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The Biology and Physiology of the Living Coelacanth

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THE INFLUENCE OF THE COELACANTH ON AFRICAN ICHTHYOLOGY

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When the Coelacanth was pulled up onto the deck of a trawler on December 22nd 1938, not only did it rock the zoological world but it also had a profound effect on South African ichthyology, mainly through the man who was prepared to make this staggering announcement when all his senses reeled at the impossible come true.

Before the appearance of the living coelacanth, the study of fishes in South Africa had begun with Andrew Smith during the first half of the nineteenth century. At the beginning of the twentieth century that remarkable and indefatigable zoologist J. D. Gilchrist described numerous deepsea forms, and together with W. W. Thompson published a number of excellent checklists of South African fishes with extensive synonymy and bibliographic references.

A fateful faux pas then changed the direction of ichthyological research when Gilchrist forgot a dinner engagement with the then Director of the South African Museum. The latter was so incensed that he brought Keppel H. Barnard out from England and directed him to work on the South African marine fishes! To this end he bought every book available on sea fish so that the South African Museum obtained almost every important treatise ever produced on marine fish. When Barnard completed his monograph in 1927 he was, to quote his own words, "sick of fishes." He then turned his fine intellect to elucidate the problems of the South African crustacea and mollusca, leaving the ichthyological field wide open.

Into this, timidly publishing his first fish paper in 1931, came a chemist and dedicated research worker, James Leonard Brierly Smith. Living in Grahamstown, he soon came to serve the four nearby museums: Port Elizabeth, Grahamstown, Kingwilliamstown and East London (as honorary curator of fishes), and by 1938 had established himself overseas as an up-and-coming ichthyologist.

When, therefore, JLB announced the capture of a living coelacanthid fish, a fish believed extinct for over 50 million years, it was not surprising that while his statement was immediately accepted overseas, at home it was met with complete disbelief!

I remember so well our return to Grahamstown. The announcement with the photograph had already appeared in the East London Daily Dispatch. We went straight to the Albany Museum to lay this incredible news before the man who encouraged JLB to work on fishes. We were met with a stoney face—how could JLB

