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00:00:00,000 --> 00:00:09,000

Will the excavation of a centuries-old shipwreck reveal a secret smuggling operation?

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00:00:09,000 --> 00:00:15,000

There happens to be about twice as much money on the vessel as should have been there.

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00:00:15,000 --> 00:00:22,000

When an entire Russian ecosystem is obliterated, could a strange ocean toxin be to blame?

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00:00:22,000 --> 00:00:28,000

Lots of marine wildlife starts washing up on the beaches, dead or sick.

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00:00:28,000 --> 00:00:36,000

And can satellites solve the 2021 mystery of a submarine that plummets to deadly depths?

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00:00:36,000 --> 00:00:41,000

What force could tear a modern submarine into three pieces?

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00:00:44,000 --> 00:00:49,000

The underwater realm is another dimension.

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00:00:49,000 --> 00:00:57,000

It's a physically hostile place where dreams of promise can sink into darkness.

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00:00:59,000 --> 00:01:09,000

I'm Jeremy Wade and I'm searching the world to bring you the most iconic and baffling underwater mysteries known to science.

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00:01:09,000 --> 00:01:15,000

The vast majority of our ocean is unobserved, unmapped and unexplored.

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00:01:15,000 --> 00:01:20,000

It's a dangerous frontier that swallows evidence.

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00:01:20,000 --> 00:01:23,000

You have nowhere to run.

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00:01:23,000 --> 00:01:30,000

Where unknown is normal and understanding is rare.

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00:01:40,000 --> 00:01:44,000

The submarine is the ultimate weapon of modern warfare.

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00:01:44,000 --> 00:01:53,000

And right now there are thought to be more than 500 manned subs in the world's oceans, ready to launch into battle.

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00:01:53,000 --> 00:02:04,000

But when a sub with 53 crew disappears without a trace during peacetime in 2021, the international community is bewildered.

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00:02:04,000 --> 00:02:12,000

It quickly becomes a race against time to find the missing vessel and rescue the crew before it's too late.

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00:02:15,000 --> 00:02:19,000

April 21st, 2021.

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00:02:19,000 --> 00:02:22,000

A breaking story hits the news.

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00:02:22,000 --> 00:02:27,000

A submarine with 53 crew members on board is missing.

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00:02:27,000 --> 00:02:38,000

Attack submarine KRI Nangala 402 has disappeared in waters around 51 nautical miles north of Bali.

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00:02:38,000 --> 00:02:46,000

Indonesian Navy officials say they lost contact with the 200 foot long sub during a training exercise.

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00:02:46,000 --> 00:02:51,000

Its crew made contact to ask permission to execute a dive.

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00:02:51,000 --> 00:02:57,000

And then, radio silence. Where is the Nangala?

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00:02:57,000 --> 00:03:04,000

There's no war in this part of the world, so it's unlikely that the submarine would have been a victim of conflict.

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00:03:04,000 --> 00:03:07,000

What happened to the submarine?

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00:03:07,000 --> 00:03:13,000

With the world watching, a massive search and rescue operation gets underway.

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00:03:13,000 --> 00:03:17,000

A submarine has roughly three days of air.

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00:03:17,000 --> 00:03:21,000

If you still have power, you can possibly stretch it out a bit longer.

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00:03:21,000 --> 00:03:26,000

But the rule of thumb is if things go wrong, lots of things go wrong.

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00:03:26,000 --> 00:03:33,000

The Indonesian Navy deploys five aircraft and over 20 ships.

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00:03:33,000 --> 00:03:37,000

And they make a worrying discovery.

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00:03:37,000 --> 00:03:42,000

A large oil slick near the Nangala's last known position.

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00:03:42,000 --> 00:03:48,000

Oil on the sea surface is a very bad thing. It means oil in a contained system got out.

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00:03:48,000 --> 00:03:54,000

If oil is leaking out of a submarine, that usually means the pressure hull has been pierced.

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00:03:54,000 --> 00:04:00,000

Does this mysterious oil slick mean the Nangala is in critical condition?

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00:04:00,000 --> 00:04:05,000

If so, how could the sub's thick steel hull have been compromised?

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00:04:05,000 --> 00:04:09,000

It was constructed in Germany in the late 1970s.

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00:04:09,000 --> 00:04:13,000

Nangala was an old submarine. She was due to be replaced.

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00:04:13,000 --> 00:04:20,000

Over its long service, the sub underwent several refits, one as recently as 2012.

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00:04:20,000 --> 00:04:24,000

The integrity of the hull was flagged as a concern.

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00:04:24,000 --> 00:04:30,000

Submarine's lives are not measured in the years. It's measured in hull years.

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00:04:30,000 --> 00:04:33,000

How many more dives it can do and it can take.

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00:04:33,000 --> 00:04:38,000

And if a submarine reaches that number of dives, you do not send that submarine out there.

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00:04:38,000 --> 00:04:42,000

Nangala hadn't reached that point yet, but you wasn't far off it.

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00:04:42,000 --> 00:04:50,000

The Nangala is near the end of its career, but the sub was still fit for purpose.

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00:04:51,000 --> 00:04:54,000

The Indonesians have a good track record when it comes to submarines.

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00:04:54,000 --> 00:04:58,000

If they are unserviceable, they don't send them back in the water till they are.

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00:04:58,000 --> 00:05:05,000

With the Nangala missing for 24 hours, the international community rallies to Indonesia's aid,

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00:05:05,000 --> 00:05:08,000

launching a large-scale search.

