26 Stories from the

nature worlds

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Finding Nemo

Coral reef basin
Royal blue tang (*Paracanthus hepatus*), yellow tang (*Zebrasoma flavescens*), Desjardin's sailfin tang (*Zebrasomadesjardinii*), clown triggerfish (*Balistoides conspicillum*), Picasso triggerfish (*Rhinecanthus aculeatus*), Queen coris (*Coris formosa*), redtoothed triggerfish (*Odonur niger*), anemonefish (*Amphiprion*, small picture)
Biotope: Indo-Pacific

Fish in tropical coral reefs come in a whole host of opulent colours, ranging from yellow or red checks to blue and black or bright orange. It is a case of anything goes. Clown trigger fish are noticeable for their white spots, yellow tang glow (as the name suggests) in bright yellow, and Desjardin's sailfin tang are covered in lots of light and dark stripes.
To us, these are unusual sights because the fish we are familiar with from the North Sea and the Baltic are usually silvery and in colours that camouflage them. Is a perpetual Mardi Gras going on in the South Seas? No, the blaze of colour in the tropical reef has a practical purpose. The vast coral colonies, whose many niches and grottos serve as a habitat for the fish, resemble a high rise with hundreds of apartments. But instead of doorbells with names next to them or house numbers, it is the striking colour combinations, unique to each species of fish, that make each fish stand apart. This is how husbands and wives or lovers spot each other, or children locate their parents. Any creature interested in a new dwelling easily recognises where there is a vacancy and turf wars of the aquatic kind are avoided. After all, fish do not want any trouble with the neighbours either.

In great shape for a swim

Amazon basin
Silver arowana (*Osteoglossum bicirrhosum*), freshwater stingray (*Potamotrygon leopoldi*), tiger oscar (*Astronotus ocellatus*), silver dollar (*Metynnis hypsauchen*), silver prochilodus (*Semaprochilodus taeniurus*).
Biotope: Amazon

The Amazon River drains the Amazon basin, which covers almost the entire northern half of South America. It is an enormous freshwater area, surrounded by tropical rainforest. Some calculations surmise that about one fifth of the freshwater on Earth flows through the rivers of the Amazon basin. As a result, biodiversity is colossal with about 2,000 different types of fish alone, four times as many as in the whole of Europe.
Similar to any ocean and lake, this water system also has several storeys, just like a house. There is the river bed, an "open-ocean zone" in the middle and the surface of the water. Just like human beings, fish are also choosy when it is a case of living on the top or bottom storeys. Some of them like "rooftop terraces", others prefer to be at "ground level". However, in this case, their preferences are due to evolution and not choice. Many thousands of years adapting to the environment determines the creatures' form. A fish that lives on the surface of the water, such as the silver arowana, has a straight back and is not round like pelagic fish such as the silver dollar. Species of fish living in the open-ocean zone have evenly shaped bellies and backs to stabilise their bodies while swimming. Catfish and rays live right down on the riverbed. Their bottoms are flatter, or, in the case of rays, completely flat – and can lie quite well camouflaged on the riverbed and burrow themselves into it for good measure. The biotope quite literally shapes the way they look.

Flat and spotty

A tank full of flatfish
The tub gurnard (*Chelidonichthys lucernus)*, small-spotted catshark (*Scyliorhinus caniucula*), plaice (*Pleuronectes platessa*), turbot (*Scophthalmus maximus*), Atlantic cod (*Gadus morhua*)
Biotope: North Sea and Baltic

It is not only fish gourmets who will have heard of turbot, flounder or plaice. Biologists are also interested in flatfish due to the special nature of their anatomy.
Their unusual body shapes make them look as if they have been squashed flat. However, when they swim on the bottom of the tank, it is not the top of the creatures you see – because they do not lie on their stomachs but on their sides! The turbots' physiques are just like any other small fish, but after four to six weeks, their eyes move to the left half of their bodies and to the right where plaice is concerned. The creatures develop asymmetrically with a spotty side where the eyes are and a plainer side towards the seabed. And by the way, just like chameleons, the shape and colour of the creatures' spots can change to match the seabed beneath them. And their flat bodies are perfect for life on the seabed.
The body shape and spots help camouflage them. But why do flatfish have to conceal themselves? Camouflage is the perfect disguise and useful in the animal kingdom for two reasons. On the one hand, when you are out hunting, nobody can see you and you get closer to your prey, increasing the chance of success. On the other hand, you are not detected as prey yourself and the enemy usually just passes by while it is still hungry.
Both aspects apply to flatfish because they are hunters. Little crabs, mussels or bristle worms are their chief source of food. But they can also be prey themselves – larger fish enjoy a nice piece of plaice.

Steller's sea cow skull
(*Hydrodamalis gigas*)
18th cent.
approx. 70 × 35 × 40 cm
Place found: Bering Island

The sea cow that came in from the cold

In 1741, the shipwreck of a vessel belonging to a Russian expedition on the Commander Islands off the Kamchatka Peninsula led to an exciting discovery. A gigantic sea cow once lived in the cold subarctic sea water and, at almost eight metres in length, it was much larger than the two genera familiar from warm waters, the dugong and manatee. Physician and zoologist, Georg Wilhelm Steller, was amazed at how easy it was to catch the gigantic sea cow and used his involuntary sojourn on the island to carry out detailed anatomical studies. He provided a description, which was published some years after his death by a colleague in 1751.

By 1768, seal hunters had wiped out the vast sea cow. Which makes the exhibited skull of Steller's sea cow, named after the first person to describe the creature, so valuable because it is one of the last on Earth.

Its large downturned "nasal section" is particularly striking. This was where a very broad, fleshy-muscular snout, the beginnings of a trunk, was positioned.

