

The scales that protect a pangolin from predators make it a target for people. Rolling into a ball does not stop a human poacher.

4.1 How many pangolin species are there, and which live in India?

There are **eight** pangolin species. Four live in Asia and four in Africa. India has two.

- The **Indian pangolin** (*Manis crassicaudata*) is Endangered on the IUCN Red List.

- The **Chinese pangolin** (*Manis pentadactyla*) is Critically Endangered.
- Both are in **Schedule I** of the Wildlife (Protection) Act, 1972.
- Pangolins have no teeth. They eat ants and termites.

4.2 Why does rolling up help poachers?

A rolled-up pangolin is easy to pick up. The US Fish and Wildlife Service says the habit is an effective answer to predators. It also makes it **easier for poachers** to collect and carry the animal.

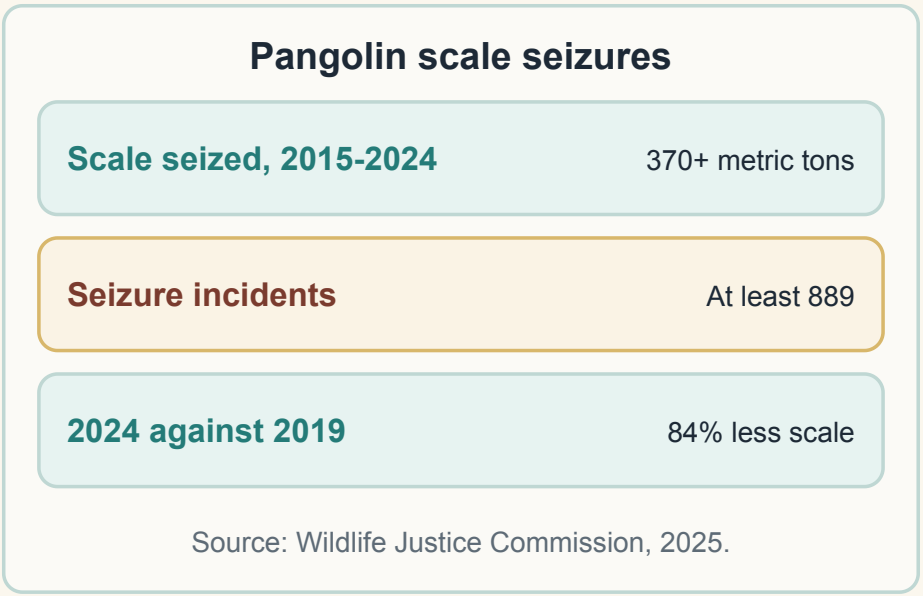
4.3 How big is the pangolin trade?

TRAFFIC reports that pangolins are among the **most trafficked wild mammals** globally. In India, pangolins are caught mostly for their scales, which are used in traditional medicines. The scales are believed to cure various ailments.

The Wildlife Justice Commission counted seizures from 2015 to 2024.

- More than **370 metric tons** of pangolin scales were seized worldwide.
- The seizures came from at least 889 incidents.
- That quantity could stand for **100,000 to one million** pangolins.
- In 2024, the volume of scales seized was **84% below** the 2019 level.

Seizure data show only what officers caught. They are a guide, not a full count of the trade. In India, TRAFFIC found over 1,000 pangolins in illegal trade from 2018 to 2022, across 342 seizure incidents.



Seizures worldwide. Original explanatory diagram.

4.4 What law protects pangolins?

International trade is banned under the CITES treaty. From early January 2017, **all eight pangolin species** are in CITES **Appendix I**. That bans international commercial trade in wild-caught animals. In India, both species have Schedule I protection.

Sources:

- US Fish and Wildlife Service, pangolins
- TRAFFIC factsheet on India’s pangolins, 2023
- Wildlife Justice Commission, Disruption and Disarray, 2025
- IUCN, what the new trade ban means for pangolins

Rolling into a ball makes a pangolin easier for poachers to collect. **Remember this: how much pangolin scale was seized worldwide from 2015 to 2024?**

More than 370 metric tons, in at least 889 incidents. That could stand for 100,000 to one million pangolins.

