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Mariana Trench

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Mariana Trench

Stack Mount Everest in the ocean's deepest point, and its summit would still sit over a mile under water. This lesson covers where the Mariana Trench lies, how it formed, and who has reached the bottom.

At a glance

Four key facts on this topic

01 **~10,900 m**Challenger Deep, the lowest known point.

02 **23 Jan 1960**Walsh and Piccard made the first crewed descent.

03 **2012**James Cameron dived solo.

04 **1000 times**Pressure compared with sea level.

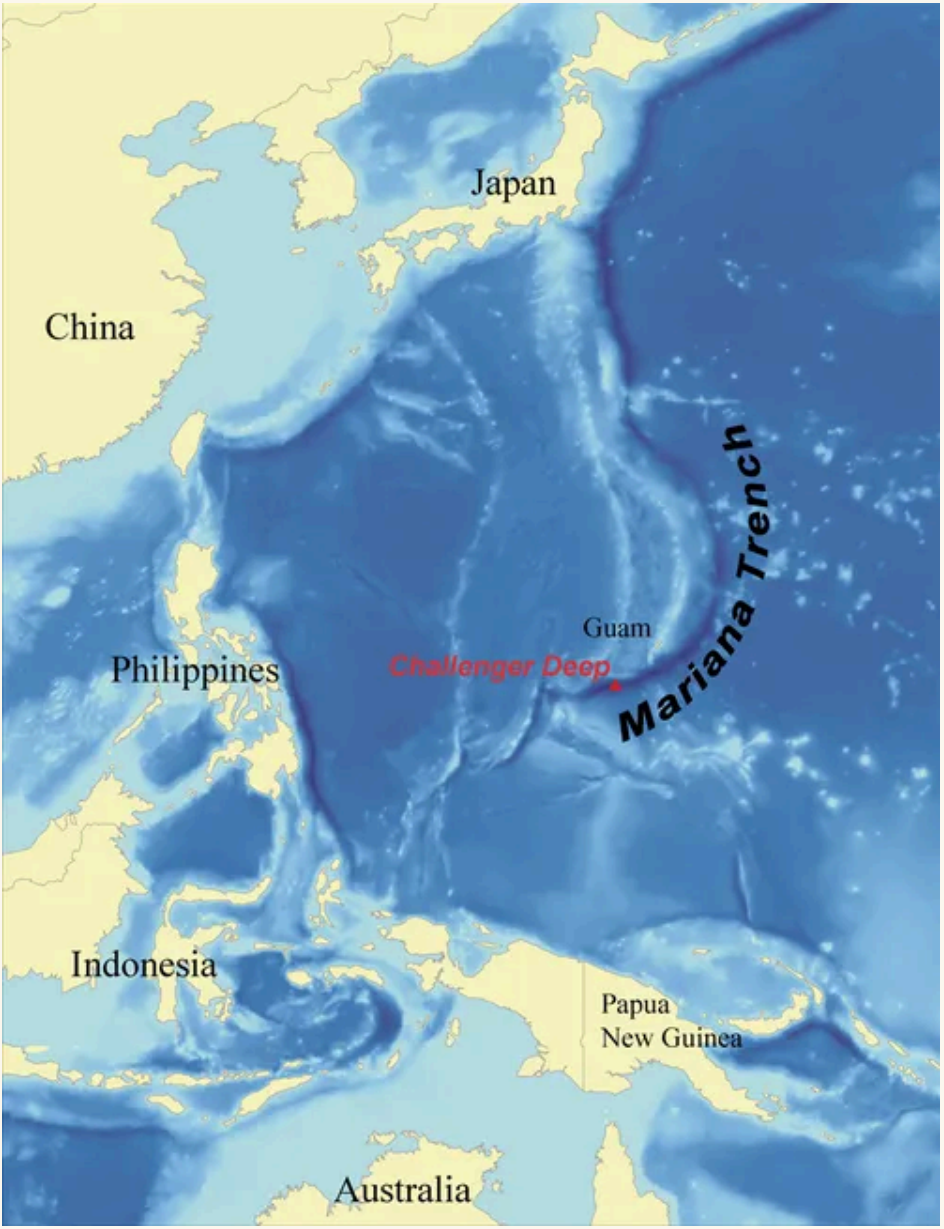
Where is the Mariana Trench, and how deep is it?