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00:05:08,000 --> 00:05:14,000

After three days, hopes are diminishing for the survival of the crew.

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00:05:14,000 --> 00:05:22,000

Then on April 24th, the Indonesian Navy finds an array of debris they think has come from the Nangala.

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00:05:24,000 --> 00:05:31,000

Among the objects is a possible clue, a part of the submarine that is associated with the torpedo tubes.

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00:05:31,000 --> 00:05:39,000

We know it was out on a training mission. We know the training mission was in part for a torpedo practice.

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00:05:40,000 --> 00:05:46,000

Is it possible that the Nangala's explosive weaponry is somehow to blame for its disappearance?

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00:05:46,000 --> 00:05:55,000

According to the Navy, the Nangala had requested permission to dive to fire a torpedo shortly before contact was lost.

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00:05:57,000 --> 00:06:01,000

The last communication with the Nangala is at 4am.

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00:06:01,000 --> 00:06:05,000

This is when the officer authorized the firing of the torpedo.

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00:06:05,000 --> 00:06:13,000

Is it possible that the firing of the torpedo has somehow gone wrong, causing some sort of catastrophic explosion?

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00:06:13,000 --> 00:06:17,000

If so, it's not the first time this has happened.

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00:06:17,000 --> 00:06:29,000

In 2000, Russian submarine K-141, the Kursk, is taking part in a large-scale naval exercise loaded with a full complement of combat weapons.

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00:06:29,000 --> 00:06:38,000

During preparations to fire one of their torpedoes, fueled by hydrogen peroxide, a failure occurs, causing an explosion.

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00:06:40,000 --> 00:06:48,000

The blast blows a large hole in the hull, killing all but 23 of the 118 people on board.

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00:06:49,000 --> 00:06:56,000

While the Nangala's training exercise was also using live torpedoes, officials don't believe one went off.

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00:06:57,000 --> 00:07:05,000

During such a naval training exercise, surely ships would have had hydrophones in the water, yet no blast was detected at the time of the incident.

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00:07:06,000 --> 00:07:10,000

If there was an explosion, it should have been heard by these hydrophones.

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00:07:11,000 --> 00:07:18,000

It's not likely that a faulty weapons explosion caused the blast, in which case something else must have happened.

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00:07:19,000 --> 00:07:26,000

Soon after the debris is found, a search and recovery vessel surveys a possible target on the sea floor.

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00:07:26,000 --> 00:07:34,000

An ROV is sent down to investigate. The images instantly confirm everyone's worst fears.

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00:07:36,000 --> 00:07:44,000

The Nangala is found in a depth of 2,800 feet, which is far deeper than its maximum safe depths.

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00:07:45,000 --> 00:07:48,000

There's no hope for the 53 crew on board.

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00:07:48,000 --> 00:07:51,000

It's a tragic outcome for the submariners.

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00:07:52,000 --> 00:07:58,000

The only consolation for their loved ones now is to figure out exactly what went wrong.

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00:07:59,000 --> 00:08:08,000

And soon investigators discover a disturbing twist to the story. The submarine has been ripped into three pieces.

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00:08:08,000 --> 00:08:13,000

What force could tear a modern submarine into three pieces?

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00:08:14,000 --> 00:08:17,000

The Nangala is found on the sea bed.

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00:08:17,000 --> 00:08:21,000

It's hull ruptured and broken into three pieces.

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00:08:21,000 --> 00:08:27,000

Experts now suspect that the sub-sank to depths it wasn't built to withstand.

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00:08:27,000 --> 00:08:30,000

The Nangala is found on the sea bed.

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00:08:30,000 --> 00:08:33,000

The Nangala is found on the sea bed.

81

00:08:33,000 --> 00:08:36,000

The Nangala is found on the sea bed.

82

00:08:36,000 --> 00:08:39,000

The Nangala is found on the sea bed.

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00:08:39,000 --> 00:08:47,000

Experts now suspect that the sub-sank to depths it wasn't built to withstand, causing a violent implosion.

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00:08:49,000 --> 00:08:54,000

Indonesian officials are determined to find the cause of this catastrophe.

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00:08:54,000 --> 00:08:58,000

Was it a technical failure? Was it nature? It's a mystery.

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00:08:58,000 --> 00:09:05,000

There are limits to what the wreckage can reveal, so investigators must turn elsewhere for clues.

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00:09:05,000 --> 00:09:13,000

Satellite data taken around the time of the tragedy reveals the presence of a force under the ocean's surface called internal waves.

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00:09:13,000 --> 00:09:20,000

Right around the time of the tragedy, NASA's Aqua Satellite captures a ripple in the Lombok Strait.

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00:09:20,000 --> 00:09:25,000

Could this ripple be evidence for an internal wave occurring at the exact same time?

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00:09:25,000 --> 00:09:30,000

Internal waves occur where layers of water with different densities meet.

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00:09:30,000 --> 00:09:39,000

As currents move around the ocean, these layers can collide with geographical features on the sea floor, causing huge waves to form.

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00:09:39,000 --> 00:09:46,000

These invisible underwater waves can measure a staggering 500 feet from peak to trough.

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00:09:46,000 --> 00:09:55,000

They are much, much bigger and much, much slower than surface waves, but they disturb the inside of the ocean as they travel outward.

