

The Kyiv Society of Naturalists and its Importance in the Development of Zoology

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Until recently, most of the works on the history of naturalist societies have been devoted to the Moscow, St. Petersburg, Tartu, and other societies. The study of scientific heritage and other societies has become an urgent need. Among them, a particular attention is paid to the Kyiv Society of Naturalists (1869–1929), which contributed significantly to the systematic development of many branches of natural science since the late 1860s. By choosing the Kyiv Society of Naturalists (hereinafter referred to as the KSN) as the topic of our research, we sought to recreate a holistic picture of the history of that society based on historical and scientific analysis. Within that society, the issues of higher education, scientific training, and practice emerged in a single complex with outstanding scientific research, traditions of Kyiv University, and specific socio-historical conditions for the development of Ukraine. The history of the KSN is highly instructive in terms of identifying the dependence of its development not only on the accumulation and theoretical comprehension of scientific facts but also on various forms of social creation and national traditions. The analysis of the specific concepts of the Kyiv naturalists is utterly vital to clarify the genesis of scientific ideas and problems. The creation of new scientific areas is associated with the activity of the KSN. The Society has largely contributed to the development of the materialistic worldview. The enormous moral and spiritual potential accumulated within the Society still remains the essential virtues that young scientists are educated on. Achievements of the KSN set the prerequisites and grounds for the development of many scientific areas in the Soviet era. Finally, many fundamental issues addressed by the Society are still relevant today. The significance of the KSN in the development of natural science in the post-Darwinian period has not been sufficiently discussed in the scientific literature. As far as we know, there are almost no works considering this issue from the perspective of modern natural science. Meanwhile, the KSN experience deserves a thorough study to highlight not only the history

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of the Society but also its part in implementing fundamental research in biology, geology, physics, chemistry, mathematics, geography, and other sciences. We are trying to fill this gap to some extent. The stated motives determined the topic of our research – the activities of the Kyiv Society of Naturalists (1869–1929) as a whole. The history of the creation and functioning of the Kyiv Society of Naturalists (1869–1929) and its role in the development of zoological research in the Russian Empire and in the early years of the young Soviet state are considered. Analysis of the history of zoological research in the KSN showed that several zoological schools emerged and successfully developed in Russia. One can point out the morphological school of A. N. Severtsov, associated with the names of I. I. Schmalhausen, B. A. Dombrovsky, M. M. Voskoboinikov, the paleontological school of N. I. Andrusov, and the school of experimental zoologists of I. I. Schmalhausen. The problem of the emergence of zoological schools in the KSN and Russia as a whole, both in the pre-revolutionary and Soviet times, was important for understanding the emergence of the theoretical foundations of zoology. However, it remains underdeveloped. Thanks to the discoveries and research carried out by the KSN naturalists, zoological science has been enriched by outstanding scientific works, underpinning, and promoting the development of modern zoology. The successes of the KSN naturalists in the fauna's study led to a high level of zoological thought in Russia and Ukraine. The study of the emergence and progress of evolutionary trends in different areas of zoology will make it possible to recreate the complex picture of the development of scientific prerequisites for evolutionary biology and the reconstruction of the entire biology on an evolutionary basis with maximum completeness over time. Therefore, the history of the emergence and development of zoological research in the KSN should be regarded as an interesting and fruitful part of the history of biology as a whole.

[Zoological Researches; Societies of Naturalists; Kyiv Society of Naturalists; Development of Embryological; Evolutionary and Functional Researches]

Introduction

Scientific societies started emerging with the organization of universities in the Russian Empire, gathering significant forces of outstanding scientists and progressive figures of the country.⁴

In the second half of 19th century, several natural science societies were

⁴ E. SINELNIKOVA, Philosophy of science in Russia: The St. Petersburg Philosophical Society (1897–1923), in: *Philosophy of Science*, 27, 4, 2019, pp. 79–93; <https://doi.org/10.14394/filnau.2019.0027>; L. SOLOVIOVA – S. HURINCHUK – Yu. BERDNYCHENKO et al., Professor V. Ye. Timonov – the Formation of the Scientific Worldview, in: *History of Science and Technology*, 10, 2, 2020, pp. 368–382, <https://doi.org/10.32703/2415-7422-2020-10-2-368-382>; N. PASICHNYK – R. RIZHNIAK – H. DEFORZH, Biographical Materials of Mathematicians and Natural Scientists in 'Bulletin of Experimental Physics and Elementary Mathematics' (1886–1917): Meaningful and Content Analysis, in: *History of Science and Technology*, 12, 2, 2022, pp. 279–301, <https://doi.org/10.32703/2415-7422-2022-12-2-279-301>.

founded at the Kyiv University of St. Vladimir: the Society of Naturalists (1869), obstetric-gynecological (1890), physico-medical (1896), psychiatric (1897), syphilidological, and dermatological (1890), and multiple technical departments of large technical and agricultural societies.⁵

It is not an accidental phenomenon that several natural science societies emerged in Ukraine. Interest in natural science, in studying the nature of Ukraine, determining the need to expand the network of higher and secondary educational institutions and, interestingly, vocational education organizations naturally arose at the stage of socio-economic development of the tsarist Russia in the post-reform, capitalist era of its history after the abolition of serfdom in 1861. This article aims at analyzing the structure, activities, historical significance, and merits in the development of natural science and, in particular, zoology, of the previous natural science society known as the Kyiv Society of Naturalists (1869–1929).

