
Mark-Oliver Rödel1,*, Alan Channing2 & Simon N. Stuart3

1 Museum für Naturkunde, Leibniz Institute for Evolution and Biodiversity Science, Invalidenstr. 43, 10115 Berlin, Germany.
2 Unit for Environmental Sciences and Management, North-West University, Potchefstroom, 2520, South Africa.
3 Synchronicity Earth, c/o Biocensus, The Malthouse, 17-20 Sydney Buildings, Bath, BA2 6BZ, United Kingdom.
* Corresponding author <mo.roedel@mfn.berlin>.

Arne Schiøtz died on 11 May 2019. With him another of the ‘big names’ in African herpetology passed away. One cannot think about African treefrogs and acoustic analyses in frog taxonomy without automatically having Arne Schiøtz in mind. His monographic publications on West African (1967) and East African (1975) treefrogs, as well as his 1999 opus covering all African species of the families Hyperoliidae and Rhacophoridae and the genus Leptopelis in the Arthroleptidae, are a must-have for everybody interested in African herpetology, be they scientists, conservationists, environmental consultants, tour guides, amateur herpetologists or simply people who love frogs.

Arne Schiøtz was born on 29 January 1932 in Nørre-Sundby, a town in northern Jutland, Denmark. His father was the director of the local bank, but actually would have liked to be a zoologist himself. He thus encouraged Arne in his interests in animals and joked about Arne being someday the director of a zoo. Arne grew up with dogs, birds in an aviary in the garden and a tame squirrel. After finishing school he started studying biology at the University of Copenhagen in 1950. During his studies, he spent a year in Greenland, serving his time in the military and, representing the Danish army, volunteered for three months at the American airbase in Thule.

When he finished his studies in 1958, the Director of the Zoological Museum in Copenhagen asked Arne to spend a year in Nigeria as an assistant to a Danish zoologist who worked on freshwater fish. On that field trip in 1959 Arne first worked on the temperature regulation in lizards, a topic that had been a focus of his master’s degree, but he soon became interested in treefrogs and started what would become his lifelong passion. His dedication to zoology and hard work did not remain unnoticed and after he returned from Nigeria, he was offered a position as an assistant to the Director of the Copenhagen Zoo and was responsible for the terrarium (fig. 1a). As assistant, Arne accompanied his professor on a fieldtrip with students in 1960, looking for Bombina bombina. On that excursion he met the woman who would later become his wife, Vibeke. They married in 1962, had two sons and three granddaughters (fig. 1f).
Figure 1. ‘Life stages’ of Arne Schiøtz: (a) in 1962 with a *Boa constrictor* at the Copenhagen Zoo; (b) with an Angwantibo on his second field trip to eastern Nigeria in 1965; (c) *Afrixalus vibekensis*, named after his wife Vibeke, photo from Atewa forest, central Ghana, a location which currently is threatened by bauxite mining plans of the Ghanaian government; (d) around 1982, during Arne’s time with WWF-International, Arne Schiøtz (left), with David Attenborough (right) and Prince Philip (center); (e) frog hunting in Tanzania, probably around 1975; (f) in Masai Mara in 2010, demonstrating a chameleon to his grandchildren; (g) at the age of 80 (c, courtesy of Piotr Naskrecki, all other photos courtesy of Vibeke Schiøtz).
In 1961 he was granted funding by the Carlsberg Foundation to spend half a year in Ghana to continue his work on treefrogs. Further field trips followed, mostly funded by the Carlsberg Foundation and often undertaken with Vibeke, to Nigeria (fig. 1b), Sierra Leone and Ivory Coast, and Arne published a series of papers on the amphibian fauna of various West African countries and a first paper summarizing the voices of African frogs. At that time he was one of very few herpetologists really going into the rainforest to search for frogs at night, whereas others usually stayed on the edges or simply asked locals to bring them animals. Not surprisingly he discovered many new species.

In 1964 he was offered the job as the Director of the ‘Danmarks Akvarium’, a position in which he served for most of his professional life. There he was in the fortunate position of having board members supporting his scientific work, which apart from all his spare time also occupied many of his working hours. His wife considered herself a ‘frog widow’ for many years, as Arne worked with his frogs every evening and most holidays. When he started his new task at the aquarium, he was already actively engaged with nature conservation, his second main passion. With his masterpiece *The treefrogs (Rhacophoridae) of West Africa* he graduated in 1967 as a ‘Doctor of Philosophy’.

