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Benedykt Dybowski's Contribution to the Exploration of Lake Baikal Fauna

Benedykt Dybowski (1833–1930) – one of the most important European zoologists of the second half of the 19th and the first decades of the 20th c. – was a man extraordinarily active both in science and society. Perceived primarily as a pioneer of Darwinism in Poland, he achieved his greatest professional success through his study of the ichthyofauna of Lake Baikal and the East Siberian rivers Angara, Yenisei, and Selenga. This work examines the Siberian period of Dybowski's life in the context of his faunistic research on the world's deepest lake.

Keywords: Benedykt Dybowski, Lake Baikal, ichthyofauna, 19th century
Słowa kluczowe: Benedykt Dybowski, Bajkał, ichtiofauna, XIX wiek

Introduction

Dybowski (Fig. 1), whom Magdalena Woltanowska accurately included among the most important representatives of 'Polish exiled science',[1] is particularly noted for his faunistic studies of Siberia, where he found himself against his will and made it his second homeland. The figure of this naturalist in the twentieth century has been the subject of several scientific biographical studies. Two extensive publications by the writer and populariser of science, Andrzej Trepka (1923–2009),[2] and the zoologist Gabriel Brzęk (1908–2002)[3] are of the greatest value among monographs in the 'life and work' category. The aim of this article is to chronologically discuss Dybowski's research on Baikal, taking into account the methods and resources he used, the results he achieved, and their reception within the scientific and non-scientific communities.

1 M. Woltanowska, *Wystawy w Muzeum Niepodległości o tematyce biograficznej (lata 1990–1994)*, "Niepodległość i Pamięć" 2001, vol. 8, no. 1 (17), p. 155.
2 A. Trepka, *Benedykt Dybowski*, Katowice 1979.
3 G. Brzęk, *Benedykt Dybowski. Życie i dzieło*, Lublin 1981.

Fig. 1. Benedykt Dybowski in an engraving from 1884 (source: "Kłosy. Czasopismo Illustrowane Tygodniowe" 12(24).01.1884, no. 969, p. 49)

For the purposes of this work, historical sources of varying provenance were studied, primarily narrative ones, including press articles, biographical contributions, memoirs, and letters. Queries were conducted at the Archives of the Polish Academy of Sciences in Warsaw (Polska Akademia Nauk Archiwum w Warszawie, APAN), the Central Archives of Historical Records in Warsaw (Archiwum Główne Akt Dawnych, AGAD) and the B. Dybowski Zoological Museum at the Ivan Franko National University of Lviv (Zoologìčnij muzej L'vìvs'kogo nacìonal'nogo unìversitetu ìmenì Ìvana Franka, IFNU ZM).

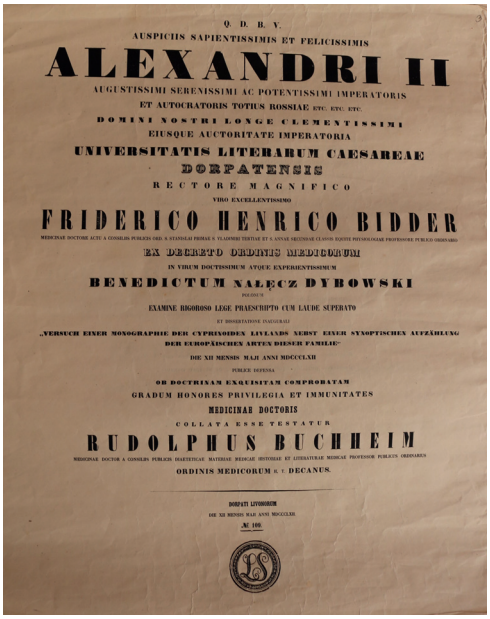
Patriot, naturalist, and social activist

Turning to Dybowski's Baikal research, it is worth recalling the basic facts of his biography, considering the historical realities in which he lived. He was born into a noble family of modest means, bearing the Nałęcz coat of arms and descending from Greater Poland, where considerable attention was paid to patriotic upbringing. They zealously adhered to this attitude – through active participation in two most important Polish national uprisings of the 19th c.: the November and January Uprisings – and paid for it with the loss of property, imprisonment, Siberian *katorga* (heavy penal labour in Siberia), loss of health, and, in the case of some of them, even life. During his childhood, which he remembered as a happy one, Benedykt lived near Nowogródek[4] in the Adamaryn and Tonwy (present-day Adamaryni and Tonovo) estates managed by his parents Jan (?–1870) and Salomea née Przysiecki (1811–1898), as well as at the household of his aunt Brygida Turczyńska in Siennica. These lands were annexed to the Russian Empire after the second partition of the Polish-Lithuanian Commonwealth (1793). He received his initial education at home and showed interest in biology, particularly botany, from a very young age.[5] A convenient opportunity for this was furnished by a garden with medicinal plants, grown by his grandmother Franciszka née Lenkiewicz. In 1848, after passing the entrance examinations, he was admitted to the third grade of the classical junior gymnasium for boys in Minsk,

4 Present-day Belarusian Navagrudak, a city in the Grodno Region of Belarus.

5 Of Benedict's five siblings, it was his brother Władysław (1838–1910), a graduate of IUD, who pursued the study of natural history, mainly palaeontology and zoology, but also floristics, and later worked as an assistant and private associate professor at this university until 1878. Based on specimens of Baikal fauna received from his brother, he published many scientific papers, including works on molluscs. See W. Dybowski, *Die Gasteropoden-Fauna des Baikal-Sees, anatomisch und systematisch bearbeitet*, "Mémoires de l'Académie impériale des sciences de St.-Pétersbourg" 1875, vol. 22, no. 8; idem, *Diagnosen neuer Choanomphalus-Arten*, "Nachrichtsblatt der Deutschen Malakozoologischen Gesellschaft" 1901, vol. 33, p. 119–125; idem, *Przyczynek do fauny ślimaków jeziora bajkalskiego*, "Wiadomości z nauk przyrodniczych" 1880, issue 1, p. 69–74. See also: B. Dybowski, *O Syberyi i Kamczatce. Część I. Podróż z Warszawy na Kamczatkę*, Warszawa, Kraków [no date], p. XII–XX; Z. Wójcik, *O Władysławie Dybowskim (1838–1910) i jego działalności naukowej*, "Analecta. Studia i materiały z dziejów nauki" 2003, vol. 12, no. 1–2 (23–24), p. 165–175. See also: Archiwum Główne Akt Dawnych [AGAD], Zbiór Branickich z Suchej, Suplement, sygn. 82/1-2, Listy Benedykta Dybowskiego pisane do Władysława Taczanowskiego z Syberii.