The increased interest in the history of naturalist societies established at universities in pre-revolutionary Russia is fully justified.⁶ The significance of a specific contribution made by researchers of different natural societies to the general development of natural science contributed to a deeper and more comprehensive understanding of their activities. A great deal of what science stands for today is owed to the activities of the well-known naturalist societies as peculiar scientific centers for the development of natural science.⁷ Until recently, most of the works on the history of naturalist societies⁸ have been devoted to the Moscow,⁹

⁵ O. Ya. PYLYPCHUK, *The Kyiv Society of Naturalists and Its Contribution to the Development of Embryological Science*, Kyiv 1991, p. 19.

⁶ S. UDERBAEVA – A. LYUBICHANKOVSKIY, The Contribution of the Russian Imperial Scientific and Local Lore Societies to the Scientific Study of Central Asia, in: *Istoriya*, 10, 8 (82), 2019, <https://doi.org/10.18254/S207987840006044-7>.

⁷ N. G. SUKHOVA – A. Y. SKRYDLOV, The Russian Geographical Society and the Polar Studies in the Second Half of the 19th century, in: *IOP Conference Series: Earth and Environmental Science*, 180, 1, 2018, p. 012001, <https://doi.org/10.1088/1755-1315/180/1/012001>.

⁸ I. KRZEPTOWSKA-MOSZKOWICZ, Study of the Interest of Seweryn Józef Krzemieniewski (1871–1945) in the Nature Conservation, the History of Botany in Poland, and his Passion for Popularizing the Natural Sciences, in: *Studia Historiae Scientiarum*, 19, 2020, pp. 53–74, <https://doi.org/10.4467/2543702XSHS.20.004.12560>.

⁹ G. G. KRIVOSHEINA, Faunistic Research in the Moscow Governorate in the 19th Century: the Role of Scientific Societies, in: *IOP Conference Series: Earth and Environmental Science*, 579, 1, 2020, p. 012163, <https://doi.org/10.1088/1755-1315/579/1/012163>.

St. Petersburg,¹⁰ Tartu¹¹ and other societies.¹² The study of scientific heritage and other societies has become an urgent need. Among them, a particular attention is paid to the Kyiv Society of Naturalists (1869–1929), which contributed significantly to the systematic development of many branches of natural science since the late 1860s.

By choosing the Kyiv Society of Naturalists (hereinafter referred to as the KSN) as the topic of our research, we sought to recreate a holistic picture of the history of that society based on historical and scientific analysis. Within that society, the issues of higher education, scientific training, and practice emerged in a single complex with outstanding scientific research, traditions of Kyiv University, and specific socio-historical conditions for the development of our State.

The history of the KSN is particularly interesting and instructive today. It turned a vivid chapter in the development of the native culture in the second half of the 19th – the first third of the 20th centuries. For 60 years, this Society played an outstanding part in the scientific, social, and cultural life of the Russian Empire, and then of Soviet Ukraine. Along with international recognition, its own understanding of being a part of the world history and its place in the common civilization grew and strengthened.

The history of the KSN is highly instructive in terms of identifying the dependence of its development not only on the accumulation and theoretical comprehension of scientific facts but also on various forms of social creation and national traditions. The analysis of the specific concepts of the Kyiv naturalists is utterly vital to clarify the genesis of scientific ideas and problems.

The academic achievements of the KSN have long been the property of science. Many members of the Society are world-renowned scientists

¹⁰ G. G. KRIVOSHEINA, Scientific Societies and Exploration of the Territory of the Russian Empire, in: *IOP Conference Series: Earth and Environmental Science*, 350, 1, 2019, p. 012007, <https://doi.org/10.1088/1755-1315/350/1/012007>.

¹¹ M. TOOMSALU, Pioneering Embryological Research at the Old Anatomical Theatre of the University of Tartu, in: *Papers on Anthropology*, 29, 2, 2020, pp. 71–82, <https://doi.org/10.12697/poa.2020.29.2.06>.