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00:09:55,000 --> 00:10:01,000

And some say they're powerful enough to drag a submarine to perilous depths.

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00:10:01,000 --> 00:10:06,000

They can travel for miles and they can go at speeds of up to five knots.

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00:10:06,000 --> 00:10:09,000

You can't see very much evidence of them on the surface.

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00:10:09,000 --> 00:10:14,000

But how could an internal wave destroy a submarine?

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00:10:14,000 --> 00:10:22,000

A submarine has one job, which is to stay at the right depth. It's very easy to go sideways in the ocean, but up and down is critical.

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00:10:23,000 --> 00:10:31,000

In order to stay at a consistent depth, a submarine will adjust its buoyancy depending on the density of the surrounding water.

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00:10:31,000 --> 00:10:37,000

But if an internal wave envelops the vessel, that density can change in an instant.

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00:10:37,000 --> 00:10:41,000

If the water becomes more dense, it can push the submarine up.

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00:10:41,000 --> 00:10:46,000

But if it's suddenly less dense, the submarine can plummet.

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00:10:47,000 --> 00:10:53,000

That change in density could be enough to adjust the submarine's buoyancy in a way that it wasn't expected.

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00:10:53,000 --> 00:11:02,000

Without taking some kind of quick action to mitigate the actions of the wave, a submarine could easily be pushed below its safe operating depth.

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00:11:04,000 --> 00:11:10,000

In June of 2021, the Indonesian government abandons plans to salvage the wreckage.

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00:11:10,000 --> 00:11:16,000

They claim the risk and difficulty of raising it from the sea floor is currently too high.

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00:11:17,000 --> 00:11:27,000

So we may need to wait a little longer to find out what really happened to the Nangala, and if

internal waves were the invisible cause of its destruction.

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00:11:27,000 --> 00:11:31,000

Perhaps the truth will be found, but only at the bottom of the sea.

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00:11:31,000 --> 00:11:50,000

China, Russia and the US are spending big money to better understand internal waves and their potential impact on naval operations.

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00:11:50,000 --> 00:12:03,000

While this invisible phenomenon could be responsible for the tragic loss of the Nangala, more evidence is needed to definitively say what forced her to take such a deep and deadly dive.

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00:12:03,000 --> 00:12:22,000

When it comes to merchants of the high seas, no one has been more successful than the Dutch East India Company.

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00:12:22,000 --> 00:12:30,000

In the 1700s, the company was worth an estimated \$7.9 trillion in today's money.

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00:12:31,000 --> 00:12:44,000

A recently discovered shipwreck may finally reveal a hidden sign to the business in which sailors on board the ships were smuggling silver and playing the markets.

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00:12:49,000 --> 00:12:58,000

In 2005, a salvage team investigates the remains of a Dutch merchant ship 80 feet below the sea surface.

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00:12:59,000 --> 00:13:07,000

The Roseveg was lost off the southern coast of England on a treacherous 10 mile sandbar called the Goodwin Sands.

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00:13:08,000 --> 00:13:20,000

This ship disappeared. It was supposed to be sailing out to the Dutch held islands in Southeast Asia, and it turns out it never got further than the English Channel.

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00:13:21,000 --> 00:13:27,000

As they investigate the wreck, salvagers uncover a horde of unexpected riches.

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00:13:28,000 --> 00:13:35,000

It's found that this shipwreck has a cargo of silver, which is obviously highly valuable.

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00:13:36,000 --> 00:13:44,000

They find a thousand silver bars and around 36,000 silver dollars neatly stacked in chests.

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00:13:45,000 --> 00:13:52,000

These coins are the infamous pieces of eight, so called because they were worth eight Spanish reales each.

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00:13:52,000 --> 00:13:59,000

One coin is worth about \$100 in today's money. That means there's over \$3 million worth.

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00:14:00,000 --> 00:14:09,000

The ship was carrying silver for basic trade purposes. The Europeans wanted spices, they wanted porcelains, they wanted silks.

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00:14:09,000 --> 00:14:12,000

Where could you get them? The Far East.

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00:14:15,000 --> 00:14:20,000

The salvaged silver from the Roseveg is handed over to Dutch authorities.

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00:14:21,000 --> 00:14:30,000

But in 2017 a groundbreaking Dutch and English archaeological project revisits the Roseveg in a bid

to study and preserve the wreck.

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00:14:31,000 --> 00:14:37,000

Using state-of-the-art equipment to survey the site, divers make an unexpected discovery.

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00:14:37,000 --> 00:14:46,000

A different type of silver not previously detected and it's not neatly stacked in chests, but scattered across the site.

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00:14:46,000 --> 00:14:51,000

What's unusual is it's actually found in individual piles all over.

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00:14:51,000 --> 00:14:56,000

This strange surplus silver doesn't belong with the ship's cargo.

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00:14:56,000 --> 00:15:03,000

Does analysis of the coins suggest a secret unofficial industry involving the Roseveg's crew?

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00:15:03,000 --> 00:15:07,000

Who were the men on board? Were they merchants or smugglers?

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00:15:07,000 --> 00:15:28,000

Archaeologists excavating a Dutch shipwreck find vast amounts of silver coins scattered across the surrounding seabed in bizarre clusters.

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00:15:28,000 --> 00:15:35,000

The loose piles of money indicate they were being carried by individual sailors when the ship went down.

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00:15:35,000 --> 00:15:39,000

And there's something very strange about the coins themselves.