The husband of the Danish queen, Prince Henrik, started the Danish section of WWF in 1972 and approached Arne to become the Secretary General. Along with his work for the aquarium, he held this honorary – unpaid – position for 6 years. Eventually the requirements for this WWF engagement became too demanding, and so Arne resigned and became a WWF board member instead, a role that apparently still required quite some public attention. In 1980 he was asked by the then International President of WWF, Prince Philip, to become the Director of Conservation for WWF-International in Switzerland (fig. 1d). He accepted and left the aquarium for three years. In Switzerland, he changed the WWF’s overall conservation strategy from focusing on the conservation of species towards the conservation of habitats and faunas, since conservation of individual species appeared meaningless to him as long as their habitats disappeared. For Arne, scientific work and describing species was only meaningful in connection with the conservation of nature. Consequently, he became one of the very first people to be fully embedded within both the taxonomic and conservation worlds, way ahead of his time. Back at the aquarium he served three more years as director, but in 1990 he left for another three years, being sent by DANIDA, the Danish development department, to help in the establishment of a government environmental department in Bhutan. In recognition of his extensive contribution to conservation worldwide, he was given Honorary Membership of WWF-International in 2000 – one of the highest awards in conservation.

He retired in 1996, but continued his scientific work; for instance he made field trips to southern and central Africa and published his landmark monograph on African treefrogs (1999) and several papers on the taxonomy and biogeography of African frogs. His last scientific expedition was in 2005 when, at the age of 73, he went searching for treefrogs in the Democratic Republic of Congo, including spending a week in a pirogue on the Congo River (Schiøtz 2007c). Eventually he had to stop his scientific work as he was no longer able to go to Africa for new material. But Arne actively continued his work on nature conservation in the local community and local government in Northern Zealand (Denmark), where he and Vibeke had moved to a small farm. In 2008 he received recognition for his ‘Exceptional Contribution to African Herpetology’ by the Herpetological Association of Africa.
Arne Schiøtz authored and co-authored 30 herpetological publications (plus many IUCN Red List species assessments), the three most influential ones being his books on West African (1967), East African (1975) and African (1999) treefrogs (Appendix 1). He also published some non-herpetological contributions, e.g. in 1974 a guide to Danmarks akvarium, and in 1972 A guide to Aquarium Fishes and Plants, co-authored by Preben Dahlstrøm. This book is available in Danish, Dutch, English, French, German and Spanish, and has seen several editions in most of these languages.

Arne’s scientific work can be divided into three distinct periods. In the 1960s he focused on West African frogs. He conducted various field trips to many West African countries and published faunistic data, described many new species, and wrote his first comprehensive paper on voices of non-treefrogs as well as his West African treefrog monograph. In the 1970s and early 1980s he broadened his focus and started publishing on East African treefrogs, on the hugely complex Hyperolius viridiflavus group, and on frog voices (including some papers with Jean-Louis Amiet on Cameroonian species). Then there was a longer gap in his publications until, after retirement, he came back with a major contribution, his book on African treefrogs in 1999. In the new millennium, Arne published further papers on the taxonomy and zoogeography of African treefrogs. In total, he described 38 African frog species and subspecies (fig. 2), 35 currently considered valid taxa (Appendix 2).

One of his favourites was no doubt a West African Afrixalus which he dedicated to Vibeke (fig. 1c). The importance of taxonomy to him was mainly to make species known and thus make their conservation possible. The example of this little frog shows that he was not a rigid taxonomist, following all formal rules. Hence, he mistakenly chose the name Afrixalus vibekensis (the ending usually referring to a location) instead of A. vibekae (the formally correct name when it is dedicated to a woman). He tried to make this change in his 1999 book, but the International Code of Zoological Nomenclature did not allow for such a change. However, as he was married to Vibeke for 57 years, he regarded his wife as his most important ‘location’, and so the original name choice might have been the most appropriate after all!