¹² L. VANIUHA – Ya. TOPORIVSKA – O. HYSYA et al., I. H. Verkhtskyi (1846–1919): at the Origins of Ukrainian Natural Science, in: *History of Science and Technology*, 11, 1, 2021, pp. 84–102, <https://doi.org/10.32703/2415-7422-2021-11-1-84-102>.

Ivan Schmalhausen,¹³ Alexander Kowalevsky,¹⁴ Sergei Navashin,¹⁵ Nicanor Chrzęszczewski,¹⁶ Józef Paczowski.¹⁷ Each of them has raised many outstanding naturalists. The creation of new scientific areas is associated with the activity of the KSN. The Society has largely contributed to the development of the materialistic worldview. The enormous moral and spiritual potential accumulated within the Society still remains the essential virtues that young scientists are educated on. Achievements of the KSN set the prerequisites and grounds for the development of many scientific areas in the Soviet era. Finally, many fundamental issues addressed by the Society are still relevant today. The significance of the KSN in the development of natural science in the post-Darwinian period has not been sufficiently discussed in the scientific literature. As far as we know, there are almost no works considering this issue from the perspective of modern natural science. Meanwhile, the KSN experience deserves a thorough study to highlight not only the history of the Society but also its part in implementing fundamental research in biology, geology, physics, chemistry, mathematics, geography, and other sciences. We are trying to fill this gap to some extent. The stated motives determined the topic of our research – the activities of the Kyiv Society of Naturalists (1869–1929) as a whole.

Research Methodology

Two aspects were chosen as the main directions of historical and scientific analysis: presenting the KSN as a special form of research activity (this

¹³ G. RISPOLI – F. D'ABRAMO, Ivan I. Schmalhausen (1884–1963), in: L. NUÑO DE LA ROSA – G. B. MÜLLER (eds.), *Evolutionary Developmental Biology*, Cham 2021, pp. 275–287, https://doi.org/10.1007/978-3-319-32979-6_29.

¹⁴ A. V. ERESKOVSKY, Alexander Onufrievich Kowalevsky (1840–1901), in: L. NUÑO DE LA ROSA – G. B. MÜLLER (eds.), *Evolutionary Developmental Biology*, Cham 2021, pp. 217–233, https://doi.org/10.1007/978-3-319-32979-6_9.

¹⁵ V. P. KORZH, Sergei Gavrilovich Navashin: Two Anniversaries, in: *Cytology and Genetics*, 42, 3, 2008, pp. 139–146, <https://doi.org/10.3103/S0095452708030018>.

¹⁶ O. O. MOIBENKO – V. Ie. DOSENKO – V. L. HUR'IANOVA, Scientific Portrait of Nicanor Adamovich Trzaska-Hrzonzczowski (to the 175th Anniversary of the Birth of the First Pathophysiological of Ukraine), in: *Physiological Journal*, 57, 6, 2011, pp. 118–124, <https://doi.org/10.15407/fz57.06.118>.

¹⁷ T. SAMOJLIK – A. FEDOTOVA – P. DASZKIEWICZ et al., Conclusions – Learning the Past to Understand the Future of BPF, in: *Białowieża Primeval Forest: Nature and Culture in the Nineteenth Century*, Cham 2020, pp. 219–223, https://doi.org/10.1007/978-3-030-33479-6_9.

required highlighting the main issues of the organization, structure, and social activity of the society), on the one hand, and analyzing the main directions of scientific activity of the society members, focusing primarily on zoological research, on the other hand. All the above determines the significance of this study, which aims at revealing the historical part of the Kyiv Society of Naturalists in the development of national natural science.

The specific objectives of the research comprised of reproducing the entire history of the KSN and periodizing this history; identifying the reasons for the emergence of naturalist societies at the universities of pre-revolutionary Russia; covering the main stages and activities of the KSN; identifying its social function; assessing the part of the KSN in raising the level of natural sciences; determining the place and significance of the Kyiv naturalists in the development of natural science; analyzing the organization of scientific activities in the Society; deploying cultural and educational activities of the KSN; covering the nature and significance of its publishing activities; demonstrating the importance of the KSN in the establishment of biological stations, exhibitions, and museums; analyzing the role of the Society in the arrangement of congresses of Russian naturalists and doctors, as well as congresses of farmers; revealing the expedition and excursion activities of the Society, and describing its scientific collections.

Following the main goal of the study, we also sought to find out the key issues within which the interaction between zoology and evolutionary trends in biology developed, and how the evolutionary principle assisted in solving complex scientific matters in specific zoological disciplines. All these tasks were solved through the study of little-known sources, large archival material, protocols, and works of the Kyiv Society of Naturalists.

Results and discussion

Despite the great merits of the Society in the development of natural science and its wide popularity in scientific circles, no analysis of its practical and scientific activities was carried out in the pre-October literature. The first attempt to assess the results of the 10-year activity of the Society was made by N. V. Bobretsky, a well-known Ukrainian zoologist of the second half of the 19th – early 20th centuries, professor and rector of the Kyiv University. His work known as “A note on the 10-year activity of the Kyiv Society of Naturalists”, as the title suggests, was a jubilee one.