then the seat of the Minsk governorate, 30 km from Adamaryn. Still fascinated by nature, he and his classmates bred various animals and observed their ethology. His attention was especially drawn by a small aquarium in the garden of the Podoliński family, for which he caught fish in the nearby river. Being subjected to intensive Russification – like most secondary school students – not only did he resist its impact, but also strengthened his patriotic convictions. Having obtained his secondary school certificate in 1851, he studied medicine at the German-speaking Imperial University in Dorpat (IUD),[6] known as 'Athens on the river Emajõgi' for its high academic standards and distinguished faculty. In 1856, as a talented and hardworking student, he was awarded a gold medal by his alma mater for his work on freshwater fish in Livonia (Estonia), entitled *Über die Süsswasserfische Livlands*. During the fourth and last year of his studies, an incident with unfortunate consequences occurred. Dybowski, agreeing to second in a duel – a form of dispute resolution which was then already legally prohibited – was imprisoned, and in May 1857, he was expelled from the university. He continued his studies in Wrocław for a year and a half, and from the autumn of 1858 at the Royal Friedrich Wilhelm University of Berlin,[7] where, having read the monograph by Charles Darwin (1809–1882) on the origin of species,[8] he immediately became an ardent supporter of the theory of evolution and its lifelong propagator in every place where he later came to work. After presenting an extremely innovative diploma thesis developed under the supervision of the German anatomist and physiologist Karl Bogislaus Reichert (1811–1883) on parthenogenesis in bees and bumblebees,[9] he received the doctoral degree in Medicine and Surgery in 1860.


Q. D. B. V.
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ALEXANDRI II
AUGUSTISSIMI SERENISSIMI AC POTENTISSIMI IMPERATORIS
ET AUTOCRATORIS TOTIUS ROSSIAE ETC. ETC. ETC.
DOMINI NOSTRI LONGE CLEMENTISSIMI
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ET DISSERTATIONE INAUGURALI
„VERSUCH EINER MONOGRAPHIE DER CYPRINOIDEN LIVLANDS NEBST EINER SYNOPTISCHEN AUFZÄHLUNG DER EUROPÄISCHEN ARTEN DIESER FAMILIE"
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Fig. 2. The Doctor of Medicine diploma awarded to Dybowski by the IUD in 1862 (source: APAN, III – 327, f. 3)

Seeking to have his diploma recognized in the Russian Empire, he returned to Dorpat, where he sat exams and presented his work on Estonian cyprinids, which he had been preparing for several years.[10] The procedure for the recognition of the title awarded in

6 The university was founded in 1632 as Universitas Gustaviana, the present-day University of Tartu in Estonia.
7 Present-day Humboldt University.
8 Ch. Darwin, *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life*, London 1859.
9 During the research, Dybowski discovered a parasitic nematode *Sphaerularia bombi* in a female bumblebee, which was described by the German zoologist Karl Rudolf Leuckart (1822–1898) a quarter of a century later. Cf. W. Kulmatycki, *O życiu i działalności ś.p. prof. dr. Benedykta Dybowskiego*, Łódź 1930, p. 4 [reprint from "Czasopismo Przyrodnicze" 1930, no. 3–4].
10 B. Dybowski, *Versuch einer Monographie der Cyprinoiden Livlands nebst einer synoptischen Aufzählung der europäischen Arten dieser Familie*, Dorpat 1862 [reprint from "Archiv für die Naturkunde Liv-, Ehst- und Kurlands" 1862, Serie 2, vol. 6, p. 133–326].

Fig. 3. Front elevation of the former WMS building (photo: P. Brzegowy, 2024)

Berlin nearly failed. In 1861, along with other Polish students, he was arrested for a few weeks for singing *Boże coś Polskę* ('God Save Poland')[11] in Vilnius Cathedral,[12] which Russian authorities deemed a political provocation. Finally, in May 1862, the IUD conferred a doctoral title upon him (Fig. 2). There were plans to employ the promising young scientist at the Department of Zoology of the Jagiellonian University in Krakow, but this was opposed by Anton von Schmerling, who knew of the candidate's patriotic tendencies. In December 1862, he found employment at the four-faculty Warsaw Main School (Szkoła Główna Warszawska, WMS, Fig. 3),[13] where he held a chair in zoology and comparative anatomy.[14]

As an assistant professor, he taught and led exercises, quickly becoming one of the most popular lecturers at the university. Before the Polish edition of *The Origin of Species* was published,[15] he was among the first to discuss the results of Darwin's research, arous-

11 Polish patriotic religious song, banned in the Russian partition since 1862. It is considered the anthem of the insurgents of the January Uprising.

12 Present-day The Archcathedral Basilica of St. Stanisław Bishop and St. Władysław in Vilnius.

13 The university was open from June 1862 to November 1869.

14 Polska Akademia Nauk Archiwum w Warszawie [APAN], III – 327 Materiały Benedykta Dybowskiego, Autobiografia profesora Uniwersytetu Lwowskiego B. Dybowskiego, f. 1; G. Brzęk, *Benedykt Dybowski,* p. 11–46; A. Trepka, *Benedykt Dybowski*, p. 9–56; L. Bykowski, *Dybowski Benedykt (1833–1930)*, [in:] *Polski Słownik Biograficzny*, vol. 6, Kraków 1948, p. 36–37.

15 The first Polish translation by Wacław Mayzl, MD (1847–1916) titled *O powstawaniu gatunków drogą naturalnego doboru, czyli o utrzymywaniu się doskonalszych ras istot organicznych w walce o byt* was published in Warsaw in 1873.

ing genuine interest among listeners in this theory, which constituted the basis for the science investigating the evolution of organisms. Since the WMS was newly established, it lacked basic teaching aids, including microscopic specimens and laboratory equipment. While preparing for classes, Dybowski made drawings that helped explain the material under discussion. He brought a taxidermied Black Sea roach from Kiev, intending to create a zoological collection. Moreover, he quickly combined teaching with patriotic activity, joining the ranks of the Provisional National Government.[16] Acting as its emissary – 'the commissioner for the Eastern Borderlands' – he made several agitational and organisational trips: to Bila Tserkva, Kamianets-Podilskyi, Kiev, Krakow, Prague and Zhytomyr. Arrested in February 1864, he spent the following months in Warsaw prisons Pawiak and Citadel, where he was physically and mentally oppressed.

Originally sentenced to death by hanging, he was eventually sentenced to twelve years of *katorga* in Siberia.[17] Completing the trek lasting several months (covering almost 8,000 km) through St. Petersburg, Moscow, Nizhny Novgorod, Tobolsk, to Irkutsk – about half of which was done on foot – came at the expense of his exhaustion and illness. In the spring of 1865, he arrived in Syvakova village. From there he proceeded to Chita and Darasun, where, due to the presence of highly CO_2-saturated and ferruginous healing waters, he worked as a spa physician and planned to build a new natural treatment facility. While staying in Darasun, he explored the surrounding areas on horseback, reaching, among others, the valleys of the Olenguy, Ingoda, and Onon Rivers and the Yablonoi Mountains, conducting faunistic surveys.