1 Where and How Deep

1.1 Where is the Mariana Trench?

The Mariana Trench lies in the **western Pacific Ocean**. It sits east of the Mariana Islands, which give it its name. The island of Guam is nearby.

The trench is shaped like a crescent. Its deepest valley, the **Challenger Deep**, lies at the southern end. It is about 200 miles from Guam.



Map of the Mariana Trench, in the western Pacific Ocean near the Mariana Islands. Map: wallace, CC BY 2.5, via Wikimedia Commons.

1.2 How big is the trench?

It is about **2,550 km long**, but only about **69 km wide**. That is five times the length of the Grand Canyon.

So the trench is a long, narrow scar in the sea floor. The deep part is a small spot at its southern end.

1.3 How deep is Challenger Deep?

It is nearly 36,000 feet below sea level. That is about **10,900 metres**, the lowest known point on Earth's surface.

Put Mount Everest inside it, and the summit still stays more than a mile under water.

The trench in numbers

Feature	Value
Length	About 2,550 km (1,580 miles)
Average width	About 69 km (43 miles)
Deepest point	Challenger Deep, near 10,900 m
Nearest island	Guam, about 330 km away

Figures from Live Science and EarthDate.

> **Quick check 1.** True or false: The Mariana Trench is a short, wide basin in the Atlantic Ocean. *(True or False?)* See answer ↓

Sources: livescience.com; earthdate.org

How did the Mariana Trench form?

2 How It Formed

2.1 Why is there a trench at all?

The answer is **subduction**. Two tectonic plates collide at the spot. One plate is forced under the other.

The sinking plate drags the sea floor down with it. That pushes the surface of the Earth down into a deep trench.

> 7. **Think it through:** Is a trench a hole made by erosion? See answer ↓

2.2 What is it like at the bottom?

No sunlight can reach this deep. The trench is in total darkness. The water is near freezing.

The pressure is also huge. It is more than **1000 times** the pressure at sea level. That is over 8 tons on every square inch.

2.3 How do scientists picture that pressure?

A University of Washington team compared it to an elephant standing on your thumb.

This is why only strong, special vessels can go there.

> **Quick check 2.** True or false: Subduction means two plates pull apart and a trench is left between them. *(True or False?)* See answer ↓

Sources: washington.edu

How was the depth measured?

3 Measuring the Deep

3.1 Who first measured the depth?

In 1875 the British ship **HMS Challenger** sounded the deep. The crew used a hemp rope with iron weights.

They recorded 4,475 fathoms. That is about 8,184 metres. It was the first hint of how deep the trench goes.

3.2 Why did the number change later?

Better tools gave better answers. In 1951 HMS Challenger II used a taut wire. It recorded 10,863 metres.

That made Challenger Deep the deepest known spot.

3.3 Why do sources give different depths?

Each dive reports its own reading. Equipment, tides and the exact spot all differ. So a few metres of spread is normal.

Exam questions usually ask for the rough figure, close to **11 km**.

Depths recorded at Challenger Deep

Year	Who or what	Depth recorded
1875	HMS Challenger (rope and weights)	8,184 m
1951	HMS Challenger II (wire)	10,863 m
1960	Trieste (Walsh and Piccard)	10,911 m
2012	Deepsea Challenger (Cameron)	10,908 m
2019	Victor Vescovo	10,927 m

Depths as given by EarthDate, Guinness World Records and Live Science.

Sources: guinnessworldrecords.com

Who first reached Challenger Deep?

4 The First Descent

4.1 Who first reached the bottom?

On **23 January 1960**, Don Walsh and Jacques Piccard reached Challenger Deep. Walsh was a US Navy lieutenant. Piccard was a Swiss oceanographer.