Therefore, it is no wonder that it emphasized the successes of the Society and omitted its failures.¹⁸

It is also worth noting the more or less thorough studies of separate issues of the Society's activities, carried out by some of its members: N. Cherkunov,¹⁹ V. Montrezor,²⁰ N. Krichagin,²¹ N. Bobretsky.²² These were reference works that significantly expanded the source base and extended the assessments of certain events in the history of the KSN activities.

In Soviet times, the study of the history of the KSN was also poor. The existing domestic historical and biological research have not always fully interpreted the trends and stages of the development of biology in Russia and Ukraine. Only sporadic works provide a historical commentary on certain issues of the Society's activities. So, only in 1929, devoted to the 60th anniversary of the Society, an advanced article (in French) was published in the "Notes of the Kyiv Society of Naturalists", which briefly highlighted the key moments of the Society's activities for the entire period of its existence.²³

In 1970, A. I. Barbarich, a historian of botany from Kyiv, analyzed the role of the KSN in the development of botany.²⁴

It is worth noting our monographic research published as a scientific manual "Kyiv Society of Naturalists and its contribution to the development of embryological science" (1991) for students of pedagogical institutes and universities in such specialties as Zoology, Evolutionary Teaching, Embryology with Fundamentals of Histology, and Phylogeny

¹⁸ N. BOBRETsky, Notes on the Ten-Year Activity of the Kyiv Society of Naturalists (1869–1878), in: *Notes of the Kyiv Society of Naturalists*, 6, 2, 1880, pp. 37–49.

¹⁹ N. CHERKUNOV, List of Beetles found in Kyiv and its Suburbs, in: *Notes of the Kyiv Society of Naturalists*, 10, 1, 1889, pp. 147–204.

²⁰ V. V. MONTREZOR, List of Rare Plants found in Kyiv, Podilsk and Volyn Regions in 1877, 1878, 1879, in: *Notes of the Kyiv Society of Naturalists*, 6, 2, 1881, pp. 117–182.

²¹ N. A. KRICHAGIN, Report on an Excursion to the Northeast Shore of the Black Sea carried out in the Summer of 1874 on Behalf of the Kyiv Society of Naturalists, in: *Notes of the Kyiv Society of Naturalists*, 5, 1, 1878, pp. 1–56.

²² N. BOBRETsky, Report of Zoological Researches conducted at the Shore of the Black Sea in Summer of 1869, in: *Notes of the Kyiv Society of Naturalists*, 1, 1, 1870, pp. 1–18.

²³ Sixtieth Anniversary of the Existence of the Kyiv Society of Naturalists, in: *Notes of the Kyiv Society of Naturalists*, 27, 4, 1929, pp. 3–5.

²⁴ A. I. BARBARICH, The Kyiv Society of Naturalists and its Role in the Development of Botany, in: *Botanical Journal*, 55, 4, 1970, pp. 583–591.

of the Animal World.²⁵ It is devoted to the organization and structure of the KSN, as well as its contribution to the development of embryology. It shows the influence of the KSN on the development of embryological ideas and its role in the formation of evolutionary biology. Along the way, considering the main stages of the establishment of the KSN, its scientific and social activities, a brief description of the creative path of the outstanding naturalists of the Society, who were actively involved in the development of complex embryological problems, is given.

We may find informative excursions into the history of certain branches of natural science, in which some aspects of the KSN activity are partially considered, in the papers of Ukrainian historians of biology such as Academician A. P. Markevich²⁶ and Professor B. N. Mazurmovich.²⁷ Studying the papers of these authors proves that they are focused mainly on covering certain specific issues.

The research is based on a wide range of both published and unpublished sources, handwritten and printed materials. The main source base comprises the minutes of the KSN meetings (sessions) published in the "Notes of the KSN", as well as unpublished documents discovered by the author in various archival repositories of Russia and Ukraine. The largest group of sources on the topic "Kyiv Society of Naturalists" consists of the documents of the Society, published in the collection of documentary materials of Kyiv University and the periodicals of the KSN. The first place in the total volume of documents concerning the KSN belongs to the minutes of the general meeting of the Society members, its Council, its departments, and committees. These documents, containing a wide variety of information, have often been of the greatest importance to us since sometimes the minutes of the Society were very short and laconic. In most cases, they reported the raising and passing of an issue with no records of the course of its discussion. That is why we compared handwritten minutes with the printed ones. Sometimes, special opinions, notes, and lists of Society members for a particular year are found in the minutes as appendix after a certain issue is resolved.