He managed to take a small number of books from Warsaw, along with a microscope, a magnifying glass, a foldable fishing rod, and a few surgical tools. The success of bringing these items to the place where he was completing his *katorga* – given the meticulous inspections, confiscations, and theft – was a feat in itself. As a forced labourer, he worked felling and transporting trees, pulling logs from the river, fetching water, and harvesting wild onions and garlic used to treat scurvy. As a doctor, he provided medical assistance to his fellow prisoners, the prison staff, the families of Tsarist officials, and the local population, which won him some sympathisers who sometimes called him a 'miracle-working doctor'. It also allowed him to establish contacts with representatives of the local administration, with whom he consulted on the idea of natural research in Eastern Siberia. He received 200 roubles from his grateful patients, which he used, among other things, to purchase a piece of wire to serve as a frame for taxidermied animals, as well as two tracking dogs.

He spent his time free from forced labour, planning zoological research. He collected plants for the herbarium, caught insects, fish and crayfish, and discovered new species in the process: Łagowski's minnow (*Phoxinus lagowskii*), a fish in the carp family (*Cyprini-*

16 A secret unit operating in the Russian partition, preparing the outbreak of the January Uprising.

17 In Tsarist Russia, Siberia was a place of temporary or lifelong exile (forced resettlement while maintaining personal freedom) or *katorga* (forced hard physical labour in prisons, from which the term *katorżnik* – *katorga*-labourer – is derived). Agriculture in Eastern Siberia was underdeveloped. The local population made a living from hunting, fishing, animal husbandry and, to a small extent, from mining. As prisoners of war, Poles were sent to Siberia from the first half of the 17th c. Mostly of noble origin, and sometimes voluntarily joined by their immediate family, they were sent there after the downfall of the January Uprising. More on this topic: W. Caban, *Zsyłka Polaków na Syberię w XIX wieku. Przegląd publikacji polskich i rosyjskich/radzieckich*, "Przegląd Historyczny" 2014, vol. 105, no. 4, p. 713–716.

Fig. 4. Dybowski (second from the left) during his stay on the Kamchatka Peninsula (source: A. Dybczak, *Album fotograficzny Benedykta Dybowskiego*, Ethnographic Museum in Kraków, etnomuzeum.eu/syberia/kontekst/album-fotograficzny-benedykta-dybowskiego [accessed 20.03.2024])

dae); the Siberian salamander (*Salamandrella keyserlingii*),[18] a tailed amphibian belonging to the Asiatic salamanders (*Hynobiidae* family); and a subspecies of the great bustard (*Otis tarda dybowskii*), a bird from the bustard family (*Otididae*). He sent many of the taxidermied specimens, mainly birds, to the university's Zoological Cabinet in Warsaw. Dybowski maintained regular correspondence with local naturalists and their patrons: ornithologist Władysław Taczanowski (1819–1890),[19] zoologist Antoni Waga (1799–1890), and the brothers – Counts Aleksander (1821–1877) and Konstanty (1824–1884) Branicki.

Dybowski devoted himself with great commitment to another task: popularising abstinence. Ever since his academic days in Dorpat, he had been an implacable anti-alcohol advocate – in his opinion, the most fundamental cause of the moral decay of humankind and the underlying factor behind many diseases. He called for sobriety and its social promotion[20] to the very end of his days. Deprived of freedom, enduring many traumatic experiences, and thousands of kilometres away from his family home, he turned the inhospitable place of exile into a place of scientific work, with the goal – finally achieved after many efforts – of refuting the Russian naturalists' thesis that the European and East Siberian fauna were identical, and that Lake Baikal was poor in other animal organisms apart from fish.[21]

18 See P. Daszkiewicz, J.-Ch. de Massary, *Notes herpétologiques tirées des mémoires de Benedykt Dybowski, et en particulier sur les circonstances de la découverte de Salamandrella keyserlingii Dybowski, 1870*, "Bulletin de la Société Herpétologique de France" 2023, no. 183, p. 1–10.

19 See W. Taczanowski, *Listy do Antoniego Wagi, Konstantego Branickiego i Benedykta Dybowskiego*, ed. by K. Kowalska, A. Mroczkowska, B. Zielińska, Wrocław, Warszawa, Kraków 1964 (Memorabilia Zoologica, vol. 12).

20 See B. Dybowski, *O wpływie trunków alkoholicznych na organizm zwierzęcy i ludzki*, Lwów 1902.

21 B. Dyakowski, *Badacz dalekiej północy (Benedykt Dybowski)*, ed. by Z. Bohuszewiczówna, Poznań, Warszawa, Wilno, Lublin 1931 (Biblioteczka Przyrodnicza), p. 9–30; G. Brzęk, *Benedykt Dybowski*, p. 47–136; A. Trepka, *Benedykt Dybowski*, p. 57–276; L. Bykowski, *Dybowski Benedykt*, p. 37; D. Iwan, A. Cegliński, H. Kowalski, D. Mierzwa-Szymkowiak, M. Raś, W. Wawer, *Z dziejów Gabinetu Zoologicznego. Materiały z badań Azji Pół-*

Having achieved fame as an explorer in Eastern Siberia and having been released from *katorga* on account of his scientific achievements, he returned to Warsaw in 1877 as a national hero, rejecting offers of the curatorship at the Branicki Counts Museum[22] and academic chairs in Tomsk and St. Petersburg. Urged by his family and friends to undertake scientific work on his native soil, he unexpectedly decided to travel to Petropavlovsk in Kamchatka for research (Fig. 4). From 1879 to 1883, he worked there as the only government doctor (supported by several feldshers), providing medical care to tens of thousands of residents across an area of 400,000 km^2. He treated people with leprosy and syphilis, combated typhus and smallpox epidemics, established hospitals and isolation wards, and undertook charitable activities. He continued his faunistic research and expanded its scope to the Commander Islands, the Kuril Islands, and Sakhalin. He studied and described the biology of salmon living in the seas and rivers of the Commander Islands. The acclimatisation of reindeer on Bering Island, carried out on his initiative and with his financial support, was successful. He contributed to the repopulation of the species considered to be extinct – the sea otter (*Enhydra lutris*), a predatory mammal of the *Mustelidae* family. His attitude towards the indigenous peoples of Kamchatka, primarily Aleuts,[23] Itelmens, and Koryaks,[24] was marked by friendliness and curiosity.

Observing the mass scale of hunting for brown bears, snow sheep, ermines and sable, he often acted as a defender of Kamchatkan wildlife. During hunts, which he permitted only for the collection of wildlife specimens and taxidermy, and when acquiring anthropological and ethnographic collections, he was assisted by a traveller and talented hunter, Jan Kalinowski (1857–1941). The prepared zoological collection, taking up 60 boxes, i.e. molluscs, porifera, arachnids, birds and mammals, was later exhibited in Warsaw and Krakow. In 1883, he came to Lviv, where, with the exception of a break forced by a trip to Lake Balaton and the island of Cres in the mid-1890s and during World War I, he lived for the rest of his life (i.e. 47 years).

