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Obituary

Igor Mikhailovich Fokin (1933–2017)

After two decades of severe struggle with serious disease and disability Dr. Igor Mikhailovich Fokin, age 84, passed away July 25, 2017, in Saint Petersburg, Russia. He was a prominent specialist in morphology, ecology and locomotion of small mammals, rodents and jerboas in particular.

Igor Fokin was born on June 2, 1933, in Leningrad. His father Mikhail Vasil'evich Bogdanov (1888 year of birth) was arrested and executed by shooting in 1937. His mother Klavdia Andreevna Fokina (1899–1976) has been working as a work-force in the Northern shipyard until the Russian revolution, after that she became an accountant in several institutions in Leningrad.

Igor lost his father at a young age. He spent his childhood with his mother and his grandfather's family. His grandfather, Andrei Fokievich Fokin, was working in Kirovsky factory in Leningrad as a specialist at that time. At the beginning of The Great Patriotic War Igor was only seven years old. He was evacuated in Kirov Region along with his aunt, his mother's sister, and went to school in 1941. After lifting of the Blockade in 1944 he returned to Leningrad and later graduated from a secondary school in Leningrad. His favourite classes were natural history science and geography. He took extra lessons to learn more about these subjects and beef up his knowledge beyond the borders of the school curriculum.

After graduation in 1951, Igor was accepted in the Leningrad State University (now — Saint Petersburg State University) on the Biological Faculty and graduated in 1956. During his education in the Department of Vertebrate Zoology, he studied the ecology of rodents under the supervision of Dr. Oleg Petrov. During 1954–1956 I.M. Fokin studied the forestry importance of mouse-like rodents on experimental seed plots in the forest-steppe zone in wildlife sanctuary "Woods on Vorskla" in the Belgorod Region. He used these studies to prepare his Master's Thesis. He finished writing his thesis in 1956. These materials were published later (Petrov & Fokin, 1960).

After graduation, Igor Fokin got a permanent position as a zoologist in the Turkmenia Republic of USSR (now — Turkmenistan). He spent three years in Tashauz (now Daşoguz) Department of the Turkmenian Anti–Plague Service. During the Soviet time, the southern

borders of USSR were considered as "Eldorado" for zoologists due to the richness and uniqueness of local faunas. Igor Fokin worked in the Kara-Kum Desert in the western part of Tashauz Region for studies of rodent distribution and pest control. In the sands of Kara-Kum he found not only amazing mammals but also true love. Anna Airapetyants, his university classmate, captured his heart. He stayed with Anna all his life.

In Kara-Kum, I.M. Fokin fell in love with the desert and its inhabitants. He was especially interested in jerboas. He started gathering data on their ecology and means of adaptation to life in the desert. In 1958 his first scientific paper was published, devoted to Bobrinski's jerboa *Allactodipus bobrinskii* in Kara-Kum Desert (Airapetyants & Fokin, 1958). Airapetyants and Fokin also found new species of jerboa in Kara-Kum, Siberian jerboa *Allactaga sibirica,* that was unknown to Turkmenistan fauna before (Airapetyants & Fokin, 1961). Scientific articles about Aral thick-tailed jerboa, about ecology and distribution of Bobrinski's jerboa and comb-toed jerboa's food followed (Fokin, 1963a, 1969a; Airapetyants *et al*., 1978). Along with studies of desert mammals' biology I.M. Fokin explored their unique locomotion. He was dreaming of studying jerboas' locomotion under the guidance of the famous scientist Prof. Boris Vinogradov in the Zoological Institute, USSR Academy of Sciences. Unfortunately, Prof. Vinogradov passed away in 1958, while Fokin was still working in Turkmenistan.

Igor and Anna came back to Leningrad in 1959. In December 1959 Igor became a PhD student in the Zoological Institute, USSR Academy of Sciences. His supervisor in Zoological Institute, Dr. Igor Gromov, supported his study of the functional morphology of jerboas of Dipodidae family. The main goal of I.M. Fokin studies was uncovering the ways of ecological and morphologic peculiarities of Dipodidae family and developing morpho-biological specifications of the family's taxa using this knowledge. In his work, he used methods of comparative ecology, comparative morphology and functional anatomy. Moreover, he used rapid photographic shooting and filming and also X-ray photography. Dr. Evgenia A. Klebanova, Dr. Anatoly S. Sokolov and Dr. Petr P. Gambaryan were his main mentors in animal morphology, and under their guidance he studied methodology of morphological researches. At that time he published papers about peculiarities of running in jerboas, methods of locomotion researches and morphology of muscles of jerboas (Fokin, 1963b, 1966, 1969b). Research of comparative anatomy of hind limb muscles of genera *Sicista* and *Salpingotus* helped to position Cardiocraniinae subfamily in Dipodidae system (Fokin, 1971b). He successfully defended his PhD thesis "Locomotion and transformation of movement apparatus of jerboa (Dipodidae) in the process of their specialization" on 14 October 1971 in the Leningrad State University. In 1978 materials of this thesis were published in the monograph "Locomotion and Morphology of Movement Apparatus of Jerboas" (Fokin, 1978b).

For a long time, from 1963 up to 1980, Igor Fokin was working in the Laboratory of the ecology of terrestrial vertebrates in the Biological Scientific Institute of the Leningrad State University. He started his work in this Institute as a research assistant in 1963. Since 1964 he got a permanent position as a junior research scientist in the Laboratory of the ecology of terrestrial vertebrates.

During his research of biomechanics and functional morphology of mammals' movement apparatus, Fokin developed new methods of instrumental analysis of mammalian locomotion, including rapid photographic shooting and filming and individual marking of animals. These methods helped him to gather valuable data to prove a theory about the origins of new locomotion forms in the evolution of mammals. Analysis of highlighted opening phases of forward movement in reptiles and rodents let I.M. Fokin form a theory about origins of speed bipedalism in tetrapods.

