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Reply to J. G. M. Thewissen's Review of the Book *Morphology of the Auditory and Vestibular Organs in Mammals, with Emphasis on Marine Species*

By Galina N. Solntseva. Pensoft Publishers and Brill Academic Publishers, Sofia, Leiden, 2007. ISBN 9789004162020, 244 pp., appearing in *Aquatic Mammals*, *33*(3), 394-395, 2007.

J. G. M. Thewissen's review of my book gives the impression that it was written for a different book altogether, so by all means, it invites a reply. The reviewer obviously was critiquing the book from his frame of reference, phenetics, rather than from that of its intended audience. I am surprised that the reviewer chose to evaluate it in these terms given that phenetics is not my field of study. My classical studies on comparative anatomy and developmental biology of aquatic mammals were mistaken by the reviewer for a comprehensive, comparative book on the phenetics of these species: much to my chagrin, the better half of the book review by Professor Thewissen was dedicated to a discussion of phenetics. I am quoting from the review: "It might appear that Solntseva boldly strays onto thin ice when she leaves her own field of phenetics" and " . . . her research fit squarely into the phenotype tradition . . . ." The field of phenetics is not the foundation of my research or my book. The reviewer's focus on phenetics is, in my opinion, an inexcusable oversight for any professor of biology.

In stark contrast to the label of "scientific parochialism," it should be pointed out that this book was purposely written to bridge the gap between the Russian and Western scientific traditions, specifically by breaking down the language barrier. At the time Van Valen's article was published in 1968, many scientists in the West were aware that excellent studies on marine mammal sensory abilities were being conducted in the former Soviet Union but were frustrated at not having access to them. Twenty years since the opening of relations among countries, there is still a backlog of important data from Russian scientists that needs to be made available in English. The main objective of my book was to provide non-Russian speaking researchers the details of my 40 years of careful and meticulous sectioning, dissecting, and examining of the auditory anatomy of the aquatic mammal species. I alone compiled the collection of the morphological material over many years, its anatomical and histological treatment, and the microphotographs seen in this book. Perhaps only specialized morphologists will appreciate the enormous volume of work performed by a single researcher. Hence, it is no surprise that "citations of her own work in the bibliography runs an incredible five pages," as was pointed out by the reviewer. If the reviewer is using the term "scientific parochialism" to criticize the book for focusing primarily on my own work, it should be noted that my intention was not to make a comprehensive book that compared my work to all other studies in this field. I am of course very familiar with the work of Ketten and others.

It is impossible to agree with Professor Thewissen concerning the criticisms of the book's design, for instance, the lack of diagrams and micrographs to illustrate key points in the text. The section of the book on the outer ear was longer than the sections on the middle and inner ear because that is the concentration of my area of study and most of my unique material was on this portion of the auditory system. The chapter of the book on the outer ear includes extensive material from studies of the auricular glands of the external auditory meatus. For the first time, research was done on representatives of different ecological groups of mammals for this area. In my opinion, researchers are undeservedly paying more attention to the study of the middle and inner ear. My interest in the study of the outer ear, especially in marine species, is vital given that the closing of the external auditory meatus for dolphins has inspired many researchers to suggest very diverse hypotheses on sound transmission in dolphins, sometimes not even related to the auditory organs. I intentionally arranged the chapters in a definite sequence which gradually leads the reader to conclusions based on the comparative morphological analysis of my data.

Professor Thewissen's attempt to refute my research based on the considerable morphological material is not well founded. I described all existing hypotheses of sound transmission in dolphins, including Ken Norris's theory of sound conduction along the fatty channel of the lower jaw, adding my own suggestions on this subject. Currently, the nature of sound transmission in the

auditory system of marine mammals is still open to discussion and future study, primarily because researchers do not know the role of skull bone conduction of sound and the effects that depth may play on hearing abilities.

The reviewer, not a specialist in the field of bio-engineering acoustics, debated the calculations of the coefficient of the sound pressure transmission in the middle ear of mammals. These calculations were carried out by my colleague, acoustician N. V. Lipatov. I performed only the morphological part of this research. Evaluating the basis for these calculations was not a goal of my book: the anatomical data were not presented to either support or refute this number.

Since I feel that the review did not properly illuminate the subject matter of the book, it is my duty to clarify the research to which I continuously devoted more than 40 years. The basic direction of the structural evolution of the outer, middle, and inner ears, representing a substantial number of mammalian species inhabiting diverse habitats (terrestrial, subterranean, aerial, semi-aquatic, and aquatic forms, including marine mammals), were traced in this monograph. The broad spectrum of the species studied and an application of traditional anatomical, optical, and bio-mechanical methods allowed for the description of previously unknown structural features of the peripheral auditory system in animals with different hearing specializations. The influence of ecological and evolutionary factors on the structural organization of auditory organs was analyzed.

This ecological-morphological approach was useful in revealing the fact that the peculiarities in auditory organ structure seen in different aquatic mammalian groups were influenced by the animals' adaptation to the distinctive acoustic features of their habitat. Morphological and functional adaptations of the peripheral auditory system leading to the optimization of auditory sensitivity for different living conditions proved to be the main selective pressures for the evolution of these systems. Particular attention in the book was paid to the less-studied mammals (pinnipeds, cetaceans), being of interest both from the point of view of echolocation abilities (in odontocetes) and an aquatic habitat influence on morphological adaptations of the peripheral auditory system in semi-aquatic and aquatic species. The book is illustrated with a great amount of original microphotos, pictures, and drawings and is intended for morphologists, zoologists, ecologists, and specialists working in bioacoustics.

I hope that readers will appreciate the value of the many decades worth of previously inaccessible research now made available to non-Russian speakers by means of this book.

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