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00:15:39,000 --> 00:15:46,000

We find coins everywhere and when we started to prepare these out we saw that they were also very different.

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00:15:46,000 --> 00:15:51,000

These don't resemble the silver found in the chests in 2005.

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00:15:51,000 --> 00:15:55,000

Bizarrely, many of them aren't even from the same century as the Roseveg.

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00:15:55,000 --> 00:16:00,000

These coins turned out not to be those silver realas.

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00:16:00,000 --> 00:16:06,000

Some of the coins that they find are from the 17th century, which is a fourth century before the ship takes sail.

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00:16:06,000 --> 00:16:11,000

Even stranger, many of the coins have holes drilled through them.

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00:16:11,000 --> 00:16:23,000

We think those holes were there to put on a string and put it around your neck or maybe sew it into your clothes so nobody would see that you did have coins on board of the ship.

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00:16:23,000 --> 00:16:27,000

We had never seen that before. We had never seen those coins with those little holes.

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00:16:30,000 --> 00:16:38,000

Official records show the Roseveg should have been carrying 300,000 Dutch guilders worth of silver.

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00:16:38,000 --> 00:16:43,000

Now it's thought the ship was actually carrying double that amount.

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00:16:43,000 --> 00:16:49,000

There happens to be about twice as much money on the vessel as should have been there.

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00:16:49,000 --> 00:16:57,000

Why was there so much concealed silver on board and who was carrying it?

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00:16:57,000 --> 00:17:05,000

In 1740, the Roseveg's crew are employees of the Dutch East India Company, also known as the VOC.

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00:17:05,000 --> 00:17:08,000

Its business is global trade.

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00:17:08,000 --> 00:17:16,000

Compared to the world's wealthiest companies of today, the VOC is still the biggest corporation ever to have existed.

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00:17:16,000 --> 00:17:25,000

They owned these ships and shipping routes and the VOC were really very, very wealthy and very, very powerful.

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00:17:25,000 --> 00:17:36,000

Individuals on board are forbidden from bringing their own silver to trade, but it would have been very tempting given the high demand for the precious metal in the Dutch East Indies.

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00:17:36,000 --> 00:17:41,000

Silver was worth far more in the East Indies than in the Netherlands.

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00:17:41,000 --> 00:17:49,000

In some places it's more valuable than others. In the East Indies it's 30-40% more valuable than in Europe.

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00:17:49,000 --> 00:17:56,000

Anyone making the trip would be in a position to play the market, buying low and selling high.

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00:17:56,000 --> 00:18:04,000

If you didn't get caught and made it back from the East Indies with your goods intact, you could make a staggering fortune.

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00:18:04,000 --> 00:18:13,000

The sheer amount of illegitimate coins among the wreckage proves there were smugglers on board who hoped to cash in big.

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00:18:13,000 --> 00:18:22,000

In 2018, archaeologists excavate artefacts as unveil key details about the people on board.

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00:18:22,000 --> 00:18:29,000

Can any of these objects tell us who had secret plans to play the silver market?

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00:18:29,000 --> 00:18:36,000

We have oil lamps on board. We've even found complete wine bottles with the corks still on it. There's personal items.

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00:18:36,000 --> 00:18:41,000

There is a nice writing set. There are candles on board.

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00:18:41,000 --> 00:18:50,000

It's such a rare find to see one of these ships. We hear about them in history, but to actually see the tangible evidence.

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00:18:50,000 --> 00:18:57,000

Although many are well preserved, some of the nearly 300-year-old items are harder to examine.

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00:18:57,000 --> 00:19:06,000

The team find giant concretions, lumps of artefacts fused together over the centuries by sediment and iron rust.

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00:19:06,000 --> 00:19:11,000

Researchers believe they contain more smuggled silver.

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00:19:11,000 --> 00:19:18,000

Can x-rays help the team look inside and uncover the truth about the Roseveg smugglers?

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00:19:18,000 --> 00:19:24,000

Using these technologies, it could be possible to better understand the distribution of the coins on the ship,

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00:19:24,000 --> 00:19:29,000

and by doing that we can get a better sense of who these people were and what their story was.

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00:19:29,000 --> 00:19:35,000

The Roseveg crew range from high-ranking officers to deckhands and even soldiers.

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00:19:35,000 --> 00:19:41,000

Determining who was carrying the coins and who wasn't seems like an impossible task.

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00:19:41,000 --> 00:19:46,000

Can new scientific techniques identify these secret smugglers?

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00:19:46,000 --> 00:19:51,000

The Roseveg team are now excavating the ship.

172

00:19:51,000 --> 00:19:56,000

The Roseveg team are now excavating the ship.

173

00:19:56,000 --> 00:20:00,000

The Roseveg team are now excavating the ship.

174

00:20:00,000 --> 00:20:07,000

In 1740, Dutch trade ship the Roseveg sinks just one day into its journey.

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00:20:07,000 --> 00:20:17,000

The team now excavating the ship finds human remains among the artefacts, evidence of the 237 who perished.

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00:20:17,000 --> 00:20:22,000

But it's the strange silver coins in the wreckage that really get their attention

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00:20:22,000 --> 00:20:32,000

and suggest a secret smuggling plot who among the crew was on the take.

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00:20:32,000 --> 00:20:37,000

Some of the smuggled coins are bound up in large concretions with other artefacts.

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00:20:37,000 --> 00:20:44,000

Breaking them apart could destroy them, so the team uses special techniques to look inside.