We paid great attention to the annual reports of the KSN on its activities. They reveal the true state of affairs in the Society, containing information on its scientific and educational activities for a year or

²⁵ PYLYPCHUK, p. 24.

²⁶ A. P. MARKEVICH, *Parasite Fauna of Freshwater Fishes of the Ukrainian SSR*, Kyiv 1951.

²⁷ B. M. MAZURMOVYCH, *Development of Zoology in Ukraine*, Kyiv 1972.

another period. One can always find information on the personnel of the Society's Council, on the participation of naturalists in expeditions and excursions, international congresses, on the activities of public committees for disseminating scientific knowledge among the population, on the arrangement of biological stations, exhibitions, and museums. An obligatory component of each annual report is the financial report of the Society and the report of the Auditing Committee.

We were greatly interested in a group of documents on the convocation of Russian congresses of naturalists and the organization of biological exhibitions therein. The materials of the congresses are mainly represented in the minutes of the Society's meetings by records of preparatory committees, project programs, regulations, reports, lists of members of the preparatory committees of congresses and exhibitions, terms of competitions, reports on exhibitions, arrangement of museums and on awarding prizes. Materials from exhibitions organized by the KSN are valuable sources on the history of natural science because they showcased important achievements of that time in the field of natural science. Sometimes the exhibitions were accompanied by catalogs providing an overview of the exhibits. And this reflected the level of scientific thought and products of national economic importance.

We paid some interest to the correspondence of the KSN members and its leadership with government bodies, Russian and foreign natural history societies, and individuals. The documents found in the handwritten department of the National Library of Ukraine named after V. I. Vernadsky fully reflect the external relations of the Society and its interests. Most of the materials already published in the collections of the KSN naturalists reveal the variety and complexity of the issues that they deal with. For example, A. O. Kowalevsky²⁸ and A. N. Severtsov,²⁹ who conducted an extensive correspondence with many outstanding scientists of the country and abroad, keep unique materials directly related both to the activities of the KSN and other scientific institutions.

To analyze the scientific and social activities of the KSN, we used papers of the Society members, reports of treasuries, other periodicals that keep

²⁸ A. V. ERESKOVSKY, Alexander Onufrievich Kowalevsky (1840–1901), in: L. NUÑO DE LA ROSA – G. B. MÜLLER (eds.), *Evolutionary Developmental Biology*, Cham 2021, pp. 217–233, https://doi.org/10.1007/978-3-319-32979-6_9.

²⁹ M. B. ADAMS, Severtsov and Schmalhausen: Russian Morphology and the Evolutionary Synthesis, in: *The evolutionary synthesis*, Cambridge, MA, London 2013, pp. 193–226, <https://doi.org/10.4159/harvard.9780674865389>.

the necessary information. The works, diaries, and other materials of scientific congresses contain important information about the development of natural science and zoological education.

To recreate the full history of the KSN activities, we used the archives of the Ministry of Public Education of the Russian Empire, Kyiv, Podilsk and Volyn governor-general, and the Kyiv educational district.

The main sources for creating the history of the KSN were also such official data: 1) Service records of professors and teachers of the university and the Society, which were preserved in the archives; 2) Minutes of the Council of the Kyiv University; since 1861, they were published in the journal "University News"; 3) Activity of the Council and the Board of Kyiv University; 4) Review of lectures at the University of St. Vladimir; 5) Overview of the annual reports of the university, published since 1861; 6) Other materials that are placed in the "University News".

Exceptionally important sources were: 1) Journal of the Ministry of Public Education (official part, reports, scientific papers, and obituaries); 2) Publications from various higher educational institutions dedicated to their history; 3) Biographical dictionaries; 4) Separate biographies and obituaries, which were published in "Kievlyanin" and "Modern Medicine". A large array of sources stored in the Kyiv city archive and the archive of the Leningrad region (the fund of St. Petersburg University) were also used. A common drawback of archival sources is their understaffing, and hence the lack of generalizing data on all areas of the KSN activity.

Along with the above issues, we were more interested in private matters concerning the development of zoological science. In this regard, the KSN served as: 1) The educator of many Russian zoologists, natural scientists, whose work was reported and critically discussed at the meeting of the Society, and then published in the "Notes of the KSN". As a rule, the Society, to the best of its capabilities, contributed materially to scientific research; 2) A place of concentration of expensive zoological collections, which were transferred to the zoological office of the Kyiv University according to the charter of the Society; 3) The center for publishing the most important works in all areas of natural science and zoology in particular; 4) A provider of multiple excursions and expeditions, which yielded essential materials for studying the fauna of Ukraine, Russia, and abroad. The studies have covered the entire fauna; 5) A center for researching the major element of the country's productive forces – the fauna, intending to use it for the needs of the national economy; 6) An active participant