This reconstruction tallies with Steller's descriptions and the anatomy of sea cow species still alive today. But despite the name, none of them is related to cows in any way, or to seals or whales, which we might assume given their way of life. Elephants are sea cows' nearest relatives!

As strict vegetarians, the vast sea cows needed a huge amount of food.

Just like today's species, Steller's sea cow therefore grazed with its flexible snout in the enormous biomass of green algae and the long kelp and chewed these with keratinous plates instead of teeth.

Copper cyclosilicate (*Dioptas*)
approx. 18.5 × 13 × 14.5 cm
Place found: Tsumeb mines, Namibia
Bahlsen collection

Gorgeous green

When identifying minerals, experts seldom go by the colour because this varies greatly for one and the same mineral. The colour of the mineral is determined by the environment in which it is formed. However, the fascinating cold-green glitter and lustre of the dioptase crystals is always equally pronounced and therefore characteristic.

Although this copper cyclosilicate is very beautiful and sometimes called copper-emerald, it is rarely turned into jewellery because with mineral hardness of 5, it is relatively soft compared with a diamond (with mineral hardness of 10) or the equally green true emerald (with mineral hardness of 7.5 to 8), with which it is understandably easily confused.

The dioptase is all the more important for collectors because it is what is known as an ore piece, in another words, a large piece with well-formed crystals and usually in typical adhesions with other minerals. In the case of the dioptase, these minerals are usually calcite. This piece is part of the collection that belonged to Klaus Bahlsen, who was very interested in minerals and whose collection was donated to the Landesmuseum by the Rut and Klaus Bahlsen Foundation.

However, it is not collecting them that raw materials geologists are primarily interested in when they find dioptase in the field. Dioptase is formed in the weathering belt or oxidised zone of copper ore deposits and therefore indicates the presence of the sought-after metal. Our piece comes from the world-famous Tsumeb copper mines in Namibia.

From a global standpoint, dioptase is a rare mineral. In addition, standard collections usually contain much smaller specimens – which is why our dioptase is a real gem thanks to its extraordinary size.

Recent scallop (*Chlamys pallium*),
fossil scallop (*Pecten asper*)
Upper Cretaceous,
approx. 70 million years old
Fossil: approx. 8 × 8 × 5 cm
Recent: approx. 8.5 × 9 × 3.5 cm
Place found: England (Warminster)

Splendid shell

The scallop was a popular object for natural history experts, pilgrims, heraldists, gourmets, speculators and cinephiles alike. It is a symbol of the Camino de Santiago, a delicacy and a logo for a big oil corporation and its beginnings can be traced back to the trade in molluscs and snails. It is considered one of Earth's molluscs par excellence.
The world's oceans are home to many different species of scallop in living and fossilised form. They are identifiable by their one or two valves on the shell's hinge. Untypically for a mollusc, this is held together by one single big muscle, which gourmets know all about. Scallops live very differently: some bury themselves in the sand and others can even swim.
In terms of size and appearance, this group is very varied. The shells are often brightly coloured in red, yellow or a soft pink. This colourfulness is not a unique feature of the species around today; even in this group of molluscs, which is more than 360 million years old, traces of colour were found in the petrified shells. The original pigments have not been preserved, but mineralised traces of its daughter products have. The world of now-extinct molluscs and snails in palaeotropical waters must have been a very colourful one 360 million years ago.

Not a flower but a marine animal

Sea lilies are not categorised as plants, not even fossilised ones. They are animals closely related to other echinoderms! The best way of describing what they look like is to imagine a flexible starfish with lots of tentacles whose back is anchored to the seabed by a stalk. Sea lilies' tentacles point upwards and are used to retrieve particles of food from the seawater and place them in their mouths in the middle of their "calyx".

In the Middle Ages, the small, chalky discs that form the stalk were thought to be tiny petrified coins and called "Boniface pennies" in many places. The Landesmuseum's vast collection compiled by collector Otto Klages has numerous sea lilies of this type. By a strange coincidence, Klages used particularly well-preserved and complete sea lily fossils as a form of currency. He liked to trade the sea lilies he had collected from the Elm hills for impressive pieces owned by other fossil collectors worldwide.

In the past, an enormous number of fossilised sea lilies were found on the Elm, a ridge of hills near Königslutter. However, as the extraction of shell-bearing limestone, which brought the sea lilies to the surface in the first place, no longer takes place there, it has been largely amateur palaeontologists who have been collecting the fossils over the past few decades. Consequently, sea lilies are no longer found in the Elm hills. It would take freshly crushed rock or a long phase of weathering to produce new finds.

A limestone block with fossilised sea lilies (*Encrinus liliiformis*)
Shell limestone, Middle Triassic,
240 million years old
Limestone block: 85 × 55 × 11 cm
Place found: Erkerode
on the Elm hills
near Königslutter

Fossil of an ichthyosaur
(*Ichthyosaurus communis*)
Lower Jurassic, Lias,
190 million years old
Length: approx. 255 cm
Place found: Doniford Bay,
United Kingdom

Ichthyosaur in the living room

The primeval creature with its snout pointing upwards must have looked menacing in photographer Ernst Schwitters' living room. Did the son of the famous Dadaist Kurt Schwitters realise that it had been hung up the wrong way?
The fossilised skeleton probably protruded from the surrounding sediment when it was discovered, which is why the less weathered bottom was prepared. So, the skull, which today so strikingly points towards the person looking at it, was slightly lower than the rest of the body when positioned properly. Preparators jokingly describe this slanting position of its head as somewhat "kamikaze-like", as if the ichthyosaur had rammed itself obliquely into the mud. In fact, the very heavy skull of the ichthyosaur's carcass only sank deeper into the mud of the seabed at the time than the rest of the body because of its extreme weight.
Over 190 million years ago, the ichthyosaur's body might have been deposited not far from an erstwhile coast – as is evidenced by an insignificant-looking branch from a terrestrial plant at the top of the fossil plate, whose well-preserved leaf pinnation indicates that it had not come far. However, the many metallically colourful shimmering ammonites (in what is known as pyrite preservation, after the mineral fool's gold) are clear indications that the habitat of the primeval animal was the open sea. Even if this slab should really be placed in the display cabinet with the bottom facing upwards, the three-dimensional preserved bones and, above all, the skull, which appears to extend upwards, are trademarks of this magnificent ichthyosaur fossil.