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00:20:44,000 --> 00:20:48,000

The archaeologists keep the artefacts in special tanks of water.

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00:20:48,000 --> 00:20:52,000

They're also using x-ray techniques to take a look at the artefacts without taking them apart or damaging them.

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00:20:52,000 --> 00:20:57,000

We can't start to chisel a concretion if we don't know what's in there.

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00:20:57,000 --> 00:21:05,000

So we really have to look into the object and only then we can see that it is a coin, the coin is of silver.

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00:21:05,000 --> 00:21:08,000

So we have to be very careful to chisel it out.

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00:21:08,000 --> 00:21:15,000

They discover that many smuggled silver coins are mixed in with personal accessories like buckles and beads,

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00:21:15,000 --> 00:21:18,000

and they're found across a wide area.

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00:21:18,000 --> 00:21:23,000

The shipwreck is spread out over 600 feet on the seabed.

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00:21:23,000 --> 00:21:26,000

How do you bring it all together to help it make sense?

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00:21:27,000 --> 00:21:34,000

The excavations give the team a wealth of information, but it's not enough to identify the smugglers.

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00:21:34,000 --> 00:21:38,000

Who exactly were they and how much were they carrying?

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00:21:38,000 --> 00:21:42,000

Researchers must turn to the archives.

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00:21:42,000 --> 00:21:46,000

By scouring historical records, sometimes you can find a paper trail.

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00:21:46,000 --> 00:21:56,000

All these things have a little traces to somebody, and that's exactly what we did with the help of a lot of people

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00:21:56,000 --> 00:21:58,000

who are searching for those guys.

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00:21:58,000 --> 00:22:03,000

Cross-referencing the date of the ship's departure against bank records,

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00:22:03,000 --> 00:22:08,000

they uncover evidence of large and highly suspicious loans.

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00:22:08,000 --> 00:22:17,000

Daniel Ronsier, the Roseveg's captain, borrowed 17,000 Dutch guilders just before the ship sailed.

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00:22:17,000 --> 00:22:22,000

The equivalent of \$200,000 in today's money.

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00:22:22,000 --> 00:22:25,000

And he wasn't alone.

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00:22:25,000 --> 00:22:29,000

Some normal sailors had quite a lot of money with them.

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00:22:29,000 --> 00:22:34,000

That's how we found out that there was not just a little bit of smuggling money on board,

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00:22:34,000 --> 00:22:37,000

there was loads of smuggling money on board.

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00:22:37,000 --> 00:22:42,000

Working for the VOC was one of the toughest and most dangerous seafaring jobs.

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00:22:42,000 --> 00:22:51,000

Did the rewards outweigh the risks for the 237 men who went down with the Roseveg?

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00:22:51,000 --> 00:22:56,000

If you were caught with this silver, having it confiscated would be punishment enough.

206

00:22:56,000 --> 00:23:07,000

You would return home heavily in debt and face debtor's prison or worse.

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00:23:07,000 --> 00:23:14,000

And the wreck of the Roseveg may still have more to tell us.

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00:23:14,000 --> 00:23:21,000

The archaeologists have only found the stern of the ship and so a large section is still unaccounted for.

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00:23:21,000 --> 00:23:32,000

Has it been ravaged by the sea or is it waiting somewhere on the sea floor yet to be discovered?

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00:23:32,000 --> 00:23:39,000

Over the centuries, 246 Dutch VOC ships have sunk to the bottom of the sea.

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00:23:39,000 --> 00:23:44,000

If silver smuggling was as rife on these ships as researchers now believe,

212

00:23:44,000 --> 00:23:50,000

there could be millions of dollars worth of illicit treasure hiding in the deep.

213

00:23:50,000 --> 00:24:09,000

The world's coastlines are teeming with life with the majority of ocean creatures swimming near our shores.

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00:24:09,000 --> 00:24:16,000

People thrive here too with 40% of the earth's human population living close to a coast.

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00:24:17,000 --> 00:24:24,000

So what happens when this crowded zone becomes a toxic wasteland?

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00:24:28,000 --> 00:24:42,000

The Kamchatka Peninsula. A pristine and remote wilderness with towering volcanic peaks and dark sweeping beaches.

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00:24:42,000 --> 00:24:49,000

Kamchatka's shores are where eastern Russia meets the vast North Pacific Ocean.

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00:24:49,000 --> 00:25:02,000

In September 2020, several surfers are enjoying the waves when suddenly they're hit by a strange

sickness.

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00:25:03,000 --> 00:25:12,000

Surfers in the water describe a variety of adverse reactions including nausea, headaches and burning and itching eyes.

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00:25:12,000 --> 00:25:21,000

Some report what feel like chemical burns. More than 15 surfers are hospitalized.

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00:25:21,000 --> 00:25:25,000

They report the incident to local authorities.

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00:25:25,000 --> 00:25:32,000

But within 24 hours Kamchatka's waters go from bad to worse.

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00:25:32,000 --> 00:25:37,000

Video captured by beachgoers reveals a scene of mass death.

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00:25:37,000 --> 00:25:43,000

Lots of marine wildlife starts washing up on the beaches. Dead or sick.

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00:25:43,000 --> 00:25:51,000

It didn't matter what level of animal life in the sea you were talking about. Everything was dying.

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00:25:52,000 --> 00:25:57,000

Underwater footage shows the sea floor is now a marine graveyard.