I.M. Fokin was a natural morphologist. His university professors took notice of it when he was still a student. His morphological preparations were the best in the class. He was an incredibly rational person and was always in search of new methods and techniques. That is why his research is very important for jerboa family studies as well as the comparative and ecological morphology of mammals. His papers on morpho-functional features of the muscular apparatus of head in the jerboas are especially noteworthy (Gambaryan & Fokin, 1976; Gambaryan *et al*., 1980). Authors analysed muscles of masticatory apparatus and facial muscles of all Dipodidae genera and came to a conclusion that the main ways of face muscles development, controlling movements of ears, eyes, nose and lips were going in different directions from birch mice and elephant shrews, even with similar functions.

In 1978 his monography "Jerboas" was published by the Leningrad University Press in series "Life of our birds and mammals" (Fokin, 1978a). This monography explored biology, distribution and behaviour of jerboa superfamily. One chapter in this book is dedicated to describing modes of locomotions in jerboas and morphological devices for fast running and digging.

I.M. Fokin actively took part in several academic conferences, congresses and workshops. On the First Congress of the All-Union Theriological Society (Moscow, 1974) he presented a paper on the evolution of modes of locomotion and ways of transformation of movement apparatus of Dipodidae (Fokin, 1974); on All-Union Conference on ecology of carnivores he shared materials on peculiarities of movements of mustelids on snow (Fokin, 1979); on Sixth USSR Conference on Rodents he made a report on peculiarities of muscle system of pygmy jerboa (Fokin, 1983) and also postnatal ontogenesis of edible dormouse and thick-tailed jerboa (Airapetyants & Fokin, 1983a, b); on International Conference "Biodiversity of European North" he brought attention to the actual state and environmental constraints of biodiversity of mammals

Study of locomotion in mammals was the main scientific passion of Dr. I Fokin. Jumping comb-toed jerboa *Paradipus ctenodactylus*, Kara-Kum Desert. Photographed by I.M. Fokin.

community of Leningrad Region (Fokin & Airapetyants, 2001). Igor Fokin was an active member of All-Union Theriological Society of the USSR Academy of Science. On the Second Congress of the All-Union Theriological Society (Moscow, 1978) he was elected as a member of main board in All-Union Theriological Society.

Aside from scientific research I.M. Fokin took a keen interest in educational work — led summer internship for the Leningrad State University students, taught a course on anatomy of laboratory animals for the students of the Department of Vertebrate Zoology, was a supervisor for students' term papers and graduation theses.

During a long time Igor Fokin continued the scientific researches in Turkmenistan. In 1975 together with Anna Airapetyants he established the scientific-educational zoological station "Shakh-Senem" in the Kara-Kum Desert. Many students of the Leningrad State University were spending their summer practice there, gathering materials for graduation theses and PhD theses. This station was also loved by scientists from the Leningrad State University and the Zoological Institute who were studying biology, morphology and adaptation of mammals in the desert. Zoological station "Shakh-Senem" existed up to the end of the Soviet Union era in 1991. Another zoological station "Shul'gino" was established for the same purposes in Boksitogorsk District on the southeast of the Leningrad Region. "Shul'gino" Station was opened in 1965 and still exists nowadays.

On June 2nd, 1980 Igor Fokin was elected as a head of the Laboratory of Mammalogy in Zoological Institute USSR Academy of Sciences, taking over from Prof. Igor Gromov, who was in charge of the laboratory during 1974–1980. Igor Fokin was a head of the Laboratory of Mammalogy up to 1997. During this time the Laboratory of Mammalogy became one of the largest and most important departments in the Zoological Institute. Fokin was a supervisor for PhD theses of Olga Zherebtsova, Alexei Abramov and Kirill Tretyakov (all of them are working as researchers in the Zoological Institute now).

Despite the fact that his main duties were connected with the laboratory, he was also involved in the museum exhibitions and has been to Japan, Finland, USA, and Sweden with different museum exhibitions from the Zoological Institute.

Igor Fokin was an outstanding natural scientist. He spent his last years in nature, researching different species of vertebrates. Aside from desert jerboas his favourite animals were dormice (Gliridae) and flying squirrels (*Pteromys*). I.M. Fokin gave all his time and energy to the research of his home region's nature. He was always working on conservation of mammals in the North-West of Russia, taking part in "Lenkompriroda"

(i.e. Leningrad State Committee of Nature Conservation) activities. He orchestrated publishing of "Nature of Leningrad Region" monograph series, the first book in this series being "Mammals" (Airapetyants, Strelkov & Fokin, 1987). Igor Fokin was an expert of commission on rodents in USSR Red Data Book and Leningrad Region Red Data Book, and also a member of Commission on the compilation of "Inventory of USSR fauna".

I.M. Fokin did not stop his scientific researches even after a severe blood stroke in spring 1999. He used to come to "Shul'gino" Station every summer until his demise, spending all his time there on researching ecology of small mammals in the woods near the station.

I.M. Fokin was one of the renowned experts in the ecological morphology of mammals. His researches were defined by a combination of morphological method with instrumental analysis of life-sustaining activities of animals. In-depth study of modes and functions of locomotory apparatus in several groups of mammals let I.M. Fokin see a problem of the evolutionary evolvement of different forms of forward movements in mammals from a new point of view. He developed a new methodological approach and successfully applied it to the analysis of ways of adaptive evolution in a Dipodidae superfamily. He published three monographs and over forty scientific papers based on results of his researches.

He will always be dearly remembered as a bright, interesting person, who is passionate about his work, a brilliant planner and talented researcher.

Elena P. Tikhonova, Alexei V. Abramov & Alexei N. Tikhonov

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