Until 1906, he was professionally associated with the Franciscan University.[25] For 23 years, he headed the chair of zoology, which he took over from Henryk Kadyi (1851–1912), taught as an academic, and managed the university zoological museum,[26] which was well stocked with his natural collections, including a large collection of Baikal molluscs. He was the dean and vice-dean of the Faculty of Philosophy. In 1900, after being

nocnej i Wschodniej (1861–1889), Warszawa 2023 (Memorabilia Zoologica. Nowa Seria, vol. 9), p. 15–18; S. Konstanczak, *Recepcja teorii Darwina w filozofii polskiej XIX wieku*, [in:] *Filozofia, nauka, religia. Księga jubileuszowa dedykowana Profesorowi Kazimierzowi Jodkowskiemu z okazji 40-lecia pracy naukowej*, ed. by P. Bylica, K.J. Kilian, R. Piotrowski, D. Sagan, Zielona Góra 2015, p. 5–6.

22 One of the most important private natural science institutions in Poland of the partition era. More on this topic: P. Daszkiewicz, D. Iwan, *Co wiemy o Muzeum Branickich? Listy Jana Sztolcmana do Benedykta Dybowskiego ze zbiorów poznańskiego oddziału Archiwum PAN – interesujący przyczynek dla historii zbiorów przyrodniczych w Polsce*, "Kwartalnik Historii Nauki i Techniki" 2020, vol. 65, no. 2, p. 77–87.

23 In 1903, Dybowski, who celebrated his 70th birthday and a 45-year jubilee of scientific work through the intermediary of Józef Morozewicz (1865–1941), a mineralogist, was sent a complete skeleton of Steller's sea cow (*Hydrodamalis gigas*), an extinct marine mammal of the Dugongidae family from Bering Island. A. Trepka, *Benedykt Dybowski*, p. 355; G. Brzęk, *Benedykt Dybowski*, p. 251–252.

24 Rich pieces of graphical material compiled by Dybowski are kept in the Kamchatka Regional United Museum (Kamčatskij kraevoj ob'edinënnyj muzej) in Petropavlovsk. Copies of some photos can be seen in A. Dybczak, *Album fotograficzny Benedykta Dybowskiego* Ethnographic Museum in Kraków, etnomuzeum.eu/syberia/kontekst/album-fotograficzny-benedykta-dybowskiego [accessed 20.03.2024].

25 Present-day IFNU.

26 Present-day IFNU ZM.

elected rector, he resigned from his duties as university administrator. He included anthropology in the students' syllabus, accepting it as a necessary supplement to zoology. Because of his energetic dissemination of the rationalist worldview in the capital of Galicia and his tenacious defence of evolutionism, he faced criticism from the Catholic Church and the conservative press. Until the last days of his life, he prepared scientific works and memories. Dybowski's funeral, which took place on 4 February 1930 at the Lychakiv Cemetery in Lviv, on the so-called Hill of the January Insurgents, was a major patriotic manifestation and a tribute from the international scientific community.[27]

On the banks of the 'Sacred Sea'

Baikal – the deepest lake on Earth and its largest freshwater reservoir,[28] known as the 'Sacred Sea' by the Buryats and Tungusic peoples – became one of the most important sites for limnological research in the world in the second half of the 19th c., owing to Dybowski's efforts. Without the help of Józef Łagowski (1820–1870)[29] and Gen. Bolesław Kukiela, the Warsaw naturalist probably would never have begun studying the lake's fauna. As a result of their intervention, together with Wiktor Godlewski (1831–1900)[30] and Władysław Księżopolski,[31] at the end of 1868 he obtained a release from *katorga* forced labour and an official permit to take up residence in Kultuk village[32] (Fig. 5), located on the south-western shore of the lake. Next to the residential buildings, there was a church and a post office. Despite the prevailing poverty and even famine, the inhabitants were

27 A. Trepka, *Benedykt Dybowski*, p. 324–372; G. Brzęk, *Benedykt Dybowski,* p. 197–318; B. Dyakowski, *Badacz dalekiej północy*, p. 66–80; AGAD, C.K. Ministerstwo Wyznań i Oświaty, 1/304/0/1/118u [Uniwersytet Lwowski. Wydz. filozoficzny. Personalia profesorów, lit. A–G], Dybowski, f. 941–948. Many previously unknown facts from the last years of Dybowski's life were provided by Piotr Daszkiewicz and Dariusz Iwan. See P. Daszkiewicz, D. Iwan, *Ostatnie lata życia Benedykta Dybowskiego (1833–1930) w świetle korespondencji z Januszem Domaniewskim (1891–1954) – przyczynek do biogramu*, "Kosmos. Problemy nauk biologicznych" 2020, vol. 69, no. 4, p. 555–561.

28 On the geography and nature of Baikal, see L. Touchart, *Baikal, Lake*, [in:] *Encyclopedia of Lakes and Reservoirs*, ed. by L. Bengtsson, R.W. Herschy, R.W. Fairbridge, New York, London 2012 (Encyclopedia of Earth Sciences Series), p. 83–91.

29 A student of the gymnasium (secondary school) in Równe (Ukrainian: Rìvne). A graduate of the medical faculty at the Saint Vladimir Imperial University of Kyiv (present-day Taras Shevchenko National University of Kyiv). While serving as a military doctor in the Tsarist army, he began collecting plants, including specimens from the Zhytomyr region, the Caucasus, and Siberia. From 1856, he lived in Zhytomyr, where he served as an assistant to the inspector of the Medical Board. He participated in preparations for the January Uprising. Arrested in 1863. Originally sentenced to death, the sentence was later commuted to Siberian *katorga* (heavy penal labour) in Usolye, from which he was sent to Irkutsk, where he worked as a doctor, while continuing his botanical work. He was married to Olga née Juszkiewicz, with whom he had three children: Michał, Maria and Konstancja. Cf. W. Lasocki, *Wspomnienia z mojego życia*, vol. 1, *W Kraju*, Kraków 1933, p. 376–378.

30 Although his education was limited to completing a gymnasium (secondary school) in Łomża, he had extensive zoological, and especially ornithological, knowledge. For participation in the January Uprising, he was punished with a twelve-year *katorga* (heavy penal labour) in Siberia, from which he returned in 1877. He settled on the Smolechy estate near Ostrowia Łomżyńska, where he worked in farming and the acclimatisation of Siberian plants. He was a talented hunter, taxidermist and constructor. His skills played the key role in exploring the deep-water fauna of Baikal. Cf. F. Zienkowicz, *Wiktor Godlewski. Wspomnienie pośmiertne*, "Wszechświat" 1900, vol. 48, no. 19, p. 753–755; M. Bartniczak, *Wiktor Ignacy Godlewski*, "Wszechświat. Pismo przyrodnicze" 1970, no. 7–8 (2081–2082), p. 200–204.

31 According to Dybowski, Księżopolski was sociable and enterprising. He managed household affairs, including meal preparation and trade, and ran a small shop within the household. He was also responsible for meteorological observations and recording the level of the lake. Cf. G. Brzęk, *Benedykt Dybowski*, p. 142, 165.

32 Kultuk – currently a city in the Irkutsk Region of Russia.

cheerful and unconcerned about difficult living conditions.[33] A group of Polish researchers found accommodation in the house of a local merchant who rented them a furnished residential building with a garden for 15 roubles per year. The property was supervised by a Pole from Volhynia, Mikołaj Kołodziej. In the autumn of 1868, Dybowski, seeking to prepare himself as well as possible to explore the Baikal environment and fauna, conducted literature studies in Irkutsk for almost three months and devised a research plan.