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00:25:57,000 --> 00:26:03,000

Even stranger, some creatures look like they've been boiled alive.

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00:26:03,000 --> 00:26:09,000

Scientists estimate some 95% of sea life has been wiped out.

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00:26:09,000 --> 00:26:16,000

There's something deadly in the water here but we don't know what. Could this be a man-made disaster or an act of mother nature?

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00:26:17,000 --> 00:26:29,000

As the bizarre incident gains global attention, international observers suggest there is one culprit capable of causing such widespread death and destruction.

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00:26:29,000 --> 00:26:34,000

Kamchatka's mighty volcanoes.

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00:26:34,000 --> 00:26:38,000

One hypothesis is that volcanic activity could be to blame.

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00:26:38,000 --> 00:26:44,000

Kamchatka has over 300 volcanoes densely packed across the peninsula.

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00:26:45,000 --> 00:26:49,000

Well over 20 of these volcanoes are known to be active.

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00:26:49,000 --> 00:26:53,000

They can erupt with explosive force.

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00:26:53,000 --> 00:26:58,000

But it's the toxic gases they spew that can be just as deadly.

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00:26:58,000 --> 00:27:08,000

Around 20 miles from Kamchatka's beaches, Karimski Lake lies next to a volcano that was once thought to be extinct.

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00:27:08,000 --> 00:27:13,000

But on January 2nd 1996, the volcano erupts.

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00:27:13,000 --> 00:27:19,000

A sulfurous plume rains down, transforming the nearby lake into a toxic soup.

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00:27:19,000 --> 00:27:23,000

An ecological catastrophe ensues.

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00:27:23,000 --> 00:27:27,000

The water in the lake becomes extremely acidic.

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00:27:27,000 --> 00:27:33,000

All but the most simple versions of algae and bacteria cannot survive in this environment.

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00:27:33,000 --> 00:27:36,000

Everything else dies.

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00:27:36,000 --> 00:27:46,000

But around the time of Kamchatka's mass sea life deaths, there are no reports of the seismic shockwaves that usually accompany an eruption.

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00:27:46,000 --> 00:27:51,000

So volcanic activity is ruled out as the cause.

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00:27:51,000 --> 00:28:00,000

Instead, Russian officials suggest a different natural phenomenon could be to blame for this bizarre, watery disaster.

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00:28:00,000 --> 00:28:06,000

Satellite images reveal a strange yellow discoloration along the coast.

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00:28:06,000 --> 00:28:13,000

It prompts Russian researchers to link the catastrophe to a known ocean killer, algal blooms.

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00:28:13,000 --> 00:28:19,000

It's like a cancer of the ocean. It sucks up all the oxygen, all the nutrients.

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00:28:19,000 --> 00:28:25,000

It will take over an entire ocean if it is not controlled.

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00:28:25,000 --> 00:28:30,000

In the US, red tides ravish coastlines each year.

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00:28:30,000 --> 00:28:39,000

Blood-coloured microorganisms produce toxins that accumulate in shellfish, making any creatures that eat them sick or even worse.

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00:28:39,000 --> 00:28:46,000

This feeds on through the chain of marine ecosystem, all the way up.

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00:28:46,000 --> 00:28:54,000

Other species of blue-green algae called cyanobacteria can also release harmful toxins.

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00:28:54,000 --> 00:29:05,000

Humans who come into contact can suffer skin irritation, fevers and breathing difficulties, the same symptoms experienced by the Kamchatka surfers.

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00:29:05,000 --> 00:29:10,000

Did they encounter toxic algae as it washed ashore?

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00:29:10,000 --> 00:29:22,000

Some people think that Russian officials are quite keen to push this idea that algal blooms are to blame in order to move the attention away from possible other reasons for it.

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00:29:22,000 --> 00:29:27,000

It seems that this might not be the full story.

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00:29:27,000 --> 00:29:37,000

Environmental scientists conducting their own separate investigation find something shocking, evidence of industrial chemicals in the water.

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00:29:37,000 --> 00:29:46,000

A secret source leads the scientists to a site near Kamchatka's coast known to harbour decades-old industrial waste.

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00:29:46,000 --> 00:29:53,000

Could it be that some of the chemicals that were dumped here because they were deemed too toxic for industry are related to this problem?

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00:29:53,000 --> 00:30:00,000

Are thousands of dead sea creatures in fact the victims of a sinister man-made disaster?

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00:30:00,000 --> 00:30:19,000

On the coast where Russia meets the North Pacific, a deadly poisonous soup has wiped out 95% of ocean life.

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00:30:19,000 --> 00:30:25,000

Can water analysis reveal the identity of the mysterious killer?

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00:30:25,000 --> 00:30:36,000

Such a mass die-off of marine creatures is unusual and strange and needs to be investigated.

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00:30:36,000 --> 00:30:43,000

Samples from the ocean reveal concentrations of several unexpected toxic agents.

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00:30:43,000 --> 00:30:49,000

Two-four dichlorofenol is a compound used in pesticides.

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00:30:49,000 --> 00:30:54,000

Highly corrosive, it causes severe skin and eye damage in humans.

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00:30:54,000 --> 00:31:03,000

Another tetrachloromethane, banned because of its toxicity, can cause liver and kidney failure.

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00:31:03,000 --> 00:31:07,000

What we're seeing here is some kind of pollution event.

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00:31:07,000 --> 00:31:11,000

But where did it come from?