Arne increased our knowledge of sub-Saharan treefrogs tremendously, a term here used not in a phylogenetic but a functional sense. When he started his work, all arboreal (or at least climbing) sub-Saharan frogs were attributed to one family, RHACOPHORIDAE. Currently, phylogenetic research places them in three families: the African endemic ARTHROLEPTIDAE; the HYPEROLIIDAE occurring in sub-Saharan Africa and Madagascar; and the mainly Asian RHACOPHORIDAE with one genus and four African species. Apart from discovering and describing many new species, mostly collected during own extensive field work, Arne was also one of the early proponents of a new tool to Anuran taxonomy: acoustics. He was the first taxonomist using this tool intensively in recognizing and describing new African species, and thus pioneered a non-exclusively morphological, and thus integrative, taxonomic approach, which today is usually complemented or even dominated by molecular techniques. Today, his call descriptions are at least as useful for taxonomists as his morphological descriptions and type specimens. Another open and still vividly discussed research field he initiated was the standardized assessments and descriptions of sexual dichromatism in anurans, a phenomenon still triggering ongoing research (Portik et al. 2019).
Figure 2. A selection of species described by Arne Schiøtz (compare Appendix 2); (a) *Arthroleptis aureoli* (Freetown Peninsula, Sierra Leone); (b) *Sclerophrys perreti* (Idanre Hills, Nigeria); (c) *Afrixalus nigeriensis* (Foya forest, Liberia); (d) *Hyperolius ighetensis* (Comoé National Park, Côte d’Ivoire); (e) *Hyperolius fusciventris lamtoensis* (Banco National Park, Côte d’Ivoire); (f) *Hyperolius sylvaticus ivorensis* Schiøtz, 1967 (Taï National Park, Côte d’Ivoire); (g) *Kassina lamottei* (Taï National Park, Côte d’Ivoire); (h) *Kassina fusca* (Comoé National Park, Côte d’Ivoire) (b, by Arne Schiøtz; all other photos by Mark-Oliver Rödel).
Some of MOR’s personal memories: When I started my career on African amphibians in the early 1990s, Arne was close to retirement. When I contacted him with questions concerning Ivorian tree- and other frogs, he responded with friendly letters containing much useful advice and many identification hints, as well as copies of all of his publications. I met Arne for the first time in person in Elmina, Ghana in December 1999, at a workshop organized by Conservation International on conservation of the Upper Guinea forest hotspot. Together, we were responsible for the herpetological component of conservation priority-setting. We identified several areas on the maps as being high priority for herpetological surveys, where I was later able to undertake surveys, revealing species-rich herpetological faunas and many new species. For me it immediately felt like meeting and discussing with a fatherly friend, sharing the same hobby. However, Arne also was a strong character who made his points very clear. At that meeting, for instance, participants were asked to come up with regional species lists – plus lists of additional taxa we thought could be discovered. I found the idea funny and suggested that a new West African *Acanthixalus*, a spiny toad and a new *Atheris* could all be found. Arne found this quite ridiculous, and very clearly told me that in particular *Acanthixalus* he would have found during his extensive fieldwork in West Africa. To my own surprise, Raffaël Ernst and I discovered and described all three taxa (*Acanthixalus sonjae*, *Sclerophrys taiensis*, *Atheris hirsuta*) in the following years (I probably predicted finding more species, but of course remember these three as my predictions for them were correct!). When I next met Arne, he told me (with a little forced smile) that he really hated me for that. But we still had some beers together! Without his generous support and guidance, my start into African frog research would have been so much slower and harder. He invited me to participate on his last field trip to Congo and I still very much regret that, due to a disease, I missed this unique chance to be in the field with one of Africa’s greatest frog researchers.

Some of AC’s personal memories: As a student in Pietermarizburg I was in an environment rich in literature: my PhD supervisor, D.E. (Eddie) van Dijk had collected copies of ALL the amphibian literature. In those days there was no internet, and he resorted to the photocopy machine and visits to libraries with extensive holdings such as the University of Göttingen. Arne Schiøtz’s publications from that collection formed a central part of my core reading. Imagine my surprise to later discover that Arne had been one of my PhD examiners. I met Arne at a meeting of the African Amphibian Working Group in 1978 in Florence, Italy. Arne was one of the founder members of the group. He was a large man physically and intellectually. His contributions at the meeting (and at others later) were always valuable. He and I started a long friendship, with me asking his advice on a range of topics, and always receiving a supportive reply. In 2008 the Herpetological Association of Africa asked me to present a talk about Arne, that would lead up to him being given the award for Exceptional Contribution to African Herpetology. Arne would happily interact with students, and many of my PhD students had useful conversations with him at meetings.