The result of this query did not amount to much for him. There was no information about bathymetry, chemical processes in the lake's waters or its topography.[34] Having no financial resources available, he requested support from the Imperial Russian Geographical Society (Imperatorskoe Russkoe Geografičeskoe Obŝestvo, IRGS)[35] and the Imperial St. Petersburg Academy of Sciences (Imperatorskaâ Sankt-Peterburgskaâ akademiâ nauk).[36] He argued that Eastern Siberia – a land mostly located in the Central Siberian Upland, intersected by many valleys and ravines – was a habitat not only for new varieties[37] of animals but also for new species.[38] However, his applications were turned down. At that time, it was believed that life did not actually exist at significant depths in various aquatic ecosystems. This was supposed to have been confirmed by the research of the German amateur geographer and traveller Gustav Radde (1831–1903) conducted in 1855–1859,[39] in which a Polish physician, Antoni Wałecki (1815–1897), participated.[40] According to Radde, Baikal was rich in fish, but the invertebrate fauna was characterized by paucity.[41] Similar conclusions were also presented by the organizers of other expeditions: a German zoologist and botanist Peter Simon Pallas (1741–1811), and a Russian zoologist Alexander von Middendorff (1815–1894).[42] An extensive encyclopaedic entry by Wałecki, published in 1860, reflected the state of knowledge about this water body at the time. Writing about the lake's ice cover, he noted that after freezing, it was an important route for transporting goods along the European Russia–Zabaykalsky Krai–China trail. In the summer, steamships were used for this purpose. He provided the general geographic coordinates of this

33 J. Kalinowski, *Listy 1856–1877*, Lublin 1979, p. 362–364.

34 G. Brzęk, *Benedykt Dybowski,* p. 137–140.

35 Present-day Russian Geographical Society (Russkoe geografičeskoe obŝestvo) with its headquarters in St. Petersburg.

36 Present-day Russian Academy of Sciences (Rossijskaâ akademiâ nauk) in St. Petersburg.

37 The term 'variety', introduced by Carl Linnaeus (1707–1778), does not appear in modern zoological nomenclature.

38 This issue was precisely presented by Dybowski in a scientific paper from 1922. See B. Dybowski, *Spis systematyczny gatunków i ras zwierząt kręgowych fauny wschodniej Syberyi*, "Archiwum Towarzystwa Naukowego we Lwowie" 1922, vol. 3, no. 1, issue 6–8.

39 It resulted in a two-volume monograph: G. Radde, *Reisen im Süden von Ost-Sibirien in den Jahren 1855–1859, incl. Band I. Die Säugethierfauna*, St. Petersburg 1862; idem, *Reisen im Süden von Ost-Sibirien in den Jahren 1855–1859, incl. Band II. Die Festlands-ornis des südöstlichen Sibiriens*, St. Petersburg 1862.

40 Wałecki was a graduate of the Medical and Surgical Academy in Vilnius and a respected ichthyologist. For his patriotic activity, he was sent to Siberia, where he was a forced labourer in, among others, the mines in Duchar and Nerchinsk. Like Dybowski, with whom he had become acquainted in Warsaw, he conducted botanical, ethnographic, local historical, and zoological research and observations. He published the works from that period in the magazine "Przegląd Naukowy" ('Scientific Review'). He provided valuable information about Baikal in the text published in the first volume of *Orgelbrand's Encyclopaedia*. After almost 18 years, he left Siberia under the 1856 amnesty. He was the curator of the Mineralogical Collection of the WMS (later the Imperial University of Warsaw). More on this topic: J. Trynkowski, A. Woltanowski, *Antoni Wałecki (1815–1897), badacz Wschodniej Syberii i Bajkału*, "Kwartalnik Historii Nauki i Techniki" 1990, vol. 4, p. 585–602.

41 APAN, III – 327, Autobiografia profesora, f. 2; cf. also B. Dybowski, *O faunie mięczaków bajkalskich (Ueber die Fauna der Baikal-Mollusken)*, Lwów 1911, p. 946–947 [reprint from "Kosmos" 1911, no. 10–12].

42 APAN, III – 327, Autobiografia profesora, f. 3.

Fig. 5. A view of Kultuk village. Monochrome photograph from 1869 (source: Museum and Institute of Zoology of the Polish Academy of Sciences in Warsaw)

body of water and an estimated maximum depth of over 2000 m. The temperature of the tasteless, highly transparent water ranged from 3.5 to 12°Ré. Due to the steep shores on the west coast, no permanent settlements were created there. All the rivers flowing into Baikal, including the largest, the Selenga, were on the eastern side. Wałecki's text also included basic information about the flora and fauna living around the lake. Of the species of fish found in Baikal, he listed only those that were of economic importance: *Thymallus verus*, golomyanka (*Comephorus baikalensis*), also known as the Baikal oilfish, Russian sturgeon (*Acipenser gueldenstaedtii*), sharp-snouted lenok (*Brachymystax lenok*), omul (*Coregonus migratorius*), houting (*†Coregonus oxyrinchus*), sevruga (*Acipenser stellatus*), taimen (*Hucho taimen*).[43] Łagowski came to Dybowski's aid by granting him a loan for the purchase of equipment and food. After moving to Kultuk and establishing the first social relations with the inhabitants of the village – mostly Buryats and Tungusic peoples – the convicts-scholars divided the scope of their duties among themselves. In the first years of their stay, Godlewski and Księżopolski expanded the rented house by adding an extension used to store ropes and nets. A cow and a horse were also kept.[44]

Research on Baikal fauna began in January 1869. It marked the start of a great adventure and important zoological discoveries that ensured Dybowski's eternal fame in the world of science. The Polish researchers, eager to uncover the lake's natural secrets, were enchanted from the outset, above all by the crystalline purity and transparency of the water. Dybowski noted that 'At times it seemed that we were somehow walking on the surface of unfrozen water as if we were not separated from it by any hard space'.[45] However, conducting field research in this location was beset by many difficulties, which

43 A. Wał. [A. Wałecki], *Bajkał*, [in:] *Encyklopedyja Powszechna*, vol. 2, *(Ap.–Bąk.)*, Warszawa 1860, p. 706–710.
44 G. Brzęk, *Benedykt Dybowski,* p. 141–142.
45 B. Dybowski, *Pamiętnik*, p. 314.

