



European Taxidermy Championships® | Budapest 2021

THE COELACANTH – a fish out of time



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Category: Scientific modelling (Master)





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INTRODUCTION:

On December 23rd 1938 Mrs Marjorie Cortenay-Latimer, curator at East London Museum (South Africa) got a call by fish trawler Captian Hendrik Goosen about an extraordinary fish caught close to Chalumna river mouth by his crew. Mrs. Latimer couldn't believe what she saw – she made some drawings and tried to preserve the fish – and contacted J.L.B. Smith, Professor of Ichthyology. What's happening then was one of the most spectacular sensations of modern science. Breaking news all around the world reported of the first ever find of a recent Coelacanth – a vertebrate order that was thought to be extinct together with the dinosaurs about at least 65 Million years ago. Until that fateful discovery these fishes were just known by fossils old up to 409 to 65 Million years.

So to find this fish was same as strange as to meet a living dinosaur. Mrs. Cortenay-Latimers discovery was even more spectacular as Coelacanth were suspects to be the vertebrates who first ever took a step out of water as a link of fishes becoming terrestrial amphibians in Devon (*Eusthenopteron*, *Ichtyostega*, *Tiktaalik*) age about 380 million years ago. The South African coelacanth fish was named *Latimeria chalumnae* and has following characteristics:



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Coelacanth-fossil from late Jurassic (Germany)

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Marjorie Courtenay-Latimer with her discovered fish 1938

Description:



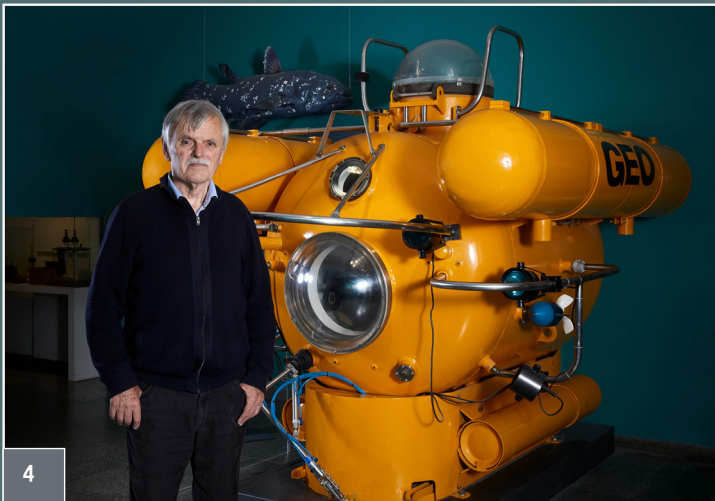
1. Adult size between 1 to 2 meters, estimated to live up to 100 years
2. Large and plump body, blueish grey with an individual white spotted camouflage pattern
3. Huge trapezoid tail fin with a tassel-like separate movable tip fin
4. 2 pectoral, 2 pelvic and 1 dorsal and 1 anal fin with a fleshy limb like base and an inner skeleton by single bones
5. 1 dorsal perch like fin
6. A less ossified skeleton with a gristly tube-like chorda dorsalis instead of an ossified vertebral spine
7. A less ossified skull with a unique skull joint between rostrum and cranium which allows to with its mouth not only by spreading the massive lower jaw (cranial joint)
8. Cosmoid pustulate scales as armour and for optimal, energy less flow adaption
9. Huge eyes adapted for deep sea darkness with a shiny tapetum lucidum as residual light amplifier
10. A special electric sensor rostral organ to target its prey in darkness
11. low metabolism
11. Ovoviviparous animal with up to 26 complete evolved juveniles born out of eggs in orange-fruit size
12. Inner organs show similarities to Amphibian and terrestrial vertebrates



Coelacanths are a part of the clade Sarcopterygii, or the lobe-finned fishes. Externally, several characteristics distinguish the coelacanth from other lobe-finned fish. They possess a three-lobed caudal fin, also called a trilobate fin or a diphyccercal tail. A secondary tail extending past the primary tail separates the upper and lower halves of the coelacanth. Cosmoid scales act as thick armor to protect the coelacanth's exterior. Several internal traits also aid in differentiating coelacanths from other lobe-finned fish. At the back of the skull, the coelacanth possesses a hinge, the intracranial joint, which allows it to open its mouth extremely wide. Coelacanths also retain an oil-filled notochord, a hollow, pressurized tube which is replaced by the vertebral column early in embryonic development in most other vertebrates. The coelacanth heart is shaped differently from that of most modern fish, with its chambers arranged in a straight tube. The coelacanth braincase is 98.5 % filled with fat; only 1.5% of the braincase contains brain tissue. The cheeks of the coelacanth are unique because the opercular bone is very small and holds a large soft-tissue opercular flap. A spiracular chamber is present, but the spiracle is closed and never opens during development. Coelacanth also possess a unique rostral organ within the ethmoid region of the braincase. Also unique to extant coelacanths is the presence of a „fatty lung“ or a fat-filled single-lobed vestigial lung, homologous to other fishes' swim bladder. The parallel development of a fatty organ for buoyancy control suggests a unique specialization for deep-water habitats. There are small and hard – but flexible – plates around the vestigial lung in an adult specimen, though not around the fatty organ. The plates most likely had a regulation function for the volume of the lung.