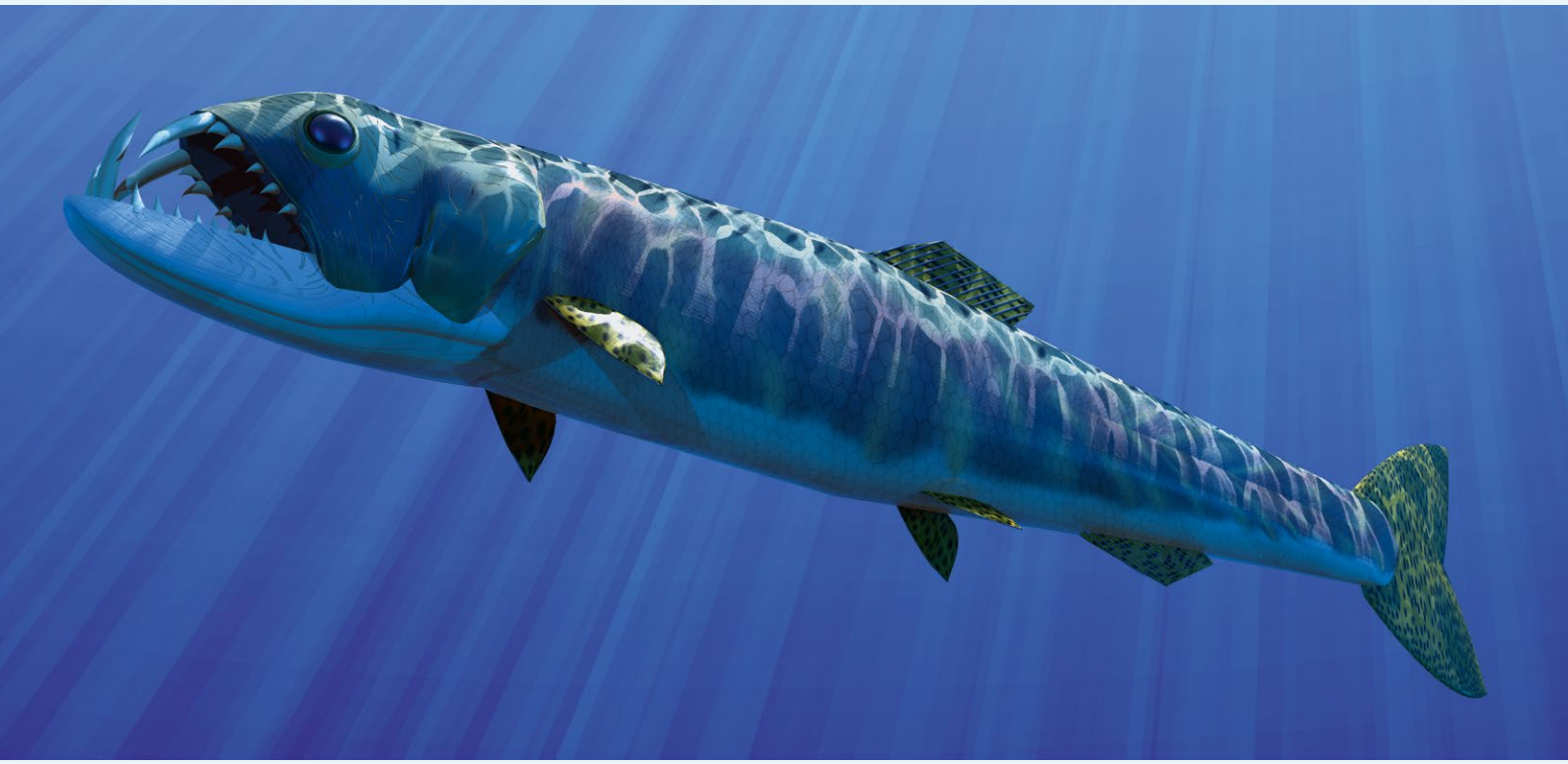
Urchins with a heart

Heart urchin
(*Micraster schroederi*)
Upper Cretaceous,
Lower Campanium,
75 million years old
approx. 6 × 6 × 4 cm
Place found: Teutonia mine,
Misburg, near Hanover

Heart urchins live in the seabed sediment quite happily. In contrast to their round cousins with their hedgehog-like, protruding chalky spines that graze on algae on the sea bed, the heart urchins like to bury themselves slowly into and through the muddy sediment. Similar to lugworms, they eat the sediment and digest the parts useful to them while burrowing. As heart urchins have no enemies in the mud and because it would interfere with burrowing, their spines are merely a sort of chalky "shorthaired coat", which is rarely preserved in fossilised heart urchins.

No other fossil is as characteristic of northern Germany as the heart urchin. Vast and well-preserved quantities of them can be found in the marl pits to the east of Hanover. Numerous fossil collectors from all over Germany, the Netherlands, Scandinavia, Italy and other European countries flock to the Höver and Misburg marl pits every year to find these sea urchins and lots of other important fossils. Only in a few places are the strata, formed during the Upper Cretaceous, so rich in fossils and, in addition, as a result of continuous marl mining, so ideal for making cement, as geologists have noted.

In biological terms, the fossils of the *Micraster* genus are close relatives of *Echinocardium cordatum*, the little heart urchin now living in large numbers in the North Sea.