in the propaganda of evolutionary doctrine and Darwinism; 7) A place of origin and development of new scientific disciplines (comparative or evolutionary embryology, evolutionary morphology, zoopsychology, etc.), as well as new methods of scientific research and equipment (for example, V.A. Karavaev's device);³⁰ 8) One of the founders of a wide front of work on the history of domestic science and the compilation of bibliography on individual disciplines; 9) One of the initiators and holders of the congresses of Russian naturalists and doctors, which was attended by many zoologists – members of the Society;³¹ 10) An initiator of several prizes, which were awarded to zoologists to involve them in research work; 11) A place where zoological nomenclature developed; 12) A creator of a valuable natural history library (its fund kept plenty of Russian and foreign periodicals), as well as an archive, which included the most important manuscripts and natural history materials. Finally, the KSN was a hotbed for popularizing natural history knowledge, including zoological knowledge, among the public.

We strive to highlight different sides of the multifaceted activity of the KSN in zoology. The key prerequisite for the success of this activity was the fact that from the very beginning of the Society's existence, a fairly significant circle of persons united by a deep interest in the study of comparative anatomy, embryology, paleontology, systematics, faunistics, and zoopsychology was identified. The increased interest in these zoological disciplines (and the separate scientific areas within each of them) was not accidental. It was conditioned by the entire period preceding the creation of the KSN, characterized by major shifts in the socio-economic life of Russia and related rapid development of evolutionary trends in biology. The theoretical foundations of special biological disciplines were transformed under the influence of the evolutionary idea. This enriched the topic of their research and expanded their goals and tasks. In several cases, the awareness of the constructive role of the evolutionary idea in zoology led to the substantiation of the programs of independent evolutionary disciplines. Some Kyiv zoologists were the founders of new scientific disciplines that emerged at the first stage of evolutionary theory development (A. O. Kowalevsky) – evolutionary

³⁰ L. G. ZAVERNÝĚ – A. I. POĬDA – I. D. LIUBITSKIĬ et al., Vladimir Afanas'evich Karavaev (on the 175th anniversary of his birth), in: *Khirurgiia*, 7, 1986, pp. 153–155.

³¹ The Sixth Congress of Russian Naturalists, (1880), in: *Nature*, 21, 534, pp. 288–289, <https://doi.org/10.1038/021288b0>.

embryology;³² and at the beginning of the 20th century – A.N. Severtsov – evolutionary morphology, V.A. Karavaev – comparative zoopsychology, and M. M. Voskoboinikov – functional morphology.

With the above considerations in mind, an analysis of the heritage of the KSN members was carried out to clarify the contribution of the KSN zoologists to the development of the main methods for studying the evolutionary process (embryological, paleontological, morphological, biogeographic, and systematic), evolutionary morphology, and zoopsychology.

The study of the KSN staff among zoologists showed that the following prominent scientists widely known in zoological literature took part in its activities: a) In the embryology of invertebrates – A. O. Kowalevsky, N. V. Bobretsky, A. A. Korotnev, V. V. Zalensky, B. A. Svarchevsky, V. P. Pospelov, N. A. Krichagin; b) In the embryology of vertebrates – A. N. Severtsov, I. I. Schmalhausen, B. A. Dombrovsky, M. M. Voskoboinikov, D. I. Beling; In the animal morphology – A. O. Kowalevsky, N. V. Bobretsky, A. A. Korotnev, V. A. Karavaev, B. A. Svarchevsky (invertebrates); A. N. Severtsov, I. I. Schmalhausen, B. A. Dombrowski (vertebrates); c) In the paleontology – N. I. Andrusov, P. A. Tutkovsky, B. L. Lichkov, B. A. Svarchevsky, and others; d) In the faunistics and systematics (with ecology) – A. O. Kowalevsky, B. A. Svarchevsky, Yu. M. Semenkevich, S. Yu. Kushakevich, V. M. Artobolevsky, I. K. Pachosky, E. B. Sharleman.

Besides these areas of zoology, the Society has made a great deal for the development of comparative anatomy and morphology, as well as experimental embryology. Some of the published studies are considered classical. Most of them have significantly strengthened the evolutionary theory. These are the works of M. A. Maksimovich, A. O. Kowalevsky, N. V. Bobretsky, V. K. Sovinsky, A. N. Severtsov, I. I. Schmalhausen, A. A. Korotnev, M. M. Voskoboinikov, and others. The Society contributed greatly to the development of zoopsychology and animal ecology.

The material we got leaves no doubt that the evolutionary idea penetrated into zoology as early as at the time of its isolation as an independent science. The study of the scientific heritage of the major zoologists of the KSN allows us to conclude that the origins of the comparative evolutionary trend in zoology date back to the late 1960s – early 1970s.