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00:31:11,000 --> 00:31:18,000

Just five miles inland, there's an isolated industrial compound called the Koselsky Chemical Landfill.

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00:31:18,000 --> 00:31:23,000

For decades, this site has been used to store barrels of poisonous and hazardous chemicals in the ground.

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The site is in a derelict condition.

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00:31:27,000 --> 00:31:31,000

The chemicals are actually seeping into the groundwater.

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00:31:31,000 --> 00:31:42,000

If any of these toxic substances get into the groundwater, it makes sense that they would flow into the ocean, right where this massive die-off occurs.

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00:31:43,000 --> 00:31:52,000

Despite evidence linking the Koselsky Chemical Landfill to the mass marine deaths, Russian officials publicly deny it.

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00:31:52,000 --> 00:32:02,000

Then in 2021, in a strange turn of events, authorities announced plans of a cleanup operation.

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00:32:02,000 --> 00:32:10,000

It seems odd that they would make plans to clear out and liquidate this facility just months after these claims.

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With Russian officials refusing to admit guilt, environmentalists are now closely monitoring the beaches at Kamchatka, amidst fears that the toxic waters could return.

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This is a real problem because this area is so rich in the ecological system.

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00:32:30,000 --> 00:32:39,000

It has some fantastic wildlife. It's very important that we need to protect these waters.

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00:32:41,000 --> 00:32:52,000

Whether it was an act of nature or industrial neglect, the Sea Life Massacre along the Kamchatka coast should serve as a warning.

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00:32:52,000 --> 00:32:59,000

The world's coastlines are a turbulent and blurred boundary between land and water.

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00:32:59,000 --> 00:33:09,000

In a place where humans and ocean creatures must coexist, where and when will the next toxic disaster strike?

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00:33:10,000 --> 00:33:15,000

The Sea Life Massacre

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00:33:19,000 --> 00:33:25,000

Across the vast blue expanses of our planet, there's a bizarre invasion underway.

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00:33:25,000 --> 00:33:33,000

Multiplying armies of jellyfish are taking over large areas of the world's oceans, where they've never been seen before.

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00:33:33,000 --> 00:33:42,000

Why are these freakish gelatinous life forms suddenly dominating our seas? And what could it mean for us?

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00:33:48,000 --> 00:33:58,000

Jellyfish have been around for 500 million years. They not only populate our coastlines, but they've also been found up to two and a half miles deep underneath the ocean.

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00:33:59,000 --> 00:34:06,000

Jellyfish are freaky. We have no real understanding of them. They have no brain as far as we can tell.

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00:34:06,000 --> 00:34:14,000

They may be very simple life forms, but venomous tentacles make jellyfish some of the most fearsome underwater inhabitants.

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00:34:17,000 --> 00:34:22,000

I've handled one of the world's deadliest creatures, the box jellyfish.

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00:34:23,000 --> 00:34:31,000

No one should approach these translucent terrors without extreme caution. This one has enough venom to kill 50 people.

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00:34:31,000 --> 00:34:37,000

I still can't compute the deadliness of the venom of this thing. This would kill people in a very, very short time.

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00:34:38,000 --> 00:34:55,000

These toxins are found in a cell that we call nematocyst, which are like little daggers. As the tentacle rubs up against you, it's like a harpoon.

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00:34:55,000 --> 00:35:01,000

And that injects a toxin into the victim. You're in a bad situation there.

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00:35:01,000 --> 00:35:08,000

Not all species have lethal stinging power, but in huge numbers they present a different kind of danger.

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00:35:08,000 --> 00:35:19,000

Studies now show that some 2,000 different species of jellyfish are turning up at unexpected times of the year in greater volumes than have ever been seen before.

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00:35:19,000 --> 00:35:23,000

One of the most bizarre phenomena in today's natural world are jellyfish swarms.

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Increasing jellyfish numbers around the world has puzzled scientists for decades.

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00:35:30,000 --> 00:35:41,000

Researchers aren't sure why this is happening, but one leading theory is overfishing, which has depleted our oceans worldwide.

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00:35:41,000 --> 00:35:48,000

With the fish gone, the jellyfish have access to all the food, so therefore their numbers grow exponentially.

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00:35:48,000 --> 00:35:57,000

And in a frightening twist, this jellyfish plague is wreaking havoc on some of the most dangerous structures on the planet.

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00:35:57,000 --> 00:36:05,000

For a non-thinking animal to take down a nuclear power plant is pretty phenomenal.

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00:36:16,000 --> 00:36:22,000

Across the world, multiplying armies of jellyfish are overwhelming our oceans.

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00:36:22,000 --> 00:36:26,000

And now they threaten our coastal infrastructure.

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00:36:26,000 --> 00:36:35,000

July 2020, in Israel, workers mount a massive cleanup after thousands swarm a coastal power station.

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00:36:35,000 --> 00:36:43,000

Video footage from the power plant reveals images of hundreds of blue jellyfish being swept down the chute and into a bin.

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00:36:43,000 --> 00:36:56,000

The plant needs a constant supply of cold seawater to run, and its complex filter systems are no match for the mysterious onslaught of jellyfish seemingly intent on shutting it down.

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00:36:56,000 --> 00:37:01,000

These washed in from the Mediterranean blocking the critical cooling system.

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00:37:01,000 --> 00:37:07,000

If the cool-down system goes down, that means trouble for the power plant.