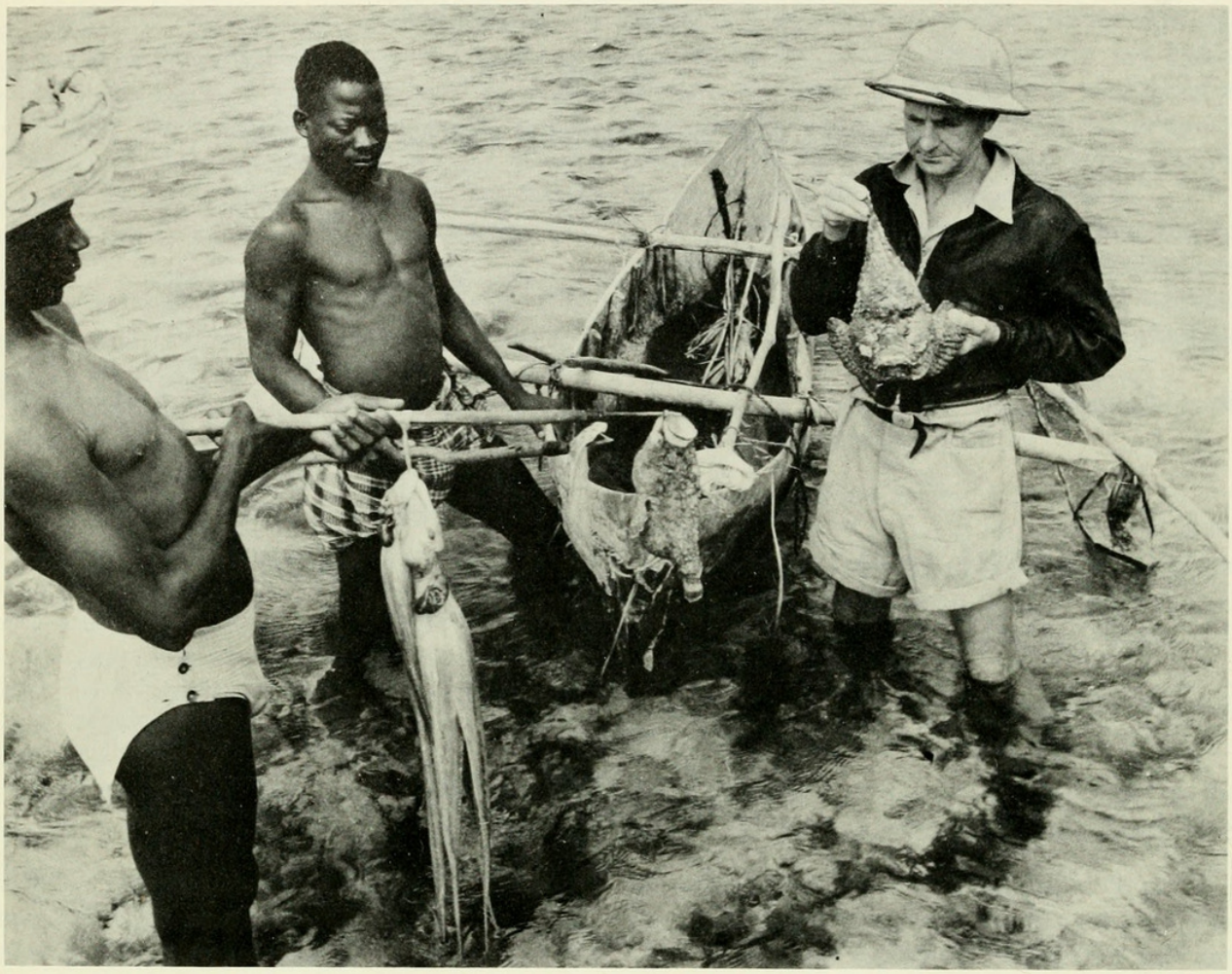


FIGURE 1. JLB Smith holding a venomous stonefish during field collections at Pinda.

have made such a terrible mistake. "Have you seen its picture?" asked my husband. "Yes, of course" was the reply—"that's just a Kob (*Argyrosomus hololepidotus*, family Sciaenidae) with a regenerated caudal." JLB assured him that it was no such thing. He'd caught and handled thousands of Kob during his lifetime and this fish was far removed from being a Kob! Nothing would convince him and we left.

The next day JLB met Dr. Liebenberg, a botanist who worked at the Albany Museum and an old friend. He was most upset, placed his hands on my husband's shoulders and said "What on earth made you do this dreadful thing?" "What dreadful thing, Lieb?" "This coelacanth nonsense" was the reply. "You'll never again be able to hold up your head in any scientific community." "But it is a Coelacanth!" he insisted "No, man, it can't be. Old H— says it isn't, and if he says it isn't then it can't possibly be one." He was inconsolable, and it wasn't JLB who convinced him it *was* a Coelacanth.

However, in America, the ichthyologists were a lot less skeptical. "If JLB Smith says it is a Coelacanth, then it must be. I know his work well and he'd never give a wrong diagnosis on a matter like this."

One of the immediate results of the capture was a flood of correspondence. The most fascinating came from palaeontologists from all over the world. Not only did letters from ichthyologists pour in, but they also sent their reprints with queries or nomenclatorial advice. The palaeontological literature we received at that time still forms an important part of the Institute's library and as such is available to workers all over South Africa.

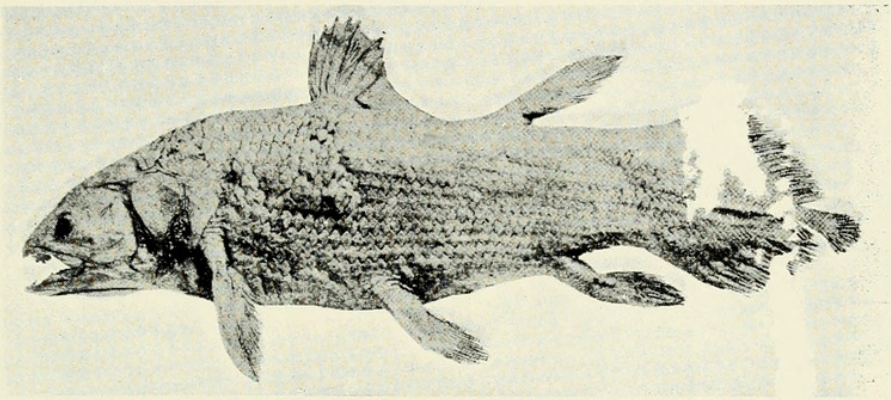
JLB decided to follow no particular school as far as the nomenclature of the bones was concerned. He considered it right and proper that a non-palaeontologist, and therefore someone completely outside the "battle of the names," should describe the fish. So he gave the bones numbers, enabling subsequent workers to decide exactly what names they should bear.