The sabre-toothed herring of Hanover

Ray-finned fish (*Enchodus*)
Upper Cretaceous, Campanium,
70 million years old
95 × 40 × 2 cm
Place found: Hanover-Anderten,
HPCF II pit

Anyone looking at the long, sharp teeth of the sabre-toothed herring will understand the reason for the common nickname of this fossilised fish.
The *Enchodus* was up to 1.50 metres in length, lived 80 million years ago and was also found in Hanover's chalk sea. During this Mesozoic period and at the same time as the dinosaurs on land, modern fish – known as *Neopterygii* – in the oceans started their triumphant march, which is still continuing today. The flat, rigid skulls of their predecessors were transformed into a system of light, bony sticks and individual elements anchored here and there, some of which can be moved against each other, giving the skull a wide range of motion. As a result, many of today's fish, like carp and perch, can pout. However, because of this delicate and multi-part structure, it is only usually possible to find skulls belonging to their fossil ancestors that have disintegrated in lots of parts.
The same applies to our specimen, which was discovered during cement mining in the east of Hanover. Despite the shattered skull bones, the big head and the pointed teeth are easy to see. And although *Enchodus'* appearance is often compared with viperfish or frogfish, it looks more like a modern barracuda.
Our sabre-toothed herring was a dangerous predatory fish, but still managed to land in the stomachs of larger fish or giant marine dinosaurs, as fossilised stomach contents prove.

A guest comes to stay

This large white bird called a gannet has been breeding regularly on Germany's small island of Heligoland with its red cliffs since 1991. The island offers plenty of juicy fish and a strong breeze, making it an ideal environment for this bird, which weighs three to four kilos. Because the bird's flight musculature is comparatively weak for its weight, it needs a lot of wind beneath its wings to take flight.

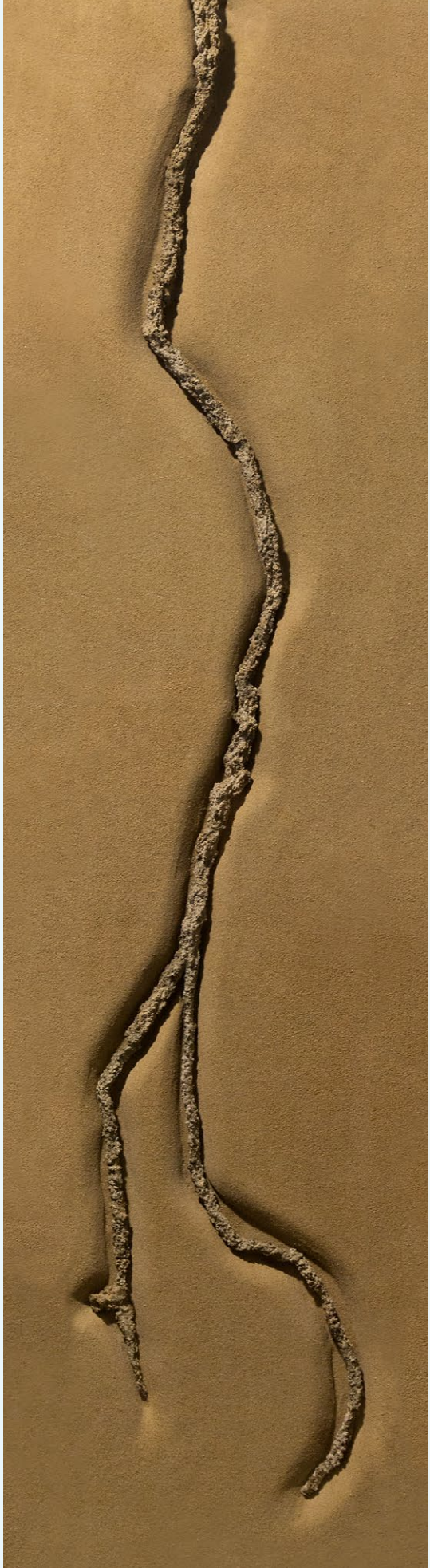
Once in the air, the gannet is a superb glider. It really picks up speed when it swoops to catch its food: at over 100 kilometres per hour, it plunges into the water and, thanks to the momentum and a few flaps of its wings, reaches depths of up to 15 metres. It occasionally looks for sand eels in shallow water, but it mostly seeks haddock, mackerel or herring.

Gannets raise their young from April to October. Each pair has one single chick that grows up in a crib made of seaweed, sea grass and often bizarre objects that its parents find. The young birds then fly to southern climes, to the coasts of West Africa or the Mediterranean. While they cover considerable distances, particularly during their first migration, their parents prefer shorter hauls and some of them remain in the colony, even in winter.

Why are these birds called gannets? The name comes from the Old English word "ganot", meaning "strong" or "masculine". The animals have been breeding on Bass Rock in Scotland on the cliffs since the 12th century and total over 40,000 pairs per year!

There are not as many on Heligoland's "Lange Anna" – the red rock formation on which the gannets breed. But there are over 1,200 of them today compared with just under 80 in 1991. That is quite a dramatic increase!

Gannet (*Morus bassanus*)
Specimen
Head-torso length:
80–110 cm
Biotope:
seashores



A petrified bolt of lightning (*Fulgurite*)
Pleistocene sands from the last ice ages, the exact time the bolt of lightning fell is unknown
210 × 40 × 10 cm
Place found: Lüneburg Heath (Drawehn?)