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00:37:08,000 --> 00:37:17,000

It would be a costly setback for a coal plant, but for a nuclear power station, a jellyfish invasion has the potential for catastrophe.

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00:37:19,000 --> 00:37:26,000

In the last decade, four countries have been forced to shut down nuclear plants because of jellyfish swarms.

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00:37:26,000 --> 00:37:32,000

Without cold water to cool their reactors, meltdown is a real possibility.

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00:37:32,000 --> 00:37:37,000

Jellyfish can literally take out a nuclear power plant. It's crazy.

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00:37:37,000 --> 00:37:43,000

Why do these gelatinous zombie hordes seem to home in on our nuclear reactors?

318

00:37:43,000 --> 00:37:47,000

Is there something in the water that's attracting them?

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00:37:47,000 --> 00:37:54,000

What is now known is that these strange creatures absorb radioactive compounds from the ocean.

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00:37:55,000 --> 00:38:00,000

In 2015, scientists discovered radiation in three sets of jellyfish.

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00:38:00,000 --> 00:38:05,000

Could there be a connection between radioactivity and these bizarre jellyfish invasions?

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00:38:05,000 --> 00:38:13,000

Scientists think these ocean drifters somehow accumulate radio-nucleides, radioactive atoms found in the sea.

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00:38:13,000 --> 00:38:20,000

When radioactive compounds accumulate in sea jellies, we could have a really big problem.

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00:38:20,000 --> 00:38:26,000

It's called bioaccumulation. This contamination can travel through the entire food chain.

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00:38:26,000 --> 00:38:35,000

Jellyfish are the world's filtration system. They go through the oceans and they pick up everything that's flowing through it.

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00:38:35,000 --> 00:38:40,000

So if the world's oceans have radiation in them, they're going to pick it up.

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00:38:40,000 --> 00:38:45,000

Could this radioactivity be affecting jellyfish evolution?

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00:38:45,000 --> 00:38:50,000

Scientists are now finding that jellyfish all over the world are getting bigger.

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00:38:51,000 --> 00:38:58,000

Over the last four years, the shores of Japan have been invaded by the giant Nomura jellyfish.

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00:38:58,000 --> 00:39:07,000

Growing to more than six feet in diameter and reaching over 400 pounds in weight, they are truly gargantuan.

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00:39:07,000 --> 00:39:14,000

In 2009, a Japanese fishing trawler was sunk by giant Nomura jellyfish.

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00:39:15,000 --> 00:39:23,000

They were the size of cars and there were hundreds, if not thousands of them, all around the trawler, overwhelming it.

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To limit the destruction caused by these enormous creatures, scientists are desperately trying to predict where swarms will occur.

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00:39:32,000 --> 00:39:40,000

The problem really with jellyfish is that they appear out of the blue and we can't really predict when they're going to come or where they're going to come.

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00:39:41,000 --> 00:39:51,000

Scientists know that overfished areas of the ocean allow jellyfish to thrive and multiply, but there might be even stranger forces driving them towards our coastlines.

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00:39:51,000 --> 00:39:55,000

Jellyfish swarms could be controlled by the moon.

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00:39:55,000 --> 00:40:02,000

In 2016, a research scientist mixed inroads into why and where jellyfish blooms may occur.

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00:40:02,000 --> 00:40:06,000

He finds that they may be connected to the lunar cycle.

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00:40:07,000 --> 00:40:14,000

Data shows that big swarms occur in the days before and during a full moon, but we have no idea why.

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00:40:14,000 --> 00:40:23,000

We do know many other animals, including to an extent humans, are impacted by the lunar gravitational fields.

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00:40:26,000 --> 00:40:31,000

There's no obvious way to fight back against this sinister wave of slime.

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00:40:31,000 --> 00:40:40,000

In fact, it's thought that as the world's human population increases, so will the environmental conditions that favour jellyfish.

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But we don't have enough historical data to determine if this is a natural fluctuation or if the jellyfish army is here to stay.

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00:40:49,000 --> 00:40:53,000

New species of jellyfish are discovered every year.

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00:40:53,000 --> 00:40:58,000

They are on our coastlines. They're two and a half miles down in our oceans.

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00:40:58,000 --> 00:41:02,000

They're everywhere. They seem to be evolving and more seem to be coming about.

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00:41:02,000 --> 00:41:09,000

What's the next chapter in the evolution of this resilient and long-living type of species?

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00:41:10,000 --> 00:41:18,000

In a final terrifying twist, it's now thought that our gelatinous adversary has the ultimate weapon in its arsenal.

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00:41:18,000 --> 00:41:20,000

Immortality.

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00:41:20,000 --> 00:41:30,000

Humans have very clear age limits because our cells begin to regenerate slower and we lose our ability to grow new tissue in the way we would when we were babies.

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00:41:30,000 --> 00:41:37,000

Jellyfish, on the other hand, don't have those mechanisms, so if some people theorise, they might be able to live forever.

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00:41:37,000 --> 00:41:44,000

We really don't understand them. They could be the key to unlocking eternal life. We don't know.

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00:41:50,000 --> 00:41:55,000

The rise of the jellyfish shows no signs of slowing down.

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00:41:55,000 --> 00:42:02,000

Experts now think that within 40 years, they'll be the dominant species in many marine ecosystems.

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00:42:02,000 --> 00:42:10,000

Unless we find a way to stop it, this spineless invader is in line to become the new King of the Ocean.