Many years later when the Danish coelacanth

PREMIO £100 REWARD RÉCOMPENSE

Examine este peixe com cuidado. Talvez lhe dê sorte. Repare nos dois rabos que possui e nas suas estranhas barbatanas. O único exemplar que a ciência encontrou tinha, de comprimento, 160 centímetros. Mas já houve quem visse outros. Se tiver a sorte de apanhar ou encontrar algum NÃO O CORTE NEM O LIMPE DE QUALQUER MODO — conduza-o imediatamente, inteiro, a um frigorífico ou peça a pessoa competente que dele se ocupe. Solicite, ao mesmo tempo, a essa pessoa, que avise imediatamente, por meio de telgrama, o professor J. L. B. Smith, da Rhodes University, Grahamstown, União Sul-Africana.

Os dois primeiros especimes serão pagos à razão de 10.000$, cada, sendo o pagamento garantido pela Rhodes University e pelo South African Council for Scientific and Industrial Research. Se conseguir obter mais de dois, conserve-os todos, visto terem grande valor, para fins científicos, e as suas canseiras serão bem recompensadas.



COELACANTH

Look carefully at this fish. It may bring you good fortune. Note the uliar double tail, and the fins. The only one ever saved for science was 5 ft (160 cm.) long. Others been seen. If you have the good fortune to catch or find one DO NOT CUT OR CLEAN IT ANY WAY get it whole at once to a cold storage or to some responsible official who can care for it, and ask him to notify Professor J. L. B. Smith of Rhodes University Grahamstown, Union of S. A., immediately by telegraph. For the first 2 specimens £100 (10.000 Esc.) each will be paid, guaranteed by Rhodes University and by the South African Council for Scientific and Industrial Research. If you get more than 2, save the tail, as every one is valuable for scientific purposes and you will be well paid.

Veuillez remarquer avec attention ce poisson. Il pourra vous apporter bonne chance, peut être. Regardez les deux queuex qu'il possède et ses étranges nageoires. Le seul exemplaire que la science a trouvé avait, de longueur, 160 centimètres. Cependant d'autres ont trouvés quelques exemplaires en plus.

Si jamais vous avez la chance d'en trouver un NE LE DÉCOUPEZ PAS NI NE LE NETTOYEZ D'AUCUNE FAÇON, conduisez-le immediatement, tout entier, a un frigorifique ou glacière en demandant a une personne competante de s'en occuper. Simultanement veuillez prier a cette personne de faire part telegraphiquement à Mr. le Professeus J. L. B. Smith, de la Rhodes University, Grahamstown, Union Sud-Africaine.

Le deux premiers exemplaires seront payés à la raison de £100 chaque dont le payment est garanti par la Rhodes University et par le South African Council for Scientific and Industrial Research.

Si, jamais il vous est possible d'en obtenir plus de deux, nous vous serions très grés de les conserver vu qu'ils sont d'une très grande valeur pour fins scientifiques, et, neanmoins les fatigues pour obtantion seront bien recompensées.

FIGURE 2. Reward poster circulated along the east African coast which resulted in the identification of the 1952 coelacanth by Capt. E. E. Hunt.

palaeontologist, Jørgen Nielsen came to South Africa in 1953 to see the second coelacanth, we suggested he should visit East London, just over 100 miles away to see the first coelacanth. "Quite unnecessary" he said, "the descriptions and photographs of the various structures in your monograph on the first coelacanth are more than adequate. I have no need to see them for myself."

South Africa had been rocked by the discovery of *Latimeria*. Anglers and trawlers alike were looking out for strange sea creatures. Specimens flowed into museums. Everyone was aware of Smith of Grahamstown. One of the best material rewards was his being made an Honorary Foreign Member of the American Society of Ichthyologists and Herpetologists, and as such received the journal *Copeia*. American ich-

FIGURE 3. Captain E. E. Hunt, the discoverer of the second coelacanth, aboard his vessel at Dzaoudzi, Isle Mayotte. Two weeks later this craft was destroyed by a cyclone.

thyologists not only sent him rare books but helped fill in the earlier parts of *Copeia*. The result was that for many years we had the only set of *Copeia* in Africa. So herpetology also benefitted!

This, the true turning point in his career, was obscured by the second world war. For the next eight years, until the war ended, he continued to teach chemistry, do research work in chemistry and produced two chemistry text books during that time.