³² M. RAINERI, On Some Historical and Theoretical Foundations of the Concept of Chordates, in: *Theory in Biosciences*, 128, 1, 2009, pp. 53–73, <https://doi.org/10.1007/s12064-009-0059-y>.

Having established evolutionary trends in special disciplines, the KSN zoologists, along with physicists, chemists, geologists, and biologists of other special disciplines created real prerequisites for the formation of important components of future evolutionary biology. Assuming that the theory of evolution serves as the foundation of the latter, and the components, as the analysis of the scientific activities of Kyiv naturalists has shown, are the elements designed to make up the future system of knowledge, they often emerged independently of each other (for example, in zoology or geology). Subsequently, they interacted with each other, like stratigraphy and paleontology, and the links between individual elements were strengthened.

Thus, the intensive restructuring of the entire complex of zoological disciplines based on the theory of evolution resulted in using the historical method and the principles of Darwinism in the study of all phenomena of the life of the fauna. There is no doubt that the development of zoology in the KSN and the theory of evolution coincided chronologically. This indicates that both branches of biology were in an emerging state.

As a general result of the development of zoological research in the KSN, it can be noted that a fairly wide range of issues has been discussed in this branch of knowledge within a relatively short time. It became obvious that the principles of Darwinism were applied to embryology, morphology, paleontology, systematics, faunistics, and even zoopsychology. All the above disciplines succeeded in using a comparative approach to study certain issues. This allowed the KSN zoologists to create new concepts. There have been attempts to construct animal systematics based on phylogenetic relationships and the emergence of new evolutionary disciplines. The evolutionary restructuring of biology required from the KSN zoologists a more thorough knowledge of the fundamentals of zoology, as well as the mastery of diverse biological information related to the entire organic world. Therefore, dealing with zoological issues involved the study of forms from different taxa and sometimes from different kingdoms of living nature. And all this required using the comparative method. However, this approach did not always pursue evolutionary goals. In most cases, it was dictated by the interests of the actual zoological research. Although the accumulation of comparative zoological material could not but contribute to the solution of evolutionary issues, it was not at all easy to distinguish the comparative and historical approach in the studies of different zoologists, the KSN member. The point is that the concept of “comparative” often had an evolutionary meaning. The programs of

A. O. Kowalevsky, N. V. Bobretsky,³³ and other KSN zoologists can serve as good examples. Here, they referred to comparative embryology, although the latter was deemed to solve truly evolutionary issues.

The material considered in this article, covering the activities of a Pleiad of prominent representatives of zoological science in Kyiv in the second half of the 19th – first third of the 20th century, allows us to conclude that zoological generalizations were based on the empirical and theoretical basis. In particular, it is noteworthy that the tendency to develop evolutionary-zoological conclusions was determined in the 1870s. A. O. Kowalevsky's detailed study of the individual development of invertebrates and vertebrates is a vivid illustration of this process.³⁴ Consequently, the emergence of evolutionary embryology as an independent science implied not only the creation of a reliable methodological basis but also the successful synthesis of empirical, comparative, and historical methods. The evolutionary trend in zoology contributed to the expansion of the scope of application of the experiment in the study of the development processes of the organic world.

The first stage of the history of zoology in the KSN yielded significant results thanks to the development of the comparative evolutionary trend. Among the evolutionary conclusions related to this period, we should first refer to the principle of the genealogical unity of the fauna, the genealogical theory of germ layers, the so-called biogenetic law, and many principles of organ transformation.

While working on evolutionary topics, the KSN zoologists were deeply interested in the philosophical questions of natural science, the theory of cognition, and its place in natural science. They not only criticized idealism but also defended and developed natural-scientific materialism (especially A. N. Severtsov and his students).³⁵ They were clearly aware of the role of theoretical thinking and philosophy in the cognition of zoological objects and the laws of their development.

³³ N. A. BOLTACHOVA – E. V. LISITSKAYA, On the Taxonomic Classification of spio (annelida, spionidae) Species from the Sea of Azov – Black Sea Basin, in: *Marine Biological Journal*, 4, 3, 2019, pp. 26–36, <https://doi.org/10.21072/mbj.2019.04.3.03>.

³⁴ R. A. RAFF – A. C. LOVE, Kowalevsky, Comparative Evolutionary Embryology, and the Intellectual Lineage of Evo-Devo, in: *Journal of Experimental Zoology Part B: Molecular and Developmental Evolution*, 302, 1, 2004, pp. 19–34, <https://doi.org/10.1002/jez.b.20004>.

³⁵ A. G. ASMOLOV – E. D. SHEKHTER – A. M. CHERNORIZOV, The Other Side of Homeostasis: A Historical Evolutionary Approach to Development of Complex Systems, in: *Voprosy Psikhologii*, 4, 2015, pp. 3–15.