5. How do exams test this topic?

UPSC asked this topic directly. Other questions use the same three animals and then add traps about armadillos, scales and conservation status.

5.1 What did UPSC ask?

UPSC CSP 2021, GS Paper I, Q23 listed hedgehog, marmot and pangolin. It asked which of them roll up to protect their vulnerable parts from predators. The answer is **hedgehog and pangolin**. The marmot does not roll up.

5.2 What are the common traps?

- **Marmot.** It does not roll. The Himalayan marmot gives alarm calls.
- **Armadillo.** The Smithsonian names the La Plata three-banded armadillo as the only armadillo that makes a complete ball. The nine-banded armadillo cannot.
- **Pangolin.** Its defence is **scales**, made of keratin. Do not confuse it with a hedgehog.
- **Hedgehog.** Its defence is **spines**, also made of keratin.
- **Pill bug.** It is a crustacean, not an insect.
- **Gibbon.** The hoolock gibbon is the only gibbon in India. Pangolins also live in India.
- **Oldest case.** A trilobite of about 510 million years ago.
- **Law.** Both Indian pangolins are in Schedule I. All pangolins are in CITES Appendix I.

Sources:

- Smithsonian's National Zoo, La Plata three-banded armadillo (section 5)
- Mongabay India, hoolock gibbon study (2021)
- Animal Diversity Web, hoolock gibbon
- TRAFFIC factsheet on India's pangolins, 2023 (section 5)
- Animal Diversity Web, nine-banded armadillo (section 5)

The hoolock gibbon is the only gibbon found in India.

Your understanding checks

Your 5 quick checks Answered 0 of 5 · Correct 0
This score resets when the page reloads.

Practice: 5 MCQs

Practice MCQs

1. Consider hedgehog, marmot, and pangolin.

Which of these roll up to protect their vulnerable parts from predators?

A. Hedgehog and marmot

B. Pangolin only

C. Marmot only

D. Hedgehog and pangolin

See answer ↓

2. What does a pangolin's defensive ball rely on to protect it?

A. Overlapping armored scales

B. Sharp spines

C. Camouflage coloring

D. A hard shell like a turtle

See answer ↓

3. Why does a marmot not use the rolling-up defense strategy?

A. It has spines that would hurt itself

B. Marmots don't have predators

C. It has soft fur, not spines or scales, so it flees to its burrow instead

D. It's too large to curl up

See answer ↓

4. Besides hedgehogs and pangolins, which other animal is known to roll into a complete defensive ball?

A. African elephant

B. Three-banded armadillo

C. Indian gaur

D. Bengal tiger

See answer ↓

5. Regarding rare Indian mammals, which is correct: are toothless pangolins absent from India, and is the gibbon India's only ape species?

A. Neither statement is genuinely correct

B. Both statements are genuinely correct

C. Only the gibbon statement is genuinely correct

D. Only the pangolin statement is genuinely correct

See answer ↓

Answer Key

1. **D.**
   The hedgehog curls up behind its spines. The pangolin curls up behind its scales. The Himalayan marmot gives alarm calls instead. So the answer is hedgehog and pangolin.
   ↑ Q1
2. **A.**
   A pangolin is covered in scales made of keratin. When it rolls up, the scales stay on the outside. Camouflage is not how the ball protects it.
   ↑ Q2
3. **C.**
   A marmot is a burrowing ground squirrel. The Himalayan marmot gives alarm calls when a predator is detected. It does not roll up.
   ↑ Q3
4. **B.**
   The La Plata three-banded armadillo can curl into a complete ball. The Brazilian three-banded armadillo is also widely known for rolling into a tight ball. Some other armadillos have too many plates to curl.
   ↑ Q4
5. **C.**
   Only the gibbon statement is correct. The hoolock gibbon is the only gibbon found in India. Pangolins do live in India. The country has two species, the Indian pangolin and the Chinese pangolin.
   ↑ Q5

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