In 1946 the South African Council for Scientific and Industrial Research came into being, and JLB Smith was made one of its first three senior bursars. The coelacanth had done its work well, and the University released Smith to concentrate on his ichthyological work, to produce *THE SEA FISHES OF SOUTHERN AFRICA* and to hunt for the home of the living coelacanths. It is of interest to note that Liebenberg, the botanist who was so upset about JLB's announcement of the capture of the first coelacanth was an important link in the chain that eventually invited JLB to undertake the writing of *THE SEA FISHES OF SOUTHERN AFRICA*. He knew JLB had at one time started writing a book to aid anglers to identify the fishes they caught. I wonder how much the East London coelacanth added to this.

By the end of the war there was little doubt that the East London coelacanth was a stray. Most of the "wise" scientists concluded that it had come from the great depths, the Danes even mounted a "deep sea" round the world expedition to look for coelacanths. They amassed a wealth of wonderful material, but no coelacanths. Even though they passed close to the Comoro Islands, they probably fished in waters too deep for them! Smith, however, maintained that the coelacanths lived among rocks, at depths able to be reached by hook and line and in areas remote from biologists. As an angler he was even able to predict how a coelacanth would play when once hooked. He deduced that the East London specimen had drifted down on the

FIGURE 4. JLB Smith and "*Malania anjouanae*," the second coelacanth specimen, 29 December 1952. Captain Hunt is at JLB's right. Monsieur P. Coudert, Governor of the Comores, is at his left.

southward flowing Mozambique–Agulhas Current. He proposed that it must have come from somewhere south of Cape Delgado where the great south equatorial current divides to wash the coast of east Africa, where one branch swings northwards up the Kenya coast and the other southwards to South Africa.

When the mammoth work *THE SEA FISHES OF SOUTHERN AFRICA* was completed in 1949, JLB and I set off on a series of expeditions up the east coast of Africa to seek the home of the coelacanths. We also were interested in studying the tropical fishes, for the major recruitment of the South African fauna to this day comes down the Mozambique–Agulhas Current. These expeditions were wonderful training times for me. In 1952 I started using diving techniques to collect in subtidal areas. One who has never dived cannot appreciate the magic of tropical reefs; the coral with all its attendant animals bathed in clear warm blue water is a marvelous sight.

By the time we tracked the coelacanth home to the Comoro Islands, I knew most of the shallow-water fishes that flitted in and out of the coral gardens. We collected, photographed, painted and preserved fish specimens as we slowly explored the virgin reefs north of Beira to Kenya.

This resulted in a steady stream of publications from JLB's pen. Soon ichthyologists the world over began to realise the wealth of marine life along the east coast of Africa. Small feeble fishes from as far away as the Philippines were found in east African waters. Closely related species to those from Japan were discovered in the Mozambique channel. Our publications eventually caused an American ichthyologist to write that it would seem the great Indo-Pacific was just one little puddle after all!

FIGURE 5. The author scrubbing the second coelacanth outside of the Department of Ichthyology, Rhodes University.

The eventual discovery of the Comoro Islands as the home of the coelacanths did not immediately stop all expeditions. By now the need to collect tropical marine species even further afield spurred us on to work at the islands north of Madagascar—from the Seychelles down to the Aldabras—and twice again along the Mozambique coast before JLB Smith called a halt to devote the remainder of his life to publishing monographs and smaller papers on the material.

In 1968 at the age of 70, "coelacanth" Smith died. During his lifetime the coelacanth had rivetted the attention of the zoological world on South Africa. It had aided the establishment of the Department of Ichthyology at Rhodes University so that JLB Smith could devote all his time to his beloved fishes. Ichthyological and palaeontological books poured into his library now safely incorporated in the Institute's library. The search for the coelacanth brought both of us collecting among reefs never before visited by any scientists, and a knowledge of western Indian Ocean fishes that will stand me in good stead for the rest of my life.

The finding of the home of the coelacanths caught the imagination of the world and added considerably to Smith's reputation, so firmly established by the identification of the East London coelacanth. The foyer of the new building that houses the JLB Smith Institute of Ichthyology has been specially designed to house an extensive and well documented permanent exhibition of the story of the coelacanth. It starts 400 million years ago, and proceeds first to a full scale model of the East London coelacanth and finally to a special glass tank displaying the "second" coelacanth. It is fitting that so many visitors to the quiet little city of Grahamstown find their way to pay homage to, and to stand gazing in awe at, the story of the fish that has done so much for South African ichthyology.