SNS has some memories too: I first met Arne in a hotel in Dar es Salaam in 1977 or 1978. The meeting took place at the instigation of the late Alan Rodgers (the most eminent wildlife biologist in Tanzania at the time). Alan was planning an international symposium on East African forests and was keen to engage Arne as a leading participant. Arne enthusiastically agreed, and he was a forceful, incisive presence in that memorable symposium that was held in Arusha in December 1978 (the
The symposium turned out to be a pivotal moment in stimulating active conservation in Tanzania’s Eastern Arc Mountains (home to so many endemic and threatened amphibians) and Arne’s energy and passion had a lot to do with making this happen. After the symposium we travelled to Amani in the East Usambaras where Arne found an enormous number of frogs and opened my eyes to a spectacular array of species, the existence of which I had previously been totally unaware. A few years later I applied to WWF for funding for a vehicle to enable me to travel around the Usambaras for my PhD research. Although Arne never admitted to helping me to get this money, the application must have passed across his desk, and I’m pretty sure that he was there for me. Much later on, in 2001 we were in contact again, this time to enlist his help with the Global Amphibian Assessment (GAA) – assessing every amphibian species against the IUCN Red List Criteria for the first time. He was one of the key players in African section of the GAA. He worked extremely hard on this for nothing and he literally poured out his knowledge to make these assessments as good as they could possibly be. I last saw him at the GAA workshop on the Kenyan coast in 2002. I shall always remember him as being unfailingly helpful, kind and encouraging, while at the same time being forceful, arguing strongly for things he believed to be right. He was indeed ahead of his time as a taxonomist-conservationist. Africa’s treefrogs have lost their strongest champion.

Arne Schiøtz was much esteemed in the herpetological and conservation communities. His memory will continue in the six frog species and subspecies named in his honour, including two species of his beloved treefrogs (Appendix 2). Arne had a long and productive life; he never had to ask for a job, they were always offered to him. He himself summarized his life as: “My life has been influenced by offers – mainly coming out of the blue – which I often accepted; maybe too often, but the result has been a very diverse and exciting life – and nearly always among living animals.”

ACKNOWLEDGEMENTS

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LITERATURE CITED


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APPENDIX 1. The herpetological publications by Arne Schiøtz (excluding numerous authored or co-authored species accounts on the IUCN Red List data base).

APPENDIX 2. Anuran taxa described by Arne Schiøtz.

**ARTHROLEPTIDAE:** *Arthroleptis aureoli* (Schiøtz, 1964) [originally placed in *Cardioglossa*]; *Cardioglossa pulchra* Schiøtz, 1963; *Leptopelis argenteus meridionalis* Schiøtz, 1975; *Leptopelis bufonides* Schiøtz, 1967; *Leptopelis macrotis* Schiøtz, 1967; *Leptopelis occidentalis* Schiøtz, 1967.

**BUFONIDAE:** *Sclerophrys perreti* (Schiøtz, 1963) [originally placed in *Bufo*].


**PHRYNOBATRACHIDAE:** *Phrynobatrachus ghanensis* Schiøtz, 1964.

APPENDIX 3. Taxa dedicated to Arne Schiøtz.

**ARTHROLEPTIDAE:** *Leptopelis ocellatus schiotzi* Laurent, 1973; *Astylosternus schioetzi* Amiet, 1978; *Cardioglossa schioetzi* Amiet, 1982.

**HYPEROLIIDAE:** *Kassina schioetzi* Rödel, Grafe, Rudolf & Ernst, 2002.

**PHRYNOBATRACHIDAE:** *Phrynobatrachus schioetzi* Blackburn & Rödel 2011.

**PTYCHADENIDAE:** *Ptychadena arnei* Perret, 1997.