A blast furnace in the Heath's sand

Bolts of lightning cannot really petrify of course, but this fascinatingly well-preserved fulgurite in Hanover's Landesmuseum does at least trace how the lightning fell.
Fulgurites are basically made of a kind of glass. Nowadays, to produce glassware, quartz sand is mixed with lime and soda and heated at high temperatures of up to 1,500 °C to produce an elastic, tough and malleable mass. However, the substance is not completely liquid, which is partly due to quartz's very high melting point of over 1,700 °C.
The loose sandy soils on the Lüneburg Heath consist mainly of grains of quartz and just a very few other minerals. If a natural bolt of lightning, with original atmospheric temperatures of sometimes over 20,000 °C, strikes here, the grains of quartz and minerals are fused (sintered) with one another like glass. This occurs around the bolt of lightning so that a characteristic, albeit irregular, "tube" is formed whose cavity allows reliable identification of fragments of these fulgurites in the field.
The material produced by the natural bolt of lightning on quartz sand is a pure quartz glass – in other words, without soda and lime – of the type used today when manufacturing high-temperature crucibles for labs. Precious metals like platinum can be melted in these types of crucibles, which are made of the same material as fulgurites.

Supplanted by the wrong mink

European mink
(*Mustela lutreola*)
American mink
(*Neovison vison*)
Specimens,
American mink head-torso
length: 30–45 cm
European mink head-torso
length: 28–40 cm
Biotope: forest mire, marshes,
the banks of rivers and lakes

What a thrill at Lake Steinhude – mink are back! Thanks to the hard work of an association called EuroNerz from Osnabrück, these small creatures are gradually returning to Europe and can be found at Lake Steinhude and in the Saarland. Various zoos in Germany and abroad are also breeding them. Only a short time ago, the animals were only encountered in a very few places in Europe, the home of the mink. Mink was thought to be almost extinct.
Could this be due to all the mink coats that were in fashion for so long? Yes, but only indirectly because mink coats are made from the fur of the American mink. The American mink (see top photo) is the American cousin of European mink (see bottom photo). These were and are also kept in farms for their fur in Europe. But some minks escaped from being factory-farmed. As American mink is slightly bigger than an European mink but both species share the same diet, the North American relative had an advantage over its European cousin in the quest for prey. In addition, its biotope, the small, woody banks of rivers and lakes, were increasingly destroyed by man. The last European mink spotted in Germany was in the valley of the Aller river in Lower Saxony, in 1925. Almost a century later, they returned in 2010. There is a very successful reintroduction project at Lake Steinhude and the first European mink kits have been born in the wild. What a sensation!

Fan palm in a fish bowl

The palm tree once grew on the beach of an azure lagoon, probably in the midst of other tropical plants while colourful fish swam through the water. Everything must have looked like a coast in the Indo-Pacific.

However, this wonderful fossil of a fan palm was encountered in northern Italy on Monte Bolca, together with an unbelievable variety of petrified species of coral fish of the type occurring in the Indian Ocean today. Traces of colour in the fossils indicate that these fish were apparently just as colourful as their modern-day relatives. Analyses of the limestone also confirm that a secluded bay must have been close to Verona back then.

Monte Bolca has been known for its fossils since the 17th century. The place where the specimen was found owes its Italian nickname, "Pescaria" or fish bowl, to its abundance of fossilised fish. The complete plants and coloured fish discovered here were particularly sought after for museums in the 19th century.

Our palm, which initially looks somewhat insignificant, is 45 million years old, but fully preserved in its enormous, hard limestone block. Silica deposits provide stability for its delicate, fanned-out leaves, which is why these are so perfectly preserved.

Palms are some of the early flowering plants – they originated back in the Cretaceous about 80 million years ago. Since they are so old as a group, they developed and were much more diverse than many other plant groups.

Fan palm
(*Latanites chiavonica*)
Middle Eocene, Lutetium,
approx. 45 million years old
Height: approx. 280 cm
Place found: Monte Bolca near
Verona, Italy

Lavandula canariensis MILL.

Familie: Lamiaceae (Lippenblütler)
Dt. Name: -
leg. (Natur): Krause (2010), La Palma
leg. (Kultur): B.O. Schlumpberger (19.05.2014), Hannover (Berggarten, 2010-G-15)

Sweet lavender

Herbarium sheet with lavender (*Lavandula canariensis Mill.*)
Plant height: up to 150 cm
Biotope: coastal regions of the Canary Islands

Imagine lilac-coloured, enchantingly fragrant fields as far as the eye can see. If lavender comes to mind, we automatically think of Provence in France. But this type of lavender grows on the Canary Islands. Because of their remote location in the middle of the Atlantic Ocean, the Canary Islands are home to over 500 species of flora and fauna that are not encountered anywhere else – including four species of lavender. This colourful plant with its delicate flavour is called "hierba de risco" there, which means "grass on the steep rock". And it is true, *Lavendula* in the Canary Islands prefers rugged conditions and grows in the often extremely arid and rocky coastal regions of the islands. Its leaf shape, which is not typical of lavender, shows that it has adapted to this dry and windy climate. The leaves are not shaped like a lance but a feather instead. On the other hand, very hairy stems and leaves are typical of the group of 30 to 40 species of lavender that occur throughout Europe and the Near East. People have been creating herbaria to document, more accurately identify and, above all, be able to compare plants, for centuries. The dried and pressed plants are mounted on paper and stored in them. Some famous herbaria contain several millions of documents. Our lavender was pressed in 2014 for the newly designed exhibition in the Landesmuseum.