Fig. 6. A fragment of the permanent exhibition dedicated to B. Dybowski at the Lviv City Children's Ecological and Naturalistic Center (L'vìvs'kij mìs'kij ditâčij ekologo-naturalìstičnij centr) (photo: P. Brzegowy, 2024)

they struggled with for six winter seasons spanning 1869–1872 and 1875–1877.[46] In winter, the temperature dropped to about –40°C. Spring and summer showers posed a risk of flooding. Frequent gusty winds caused storms and high waves, while thick autumn fog forced the boat to be illuminated with wooden torches or lanterns. Therefore, deepwater surveys could only be conducted for four months a year. From April to December, specimen collections were expanded, scientific articles were written, and the terrestrial fauna, especially birds, was studied. Occasionally, fishing with nets was carried out at shallow depths. The peace of the inhabitants of Kultuk was sometimes disturbed by *brodiagi*, i.e. criminals released from Siberian prisons or escapees not shying away from theft and murder. Interruptions in the research process were caused by various unforeseen events. For example, in 1872, Godlewski was struck by severe diarrhoea with a loss of consciousness, which almost led to his death.[47]

Research instruments

The lack of specialized research instruments and laboratory equipment – apart from the microscope, basic glass vessels, tweezers, sleighs and fishing rods – was the main factor inhibiting the faunistic exploration of Baikal by Dybowski's team.[48] Using pickaxes, the researchers worked their way through a layer of ice which was almost one meter thick.

46 In 1869, Dybowski and Godlewski participated in the expedition led by Gen. Ivan Skolkov to the Amur Krai, in the Ussuri and Amur catchment basins, to Vladivostok and Korea, as well as to Manchuria. Between 1872 and 1875, they explored the areas around the rivers Argun, Amur, and Ussuri. They reached Lake Khanka and the Sea of Japan. Cf. G. Brzęk, *Benedykt Dybowski,* p. 163–166, 179–192.

47 Ibidem, p. 153–154, 156, 175–176.

48 A small fragment of Dybowski's research instruments and laboratory equipment is held in Lviv City Children's Ecological and Naturalistic Center (L'vìvs'kij mìs'kij ditâčij ekologo-naturalìstičnij centr) (Fig. 6).

Their physical strength allowed them to cut ten holes in the ice sheet a day. During the first winter, they carved 79 of them over a distance of eight kilometres. A total of 200 holes were made. The holes in the ice sheet were numbered, and their depths were recorded. The extraction of profundal and benthic fauna was carried out with the help of dredgers invented by them, and buckets lowered on hand-made ropes, the longest of which were almost 3,000 metres long. The hemp yarn was bought in Irkutsk. A deepwater net was also used, but the attempt to pull it out with a horse was unsuccessful. The depth measurements were carried out with the help of a Russian shifter scale and a French spring scale, probes, and large scissors with a pointed end, used together with a canvas sack. An automatically closing iron gripper for extracting bottom mud proved particularly helpful. Most of these instruments were made in the local forge by the technically talented Godlewski.[49]

The lack of a tent in the early months of the research forced overnight stays on a makeshift bed laid directly on the frozen surface of Baikal. Only some time later did Godlewski build a cabin on skids equipped with an anchor (in Polish *furgon*, Fig. 7) serving as a shelter and a primitive laboratory. The cabin was anchored and heated with an iron stove. A rented boat was used for fishing after the spring thaw until high waves made it unsafe. After the completion of the research, the constructed instruments were transferred to the Irkutsk branch of the IRGS. They were destroyed in a city fire.[50] According to Dybowski, the best baits included: charred bones with an intense smell of decay, grated hemp seeds mixed with clay, rotted wood bark and partially roasted fish. In order to catch molluscs, lime balls with grated hemp were used.[51] The newly acquired animal specimens were examined in detail by Dybowski for morphology and anatomy, and then described and documented with biological drawings. Stanisław Wroński (1848–1898),[52] Feliks Zienkowicz (1842–1910)[53] and other Polish exiles helped the scholar create them.[54]

49 See D. Mierzwa-Szymkowiak, R. Rutkowski, *Benedykt Tadeusz Dybowski and Wiktor Ignacy Godlewski: Ground-breaking Studies of Siberian Natural History in the Nineteenth Century*, "Archives of Natural History" 2023, vol. 50, issue 2, p. 229–243.

50 G. Brzęk, *Udział Polaków w badaniach przyrody Syberii, a zwłaszcza Bajkału*, "Analecta. Studia i materiały z dziejów nauki" 1999, vol. 8, no. 1, p. 145; idem, *Bajkalska szkoła Benedykta Dybowskiego*, "Prace Komisji Historii Nauki" 2000, vol. 2, p. 59; APAN, III – 327, Autobiografia profesora, f. 3–7.

51 B. Dybowski, *Pamiętnik*, p. 327–329.

52 A painter. In Lublin, he completed four classes at a powiat (district) school. He continued his education in Warsaw, studying at the local School of Fine Arts. As a participant in the January Uprising, he was captured in March 1863. The Tsarist authorities sentenced him to 10 years of Siberian *katorga* labour. He stayed in Petrovsk, Syvakova, Darasun and Irkutsk. He painted landscapes, including the Transbaikalie area (Dauria), and drew trees of the Daurian Krai. He also restored paintings from household altars. He taught drawing at the Technical School in Irkutsk. He created the curtain for the local city theatre, the painting in the main altar of the church of the Assumption of the Blessed Virgin Mary, and some maps for Jan Czerski. He participated in expeditions to the Chamar Daban mountains, the valley of the Bystraya river, and the Sayan mountains. From 1892, he lived in Warsaw. Cf. D. Leszczyńska, *Stanisław Wroński – artysta, powstaniec, sybirak*, "Radzyński Rocznik Humanistyczny" 2019, vol. 17, p. 53–61.

53 He came from Polesie. He attended schools in Prużana (present-day Pruzhany) and Białystok. He studied natural sciences at the Imperial University of St. Petersburg (present-day St. Petersburg State University). Later, he studied in Paris, where he left after learning of the start of the January Uprising, in which he became a participant. After imprisonment in 1863, he was sentenced to 12 years of *katorga* labour. He served it, among other places, at the salt works in Usolye and Irkutsk, where he carried out pedagogical work. He participated in Dybowski's Siberian expeditions. He helped Łagowski collect plants for his herbarium. He returned to his homeland, Polesie, in 1881. He spent the last years of his life with his wife and four daughters in Warsaw. W. Wasiliew, *Feliks Zienkowicz (1842–1910)*, "Głos znad Pregoły" 2003, no. 7–8, p. 9.

54 Leon Dąbrowski, Ignacy Eichmiler, Paweł Ekert, Mikołaj Hartung, Michał Jankowski, Mikołaj Witkowski, and Henryk Wohl attended at varying frequencies. G. Brzęk, *Bajkalska szkoła,* p. 60.