They rode in the bathyscaphe **Trieste**. Jacques's father, Auguste Piccard, a Swiss scientist, designed it. It was built in Italy, and the US Navy bought it in 1958.



The bathyscaphe Trieste alongside the USS Lewis over the Mariana Trench, 23 January 1960, the day of the first crewed descent. U.S. Navy photo, public domain, via Wikimedia Commons.

4.2 How long did they stay?

Only about **20 minutes** on the sea floor. Then they rose back to the surface.

The trip proved a crewed vessel could survive the pressure. It was a test of survival more than a study of the deep.

8. **Think it through:** Why was the stay so short? See answer ↓

Quick check 3. True or false: Walsh and Piccard made the first crewed descent to Challenger Deep in 1960. *(True or False?)*

See answer ↓

Sources: sciencedaily.com

What did James Cameron do in 2012?

5 Cameron's Solo Dive

5.1 What did Cameron achieve in 2012?

Filmmaker **James Cameron** made the first solo dive to Challenger Deep. He piloted the submersible Deepsea Challenger.

The record lists a depth of 10,908 metres. This was the first solo descent by a crewed submersible.

5.2 How long did it take?

The trip down took two hours and 36 minutes. Cameron then spent about **three hours** at the sea floor. The whole dive lasted about seven hours.

That is far longer than the 20 minutes in 1960. He could explore, not only touch the bottom.

5.3 Why do sources give two dates?

Guam time and US Eastern time differ. The dive began early on Monday 26 March in Guam. It was still Sunday 25 March in the US.

So you may see either date in books. The place and the person matter more.

5.4 Were there more dives after that?

Yes. In 2019 explorer Victor Vescovo made the deepest dive on record. Live Science lists it at 10,927 metres.

So the idea that only three crewed dives ever reached the bottom is out of date.

> **Quick check 4.** True or false: James Cameron's 2012 dive was the first crewed descent to Challenger Deep. *(True or False?)*
>
> See answer ↓

What lives and pollutes at the bottom?

6 Life and Litter

6.1 What fish lives deepest?

The **Mariana snailfish** was named in 2017 in the journal Zootaxa. It lives down to about 8,000 metres. In its home it is the top predator, with no bigger hunters around.

In 2017 it held the deepest-fish record, but that record has been passed. In 2022, scientists filmed a snailfish of the genus *Pseudoliparis* at 8,336 metres in the Izu-Ogasawara Trench. The University of Western

Australia reported this in April 2023.

Keep two records apart. The deepest fish **filmed** is that one at 8,336 metres. The deepest fish **caught** is *Pseudoliparis belyaevi*, at 8,022 metres.

6.2 How can a fish survive that pressure?

Little is known about how these fish live under such pressure. It is still an open question.

They hunt tiny crustaceans and shrimp. They gulp prey using suction from their mouths.

6.3 Has human waste reached the trench?

Yes. A 2018 study in the journal *Marine Policy* reported rubbish on the floor. It was led by Sanae Chiba of JAMSTEC.

A plastic bag was found over 10,000 metres down. Clearly visible plastics made up about 33 per cent of the debris.

- **Plastic share:** about 33 per cent of the visible debris.
- **Single-use items:** nearly 90 per cent of that plastic.
- **Typical item:** plastic supermarket bags.

> **Quick check 5.** True or false: The deepest fish ever filmed was found in the Mariana Trench. *(True or False?)* See answer ↓

Sources: ncl.ac.uk; uwa.edu.au; amp.cbc.ca

What do exams ask about the trench?

7 Exam Traps

7.1 What do exams ask about the Mariana Trench?

The link between trench and ocean is a favourite. Know that it is in the **western Pacific**.

> 9. **Exam angle:** NDA-NA-2 2017 asked which ocean floor holds the Mariana Trench. See answer ↓

7.2 Which mix-ups cost marks?

Questions usually test one of four confusions.

- Putting it in the **Atlantic** or Indian Ocean. It is in the western Pacific.
- Mixing the **trench** with the Challenger Deep. The Deep is only its deepest spot.
- Giving the first dive to Cameron. **Walsh and Piccard** went first, in 1960.
- Saying plates pull apart to make a trench. Trenches form where plates **collide**.