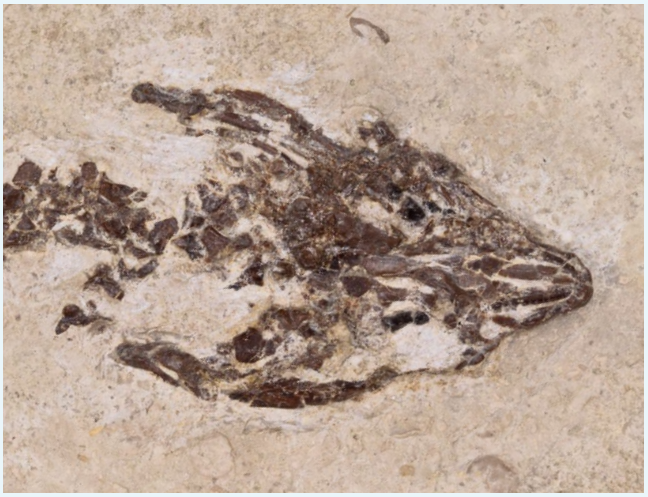
Not just on the Nile

Crocodiles have been around for over 220 million years, or since dinosaurs roamed the Earth! Today's "real" crocodiles occur throughout the world, especially in Africa and Asia. Nevertheless, there are some species in the New World, too, where they are found from Central America to South America alongside the caimans and alligators, which are typical for this region. One of these is also the Cuban crocodile.

Crocodiles are listed as highly endangered reptiles in Appendix 1 of the Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora, making trading them impossible or subject to strict controls. But they are considered to be dangerous and therefore often killed locally or brought to zoos. Most species of crocodile living in the wild today probably do not reach their maximum size anymore. Reports from the 19th century describe encounters with Cuban crocodiles up to five metres long. Our Cuban crocodile is just under three metres long, but still considered to be fully grown.

Typical for real crocodiles is – in contrast to caimans and alligators – a large, canine-like lower jaw tooth, which projects above the upper jaw from below. Crocodiles' teeth are generally characteristic features and usually come in the form of robust cones with a wide base, front and rear cutting edges and a system of fine longitudinal grooves to help stability, just like a corrugated iron sheet. This biomechanical principle is ancient and can also be seen in the extinct giant sea crocodiles that once swam in Hanover's Upper Jurassic Sea, as the *Machimosaurus* tooth fossil proves.

Cuban crocodile
(*Crocodylus rhombifer*)
Specimen, length: 265 cm
Tooth of an extinct machimosaurus crocodile (*Machimosaurus sp.*)
Upper Jurassic, 155 million years old
Length of fossil: approx. 7 cm



Fossilised tuatara
(*Kallimodon pulchellus*)
Upper Jurassic, Kimmeridgian,
155 million years old,
Length: 31.9 cm
Place found: Ahlem near Hanover

Elderly lizard

It was probably a beach 155 million years ago, located near today's Ahlem close to Hanover, where an approximately 30-cm-long, somewhat elderly prehistoric lizard was making its way through the tropically warm sea water between the reefs in search of tiny fish to eat. It was its last ever hunt for prey before it perished and its body sank completely into the soft lagoon bed and hardened into limestone.

In the 19th century, an Ahlem quarry extracted this limestone. An agriculture assessor called Carl E. F. Struckmann, who was interested in palaeontology, was looking for fossils there and discovered the petrified skeleton of the little lizard. He was quite right in assuming that it was not a modern lizard but the fossil of a tuatara.

Tuatara do still exist today, but there are only two species left on islands off New Zealand. These "living fossils" are the last descendants of their almost 155-million-year-old relatives and of our lizard from the Hanover area. They also have unique spines and lots of prehistoric characteristics, such as a parietal eye, or third eye, which is photoreceptive.

Tuatara can live until they are a ripe-old age. They do not become sexually mature until they are over 20 and are guaranteed to live until at least the age of 80 but probably 100. How old would our little lizard from Ahlem have been when it died?

Masters of disguise

Patterns on butterflies (*Nymphalidae*)
Numberwing (*Callicore astarte*)
Owl butterfly (*Caligo sp.*)
Specimens, *Callicore:* 5 × 3.5 cm,
Caligo: 12 × 10 cm
Biotope: Central and South America

With a wingspan of 13 cm, the owl butterfly is a giant among butterflies. But its size is no deterrent to hungry birds. To ward off predators, it has a clever trick in store that biologists called mimicry: it pretends to be dangerous. It is easy to spot an enormous eye on its back. This imitation is considered the best in the butterfly world, even the bright iris is copied by a white circle. Predators chancing upon the tasty-looking butterfly in the canopy of leaves will certainly shy away if it looks like an unidentifiable giant animal with big eyes when its wings are folded up.

The numberwing (also known as the eighty-eight) has a smart pattern on the bottom. It cannot boast big eyes but does have a brightly coloured eighty-eight on its underside. And this bold pattern clearly prevents it from being gobbled up.

Both butterflies are members of the same family, *Nymphalidae*. There are over 6,000 types in this large group of butterflies. In Germany, the peacock butterfly, the small tortoiseshell or the red admiral belong to this group. Typical of *Nymphalidae* is that one of their pairs of legs is much shorter. The butterflies sit on their two pairs of hind legs while the front pair are only used for cleaning themselves. Whether they come with or without an eye on their wings, South America's tropical butterflies are very attractive.

Oil bird
(*Steatornis caripensis*)
Specimen
Head-torso length:
40–49 cm
Biotope:
caves in Venezuela

Humboldt's cave birds

While still in the nest, these young birds gain quite a lot of fat around their hips and legs. But the reason for their "problems" with their figures lie, of course, in their diet. Nocturnal birds usually hunt other animals. Nightjars look for insects and owls pursue other vertebrates like mice. The oil bird is nocturnal but a vegetarian. Its diet consists of fatty oil palm fruit, which makes the young put on so much weight, as previously mentioned. Which is why, in the past, they were originally hunted by Native Americans and later by missionaries because this fat could be turned into crystal-clear, tasty oil, which, above all kept for a long time even in tropical temperatures.

These cave dwellers were discovered by no-one less than Alexander von Humboldt who, in 1799, also described the striking cries they made. These birds need to be able to navigate and communicate with one another in complete darkness, but in contrast to bats, they do so at low frequencies instead of extremely high ones. Therefore, their cries are also audible to humans and also made an impression on Humboldt during his major South American expedition in 1799: "It is hard to imagine the terrible noise that thousands of birds make inside the cave in the dark", he wrote.