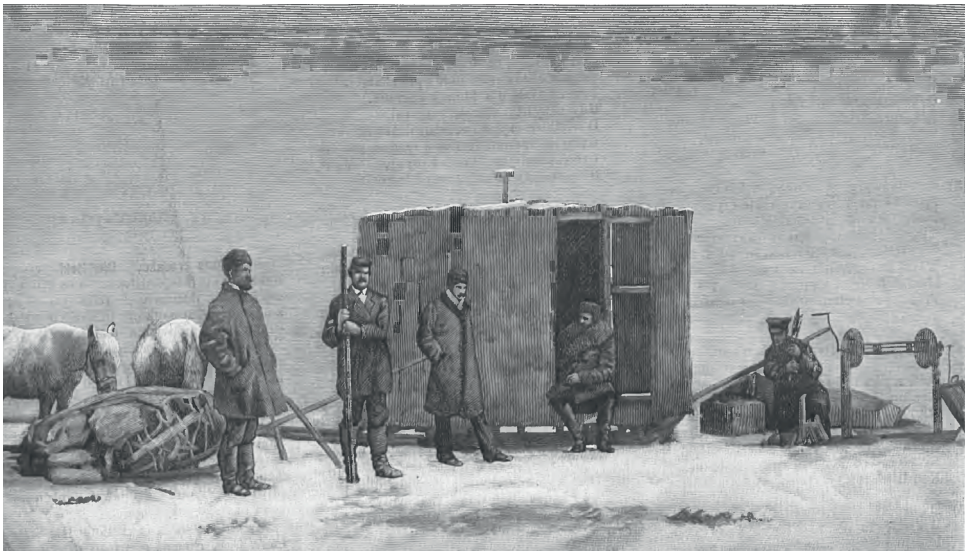


Fig. 7. Dybowski's 'Laboratory' on Lake Baikal (engraving by Paweł Boczkowski) (source: *Dr Benedykt Dybowski i Godlewski, robiący pomiary na jeziorze Bajkał*, "Tygodnik Illustrowany" 1884, vol. 3, no. 59, p. 112)

Fig. 8. Endemic of Lake Baikal sponge *Lubomirskia baicalensis* in the Baikal collection of Dybowski from the IFNU ZM (photo: P. Brzegowy, 2024)

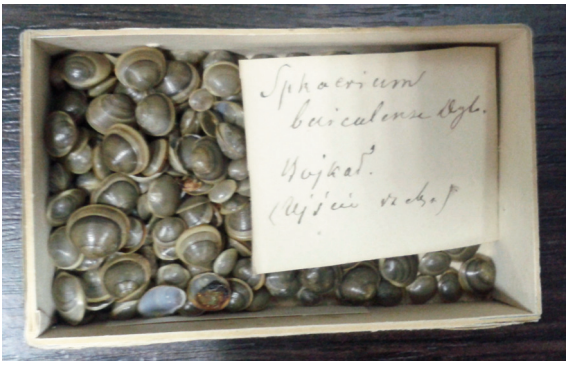


Fig. 9. A mollusc *Sphaerium baicalensis* in the Baikal collection of Dybowski from the IFNU ZM (photo: P. Brzegowy, 2024)

Dybowski was renowned as an excellent preparator of taxidermied exhibits. With extensive knowledge of animal anatomy, autopsies, and tanning techniques, he earned considerable fame. He devised his own method for preserving aquatic invertebrates and fish.[55] He sent molluscs preserved in alcohol or dried to his brother Władysław, who carefully studied their anatomy and morphology. The detailed descriptions were supplemented with graphical images produced by specialists. The high quality of these works is supported by a flattering review of one of them, published in "Malakozoologische Blätter" in

55 A. Trepka, *Benedykt Dybowski*, p. 400.

1878.[56] Notably, using a camera borrowed from a photographer in Irkutsk, Dybowski took several dozen photographs of Lake Baikal, which he compiled into two albums.[57]

Research results

The efforts of Dybowski and Godlewski quickly yielded excellent results.[58] Their research provided evidence of faunal diversity, especially invertebrates, and the presence of endemic species (Figs. 8, 9). The very first winter brought a large number of freshwater organisms unknown to science. The most interesting specimens: 70 species of gammarids, 30 species of molluscs, 18 species of fish and a small number of other animals were sent to the Irkutsk branch of the IRGS.[59] It was noted that animals extracted from depths of up to 1000 m had a milky-white vision organ and more developed limbs and tentacles.[60] It was demonstrated that the fauna of Lake Baikal consisted of marine and freshwater organisms, among which many evolutionarily ancient species were found. Alongside them, however, there were numerous modern species. Dybowski suspected that Lake Baikal had once been a sea bay,[61] which would explain the presence of marine fauna therein. He gained the greatest recognition for his research on gammarids, reflected in the 1874 work, illustrated with 14 plates and discussing 116 species of these crustaceans, mostly endemic (Fig. 10).[62]

After studying the habitats of individual species, the author was the first to provide information on their nutrition and reproduction, as well as selected adaptive features. According to Brzęk, this dissertation – published with the support of the Russian Entomological Society in St. Petersburg and Count K. Branicki – was not only original but also highly innovative.[63] Among his scientific achievements, comprising over 350 works of various types, Benedykt Dybowski devoted about 60 to Siberia and the Far East.[64] Having become acquainted with the fauna of Angara and Yenisei, Dybowski was sure that the local gammarids, although similar to the Baikal ones, displayed morphological differences.[65] The researcher demonstrated that the well-developed fishing industry – especially one targeting omul – resulted from the abundance of lower-tier fauna, which serve as the food source

56 B. Dybowski, *O faunie mięczaków,* p. 949–950; see W. Dybowsky, *Die Gasteropoden-Fauna*, p. 132–139.

57 G. Brzęk, *Benedykt Dybowski,* p. 197.

58 The faunistic research of Baikal by Dybowski and Godlewski was supplemented by geological research of the lake's basin carried out by Aleksander Czekanowski (1833–1876), a graduate of IUD from Volhynia, who considered Baikal to be a water body from the Jurassic period. In 1863, for participation in the January Uprising, he was sent to Transbaikalie, later to the area of Bratsk, and finally to Irkutsk. He worked on, among others, the geology of the southern part of the Irkutsk Governorate and Lake Chubsugul, and led expeditions along the Yenisei, Lena, Lower Tunguska and Olenyok rivers. He gathered a rich botanical, mineralogical and zoological collection. Cf. G. Racki, *Aleksander Czekanowski – odkrywca trapów syberyjskich*, "Przegląd Geologiczny" 2019, vol. 67, no. 10, p. 791–798.

59 B. Dyakowski, *Badacz dalekiej północy*, p. 37.

60 APAN, III – 327, Autobiografia profesora, f. 7.

61 It is assumed that Baikal was created when the Amur plate moved away from the Eurasian plate during the collision of the Indian plate with Asia. The lake may be 25 million years old or older.

62 B. Dybowski, *Beiträge zur näheren Kenntniss der im Baikal-See vorkommenden niederen Krebse aus der Gruppe der Gammariden*, St. Petersburg 1874.

63 G. Brzęk, *Benedykt Dybowski,* p. 322–323.

64 APAN, III – 327, Bibliografja prac naukowych prof. dra. Benedykta Dybowskiego, odnoszących się do północnej Azji (głównie jez. Bajkał) (w porządku chronologicznym), f. 1–9.