The development of evolutionary disciplines in biology was driven by the interaction of individual sciences. Geologists, physicists, chemists, and representatives of other sciences were involved in the study of the laws of biological evolution. At the same time, the evolutionary disciplines themselves revealed a tendency towards integration, which later became a factor contributing to the formation of a united front of sciences studying living nature. The above was fully manifested in the activities of biologists of the Kyiv Society of Naturalists.

There is a certain continuity in the development of research of different zoological directions in the KSN, which is characteristic of all methods of scientific research – empirical, experimental, and theoretical. For example, the studies of A. O. Kowalevsky, N. V. Bobretsky, A. A. Korotnev, B. A. Svarchevsky, V. A. Karavaeva, A. N. Severtsova, I. I. Schmalhausen, and others constitute separate scientific directions, which are manifested in the development of embryology, comparative in its content. The theoretical direction in embryology did not remain isolated from zoology. On the contrary, represented the process of shaping the theoretical foundations of zoology and the evolutionary process, an indicator of the involvement of zoological science in solving general biological issues and understanding the laws of development of the organic world. It can be assumed that the evolutionary doctrine should be considered one of the first among the many factors that conditioned the differentiation and development of zoological science. The successes of the comparative evolutionary direction in zoology served as a prerequisite for the creation of serious research programs by A. O. Kowalevsky, N. I. Andrusov, A. N. Severtsov, I. I. Schmalhausen, and other researchers. Implementing some of them led to the creation of independent research areas (evolutionary embryology,³⁶ geomorphology,³⁷ evolutionary morphology,³⁸ etc.).

It should be emphasized that a lot of work has been done in the KSN, specifically in zoological research. Zoologists of the KSN have widely studied the fauna of Russia and Ukraine – its species composition,

³⁶ S. I. FOKIN, Life of Alexander Onufrievich Kowalevsky (1840–1901), in: *Evolution and Development*, 14, 1, 2012, pp. 3–8. <https://doi.org/10.1111/j.1525-142X.2011.00517.x>.

³⁷ V. P. CHICHAGOV, Outstanding Russian Scientist Nikolai Ivanovich Andrusov (1861–1924) and his Geomorphological Works, in: *Geomorfologiya*, 4, 2018, pp. 96–103, <https://doi.org/10.7868/S0435428118040089>.

³⁸ M. F. NIKITENKO, Development of the Ideas of A. N. Severtsov on Evolutionary Morphology of the Brain, in: *Arkhiv Anatomii, Gistologii i Embriologii*, 52, 1, 1967, pp. 99–112.

ecology, geographical distribution, and systematics. Owing to their efforts, the fauna of Ukraine is now studied quite thoroughly. The invertebrates are the most thoroughly studied. Along with the study of terrestrial fauna, the fauna of freshwater bodies, the Black Sea, the Sea of Azov, and the Mediterranean Sea has been studied in detail. The KSN zoologists have produced several summarizing papers and major monographs on faunistics, zoogeography, and animal ecology.

The works of the KSN morphologists (in comparative anatomy, comparative embryology, and experimental zoology) were a significant contribution to the creative development of Darwinism's issues. All the material accumulated by morphologists confirmed the validity of the evolutionary teachings of Charles Darwin. Thus, the works on the establishment of morpho-physiological regularities of shape formation are of exceptional interest in the KSN. The issues of general regularities of the evolutionary process and animal phylogeny were successfully addressed in the KSN. The activity of paleozoologists was also fruitful. After the October revolution, research on experimental zoology, morphology, fauna, and animal ecology developed successfully. Naturally, the discovery of the regularities concerning zoological objects facilitated the reconstruction of the ways of their historical development.

Conclusion

Analysis of the history of zoological research in the KSN showed that several zoological schools emerged and successfully developed in Russia. One can point out the morphological school of A. N. Severtsov, associated with the names of I. I. Schmalhausen, B. A. Dombrovsky, M. M. Voskoboinikov, the paleontological school of N. I. Andrusov, and the school of experimental zoologists of I. I. Chmalhausen. The problem of the emergence of zoological schools in the KSN and Russia as a whole, both in the pre-revolutionary and Soviet times, was important for understanding the emergence of the theoretical foundations of zoology. However, it remains underdeveloped.

Thanks to the discoveries and research carried out by the KSN naturalists, zoological science has been enriched by outstanding scientific works, underpinning, and promoting the development of modern zoology. The successes of the KSN naturalists in the fauna's study led to a high level of zoological thought in Russia and Ukraine. The study of the emergence and progress of evolutionary trends in different areas of zoology will make it possible to recreate the complex picture of the development of

scientific prerequisites for evolutionary biology and the reconstruction of the entire biology on an evolutionary basis with maximum completeness over time. Therefore, the history of the emergence and development of zoological research in the KSN should be regarded as an interesting and fruitful part of the history of biology as a whole.