Bush dwellers

Agouti (*Dasyprocta* sp.)
Specimen
Head-torso length: 42–62 cm
Biotope: tropical rainforests
of Central and South America

Agouti is a rodent species of the genus *Dasyprocta*, which is the term scientists use to describe animals with long legs and small hips, allowing them to quickly disappear into the bush – whether they are fleeing from an enemy or out hunting. Also in this category are some wildcats, small deer like the muntjac, elegant African antelopes and agouti, which is a rodent. A rodent? Yes, agoutis are classified as rodents, even if they look more like small deer with a small head, high back, brown-gold fur and even the claws on their hind legs resemble hooves.

The word rodent comes from the Latin expression for "to gnaw", which is the agoutis' favourite pastime. They are mad about nuts and fruit and use their chisel-like front teeth to bite into juicy food and even crack the hard shells of Brazil nuts. However, in the rainforest, some of their food is seasonal. Even in such a perpetually warm climate, trees and bushes tend to only produce fruit at certain times. Therefore, keeping a few supplies in store is a shrewd move. Agoutis' claws on their front legs allow them to dig really well and conceal the seeds left over from a meal. But they do not find everything they have hidden – so similarly to jays and squirrels here in Europe, agoutis in Central and South America perform the important task of spreading seeds. Plants are happy, because the young shoots of the big trees in particular would never have a chance to grow close to the all-dominating mother plant. And the agouti also benefits because many a secret store still harbours delicious Brazil nuts months later.

Pretty plumage

In order to score points with females, the quetzal really goes to town. The emerald-green feathers on its tail streamer are a breathtaking metre long. During mating season, the male quetzals grow new ones with a beautiful, metallic, shiny look and the trick clearly works. The feathers were also coveted by humans as jewellery, but for other prestigious purposes, too. The Maya and Aztecs carefully plucked the sought-after feathers from living animals to add them to the feather crowns of high-ranking dignitaries. Only very few were allowed to wear these feathers since the quetzal was worshipped as a god in some cultures. People who killed the animal risked being put to death themselves.

But the quetzal also symbolises the struggle of the ancient cultures of Central America – the Maya, Aztecs and K'iche' – against the Spanish conquistadors. Legend has it that the red colour of the breast plumage of male quetzals comes from the blood of the freedom fighters or from the last king of the K'iche', Tecun Uman. Therefore, the bird embodies not just freedom between heaven and earth, but also the fight for freedom.

Today, the beautiful bird is often found in Central America on flags and pennants and graces Guatemala's national coat of arms. It can also be encountered in wallets or purses because in Guatemala the currency is not the dollar or peso but the quetzal.

Quetzal
(*Pharomachrus mocinno*)
Specimen
Head-torso length:
35–38 cm
Biotope: tropical forests
of South America

Carolina parakeet
(*Conuropsis carolinensis*)
Specimen
Head-torso length:
30–33 cm
Biotope: Gallery forests

Death in the rye

Everything is quiet and suddenly there is a screeching and cawing in the air and hundreds of colourful parrots fly over a house. This was not an occurrence that necessarily took place in South America either because until the 1920s, North America was home to a really colourful species of parrot called the Carolina parakeet. Several million of these animals with their green bodies and yellow-orange heads once flew between New York and Florida. They preferred to live in the forests around river plains, a safe environment with plenty to offer in terms of diet to this seed-eating creature. But as man started to encroach increasingly on the parakeet's terrain, the forests were cleared and more and more land was used for agriculture, which sounded the death knell for this smart bird. Because, on the one hand, its original habitat had been destroyed and on the other hand, although it suddenly found fantastic sources of food in the orchards and fields, it became the enemy of the farmers. It was hunted down as a pest and numbers quickly started to dwindle. Some of them were given to zoos but their shrieking, loud cries made Carolina parakeets very unpopular with most bird breeders. On 21 February 1918, the last living Carolina parakeet, which was called "Incas", died in Cincinnati Zoo.

Ancestor of birds

Troodontid tracks with a troodontid model
Early Cretaceous, Berriasian,
140 million years old
Length of rock: 187 cm
Model length: approx. 215 cm

Are they dinosaurs with feathers? The reconstructions of troodontids do not just resemble small, flightless birds, they were also closely related to the famous prehistoric bird *Archaeopteryx*. In the story of the evolution from dinosaurs to birds, the dinobirds, as they are also called, are roughly in the middle.

For a long time, China was regarded as the birthplace of birds because skeletons of these sorts of terrestrial, bird-like carnivorous dinosaurs were found there. But since the fossilised tracks of a troodontid were discovered in a quarry near Obernkirchen in 2008, it is clear that these types of dinosaurs also lived in the area that is Lower Saxony today.

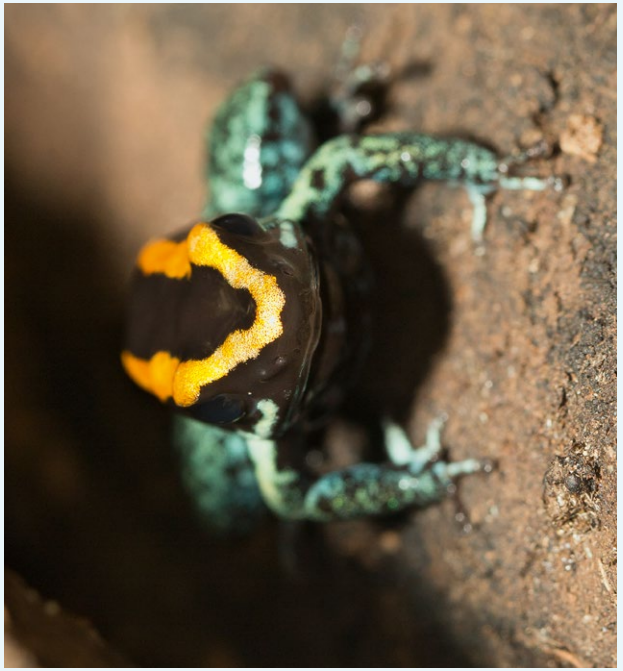
Now it might appear unlikely that the local rock strata would provide much information about troodontids because a sea was located here during virtually the whole dinosaur era, meaning that marine fossils are the major types found. But about 140 million years ago, the sea withdrew for a short period of time and large areas of land with extensive forests existed on the edge of huge lake and river landscapes. Lots of dinosaurs lived there – vast herbivores, large and medium-sized carnivores and, of course, smaller dinosaurs. They all left tracks, many of which later petrified in the sludgy sand while the animals were wandering through the lagoons and river deltas.