> **Quick check 6.** True or false: Challenger Deep is the deepest spot inside the Mariana Trench. *(True or False?)* See answer ↓

Remember this

- **Location:** western Pacific, east of the Mariana Islands, near Guam.
- **Shape:** crescent, about 2,550 km long and 69 km wide.
- **Origin:** subduction, where one plate is forced under another.
- **23 January 1960:** Walsh and Piccard, in the Trieste, first to the bottom.
- **2012:** Cameron's first solo dive; 2019: Vescovo's deepest dive.

Explain it back: Say in your own words why the 1960 dive lasted only 20 minutes.

Practice MCQs

1. In which ocean is the Mariana Trench located?

A. Atlantic Ocean

B. Indian Ocean

C. Arctic Ocean

D. Western Pacific Ocean

See answer ↓

2. Who made the first crewed descent to Challenger Deep, and when?

A. Victor Vescovo, 2019

B. James Cameron, 2012

C. Don Walsh and Jacques Piccard, 1960

D. Jacques Cousteau, 1960

See answer ↓

3. How long did Walsh and Piccard stay on the sea floor in 1960?

A. About 4 hours

B. About 2 hours 36 minutes

C. About 20 minutes

D. About 2 days

See answer ↓

4. James Cameron's 2012 dive to Challenger Deep was noteworthy because it was:

A. The first solo descent by a crewed submersible

B. The first dive in the bathyscaphe Trieste

C. The first crewed dive of any kind

D. The deepest dive ever recorded

See answer ↓

5. The Mariana snailfish is notable because it is:

A. The largest shark in the trench

B. A giant single-celled organism

C. The deepest-living fish known, near 8,000 metres

D. A scavenging amphipod

See answer ↓

6. About how long is the crescent-shaped Mariana Trench?

A. About 255 km

B. About 69 km

C. About 25,500 km

D. About 2,550 km

See answer ↓

Answer Key

1. **D.**
   The trench lies in the western Pacific Ocean, east of the Mariana Islands and near Guam. It is not in the Atlantic, Indian or Arctic Ocean.
   ↑ Q1
2. **C.**
   Walsh and Piccard reached the bottom in the bathyscaphe Trieste on 23 January 1960. Cameron's 2012 dive was the first solo descent.
   ↑ Q2
3. **C.**
   They spent about 20 minutes at the bottom before returning to the surface. Cameron stayed about four hours in 2012.
   ↑ Q3
4. **A.**
   Cameron piloted the Deepsea Challenger alone. Walsh and Piccard went down first, in 1960, and Vescovo's 2019 dive is recorded as deeper.
   ↑ Q4
5. **C.**
   The Mariana snailfish thrives down to about 8,000 metres and is the top predator there. It was named in 2017 in the journal Zootaxa.
   ↑ Q5
6. **D.**
   The trench is about 2,550 km (1,580 miles) long but only about 69 km wide. That is five times the length of the Grand Canyon.
   ↑ Q6

Quick-check answers

1. **False.** It is a long, narrow crescent in the western Pacific Ocean. ↑ 1
2. **False.** In subduction two plates collide and one is forced under the other. ↑ 2
3. **True.** They reached the bottom on 23 January 1960 in the Trieste. ↑ 3
4. **False.** It was the first solo descent. Walsh and Piccard went down first, in 1960. ↑ 4

5. **False.** The deepest fish filmed was at 8,336 metres in the Izu-Ogasawara Trench, not the Mariana Trench. ↑ 5
6. **True.** It lies at the southern end of the trench. ↑ 6
7. **Think it through.** Rivers and waves do not carve it. Plates meeting at a boundary bend the sea floor downward. ↑ 7
8. **Think it through.** The Trieste was built mainly to get down and back safely. It had little room for lights, cameras or long study. ↑ 8
9. **Think it through.** The answer is the western Pacific Ocean, east of the Mariana Islands. ↑ 9

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