After discovery of this first death fish many scientists and adventurers were in hunt for decades to spot a living *Latimeria* in its habitat. The German scientist, diving pioneer and film-maker Prof. Hans Fricke spent most of his life on research of *Latimeria*. He talked to hundreds of local fishermen at west Indian Ocean shores. Finally at the islands of Comoros the fisherman told him about the places where they catch their so called “Gombessa” – a local name of *Latimeria chalumnae* and so he found out that the Coelacanths were located mostly in depths much more than 150 meters down in rugged deep-water canyons of ancient volcanic lava-streams with less flow. Fricke designed the submarines “Jago” and “Geo” especially to entrance the unknown world of the Coelacanths deep down the Comorian sea (Bild 22). Finally on 17th January 1987 submarine “Geo” first ever spotted and filmed a living *Latimeria chalumnae* in its habitat at a depth of 198 m.

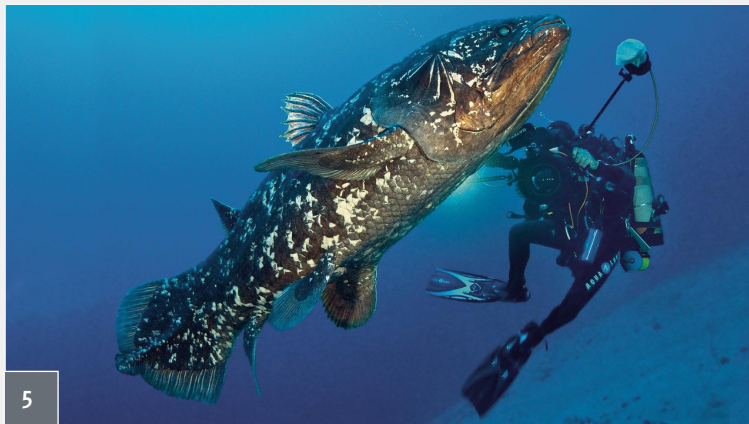


This pictures and clips again went around the world and initiated a real Coelacanth roar in media, publicity and science.

Fricke's submarine Team found out that *Latimeria chalumnae* is a very rare fish who is bound to rugged rocks with a lot of caves to hide in reach of much deeper areas where the fish hunt as drift predators using their adapted eyes and rostral sensor to find and catch its prey by one rapid snap pushed with her powerful tail. The Coelacanth has a very low metabolism and needs just about 300g fish a night. Fricke was impressed most by the ability of *Latimeria* to breathe between the rocks using her fleshy fins most precisely. (Bild 23). A typical behaviour is also to swim at place head straight downwards – it is still not exactly clear why the Coelacanth behave like this.

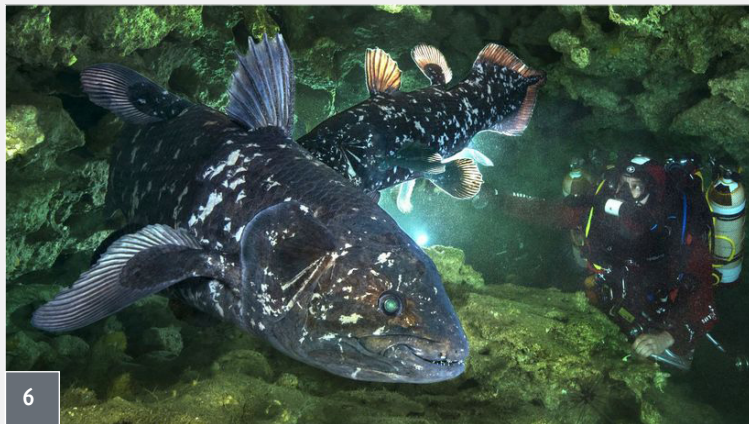
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first image of a living Coelacanth



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On December 1st 2000 a team of professional divers photographed three Coelacanth in just 107m depth close to Sodwana Bay South Africa. This was the first ever encounter of divers with *Latimeria chalumnae*. The pictures taken at this extraordinary event were most important for the authors scientific model as they first ever show the real colour and structure of the fish – especially of its eyes and the fleshy parts and pattern of its skin and scales.



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These unique pictures provide also a lot of further anatomical details as the prepared and conserved fishes in several institutions and Museum are partly denatured or transformed by decay, drying and also by protein denaturation in formalin. To present this details of shape, colour and behaviour - and also to spread the fascination of that fish out of time - the author decided to start a detailed hand modelling work of a *Latimera chalumnae* (male) individual in its habitat. Its all handmade without taking cast or even cast partitions of *Latimeria* material.

6, 7

here real skin colour, structures and shiny parts can be observed without to much blueish underwater light



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Final note:

After completion of this *Latimeria chalumnae* model the author got a sudden call. In a first ever direct talk Prof. Hans Fricke said as he saw some images of this model he was quite excited:

“This is the best and most authentic model of Latimeria I have ever seen. Its exactly how she is. The eyes and colour... Also I did recall to Jürgen (his submarine driver Jürgen Schauer, the person who first ever saw a living *Latimeria chalumnae* in its habitat) an he said the same.”
(Prof. Hans Fricke)

Sebastian Brandt, September 2021

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