In addition to the three-toe fossil footprints of "normal" carnivorous dinosaurs, two-toe footprints were found. These can only belong to the troodontids, because they kept the inner three toes curved upward when running – which is how they received their other name "sickle claw dinosaurs". Tracks like these have not been found anywhere else in the world. Compared with finds from China, which seemed only to have species the size of a chicken, models can be made of our dinobirds and, despite their plumage, they are large dinosaurs and not birds!

Croaks, poison and breeding

Poison dart frogs (*Dendrobatidae*)
The blue poison dart frog
(Dendrobates azureus),
Dyeing dart frog
(Dendrobates tinctorius),
Phantasmal poison frog
(Epipedobates tricolor),
Golfodulcean poison frog
(Phyllobates vittatus)
Head-torso length: 2–4.5 cm
Biotope: rainforests of
Central and South America

Do not worry, even if they are sometimes called "poison dart frogs", these ones in our terrarium will not harm you.
It is true that they are related to three pretty dangerous creatures, including the "golden poison frog" whose toxin is also fatal to humans. But the animals need a specific diet to make this deadly cocktail. Today, a species of mite is suspected of providing the required chemicals and if these are not fed to captive frogs the animals are no longer poisonous.
Even though they are not the most poisonous inhabitants in the vivarium, the poison dart frogs are the smallest, loudest and most reproductive. They are famous for their elaborate mating preparations. First of all, they seek a safe place to lay their eggs, usually on the underside of leaves, often a bromeliad. But when they hatch, the tadpoles cannot survive there because they have gills and need water. So, mum or dad drags the kids to a pool, which could be a leaf shaft or flower filled with rainwater. Once the tadpoles have turned into little frogs there, their parents take them piggyback and put them on the ground. Now they have got lungs, they can move freely in the South American jungle.
They do not need to hide either, because it is common knowledge in the animal kingdom that some of the poison dart frogs are unpalatable. The sociable frogs can join in calling to their contemporaries without a care in the world and that is also quite an impressive sound in our museum!



Positive-negative track
(a flat imprint of a carnivorous dinosaur and a deep imprint of a herbivorous dinosaur)
Early Cretaceous, Berriasian,
140 million years old
each approx. 150 × 80 × 12 cm
Place found: Münchehagen

The stone book

The two sandstone layers from a quarry in Münchehagen just west of Hanover lie open like two pages from a book of the history of the Earth and show two different dinosaur footprints. One page reveals two deep footprints on the stratum surface, the other the bulge in the original subsequent stratum over which the dinosaurs once ran. Therefore, this top stratum must be slightly younger and we are looking at its underside. It is usually easier to preserve these sorts of bulges, which we call positives, on the approx. 140-million-year-old strata, than the actual footprints, which we call the negatives. Most of the first descriptions of footprints between the 19th century and the 1920s are therefore based on positive ones.
If you look more closely, this specimen shows that the lower footprint stratum with its original recesses had also disintegrated into lots of small pieces, which were reassembled after it was found. This is due to its higher clay content. When the dinosaurs crossed the original delta riverbed, it was very muddy; later it was coarser sand that dominated.
In this case, a small carnivorous dinosaur and a large, very heavy herbivore crossed the formerly soft lagoon bed in different directions; first the smaller and lighter predator, which logically left a much flatter footprint, in which even the claw impressions can be seen by the tips of the toes. Later, a massive herbivore came along and left a correspondingly deep footprint.

Meteorite disc with an etched surface
Outer face of a meteorite 1836
approx. 13 × 7.5 × 0.5 cm
approx. 10 × 9.5 × 1.5 cm

A small piece of heaven

"Stones fallen from the sky" were already kept in prehistoric graves and temples as sacred objects, but it took until 1794 when the actual, cosmic origin of meteorites was recognised by physicist Ernst Florens Chladni.
Vast quantities of rock fell from the sky in south-west Africa in 1836. The piece with a dark exterior and the metallic and shiny, strangely patterned disc came from the larger chunks of the famous Gibeon meteorite fall. Although it is very thin, the disc weighs over 200 grams due to its high iron content. A meteorite weighing 200 kilos was even discovered in Gibeon and there are other pieces of up to seven tonnes in weight. Only pieces weighing up to 50 kilos have been discovered stemming from pure stone meteorites. Meteorites weighing less than 10 kilos usually burn up completely when they enter the Earth's atmosphere.
Whether they consist of stone, iron or a mixture of the two, all meteorites are remnants of smaller celestial bodies. They probably originate from the asteroid belt between Mars and Jupiter.
If freshly cut surfaces of iron meteorites are treated with nitric acid, peculiar patterns emerge, clearly recognisable boundary lines of lots of triangles nesting into one another. Called "Widmannstätten patterns" after the person who discovered them, these crystals are made of kamacite, a special manifestation of elementary iron in these celestial bodies. These patterns almost look like messages from another world.