65 G. Brzęk, *Benedykt Dybowski*, p. 196.

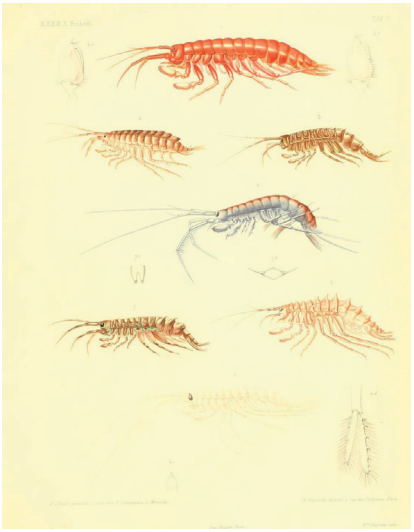


Fig. 10. The gammarids of Lake Baikal (drawings by Wroński and Zienkowicz) (source: B. Dybowski, *Beiträge zur näheren Kenntniss der im Baikal-See vorkommenden niederen Krebse aus der Gruppe der Gammariden*, St. Petersburg 1874, Taf. I)

Fig. 11. A drawing of *Comephorus baikalensis*, the big Baikal oilfish (source: B. Dybowski, *O „Gołomiance" bajkalskiej (Comephorus baicalensis Lac.) i jej narybku młodocianym*, "Kosmos. Czasopismo Polskiego Tow. Przyrodników Im. Kopernika" 1901, vol. 26, p. 116)

for this fish species. Among works devoted to the ichthyofauna of Lake Baikal that provide information on new species and subspecies, an article from 1874 is particularly important.[66]

During the research, he became interested in the intriguing problem of the mass extinction of predatory fish from the family *Comephoridae*, known as the big Baikal oilfish (or big golomyanka)[67] (Fig. 11), also called lepyanka by the local population and Fettfish in German literature, i.e., a fatty fish.[68] The Polish zoologist did not accept the explanation of this phenomenon, which was attributed to poisonous gases released from the bottom of the lake, even though it was supported by Aleksander Piotr Czekanowski, the Russian naturalist Mikhail Lomonosov (1711–1765), and the German anthropologist Richard Maak (1825–1886). Some still believed in the hypothesis of the German-Russian naturalist Johan Gottlieb Georgi (1729–1802), who had claimed that the fish were killed by the 'winds'/currents occurring in the lacustrine sinkholes in the spring. Fat was rendered from dead fish for medicinal purposes – intriguingly, only females of the same size – floating to the surface in large quantities, and was used as fertilizer or processed into fish meal. It is worth noting that none of the previous researchers of the 'Sacred Sea' managed to catch a live golomyanka, and its biology was unknown. It was not until 1869 that Godlewski succeeded at this. However, the fish placed in a water container quickly died. After dissecting it, Dybowski found spirally twisted embryos. Unlike other Baikal fish living in the depths, golomyanka was viviparous, which was then unknown. In July–August, the female would die after giving birth to her offspring. This specimen, with a description, was sent to a zoologist August Wrześniowski (1836–1892),[69] in Warsaw.[70]

66 B. Dybowski, *Die Fische des Baical-Wassersystemes*, "Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien" 1874, vol. 24, p. 383–394.

67 The species was first described in 1776 by the German zoologist and botanist Peter Simon Pallas (1741–1811) as *Callionymus baicalensis Pallas*. *Comephorus baikalensis*, National Institutes of Health, www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?mode=Info&id=200676 [accessed 14.03.2024].

68 B. Dybowski, *O „Gołomiance" bajkalskiej (Comephorus baicalensis Lac.) i jej narybku młodocianym*, "Kosmos. Czasopismo Polskiego Tow. Przyrodników Im. Kopernika" 1901, vol. 26, p. 113.

69 Wrześniowski took an interest in various zoological issues. He was, among others, the author of the work *O trzech kiełżach podziemnych*, "Pamiętnik Fizyograficzny" 1888, vol. 8, p. 221–330.

70 A. Trepka, *Benedykt Dybowski*, p. 299–302; G. Brzęk, *Benedykt Dybowski,* p. 169–172, 362; B. Dybowski, *O „Gołomiance" bajkalskiej,* p. 119, 122–124, 135–136.

The 1877 attempt to catch golomyanka fry was also successful. Based on morphological observations, young fish were found to spend their early life in the surface waters of the limnetic zone, feeding on crustacean plankton, and would later descend to depths of 700–1000 m. The probable food source for adults was annelids and gammarids. Dybowski's suspicions – confirmed more than two decades later by a Russian zoologist Aleksei Korotnev (1854–1915) – that there existed two species of golomyanka[71] in Lake Baikal, reproducing at different times of the year, were also proved to be true.[72] This important discovery led to the issuance of three scientific articles. The first of them was published in Russian in 1870 in the "News of the East Siberian Department of the Imperial Russian Geographical Society".[73] Dybowski's research on the biology and ecology[74] of the endemic Baikal seal (*Pusa sibirica*), a predatory mammal of the seal family (*Phocidae*), yielded interesting results. He observed that its only source of food were omuls and that this species never appeared in the littoral zone. In his opinion, due to intensive winter hunting, the Baikal seal required protection.

Dybowski's first publications on the Baikal fauna sparked the interest of the international scientific community, earning him well-deserved recognition. However, some scientists, driven by disbelief or jealousy of Dybowski's research results, sought to diminish them. Johann Friedrich von Brandt (1802–1879), who agreed with Pallas and Gerstfeldt that only six gammarid species lived in the lake, also acted in this way. An Italian zoologist, Antonio della Valle (1850–1935),[75] likewise held a negative attitude towards Dybowski.

When studying Lake Baikal, Dybowski and Godlewski were the first to establish several important facts:

1. They refuted Gustav Radde's claim, which was considered scientific, that apart from a few fish species, Baikal lacked other animal organisms.
2. They divided the Baikal fauna into indigenous ('ancient') fauna inhabiting the abyssal zone and immigrant fauna inhabiting the littoral zone. The species in these zones did not intermingle. However, they could not explain the cause of this phenomenon.
3. They were the first to define the characteristics of the lake's ice cover. The maximum height of frozen waves rising above the ice sheet was estimated at 4 m. The ice sheet would thaw between 15 May and 15 June, then freeze again between 15 December and 15 February.
4. They carried out a precise bathymetric survey, establishing the maximum depth at 1373 m. They also measured the water temperature at depths of 90 m and 1320 m. The temperature at depth remained unchanged at 3.5°C. Until 1925, these measurements were the only source of information on Baikal's temperature distribution.
5. They found that the lake's summer maximum water temperatures occurred in August, reaching a range of 10°C–15°C.

71 In 1905, a Russian zoologist Aleksei Korotnev (1854–1915) introduced the scientific name *Comephorus dybowskii* in honour of Dybowski. Cf. G. Brzęk, *Benedykt Dybowski,* p. 327.

72 B. Dybowski, *O „Gołomiance" bajkalskiej,* p. 130–131, 138–141; A. Trepka, *Benedykt Dybowski*, p. 299–302; G. Brzęk, *Benedykt Dybowski,* p. 196–197, 327.

73 "Izvestiâ Vostočno-Sibirskogo otdela Imperatorskogo Russkogo geografičeskogo obŝestva" 1870, vol. 1, no 1, p. 28–30.

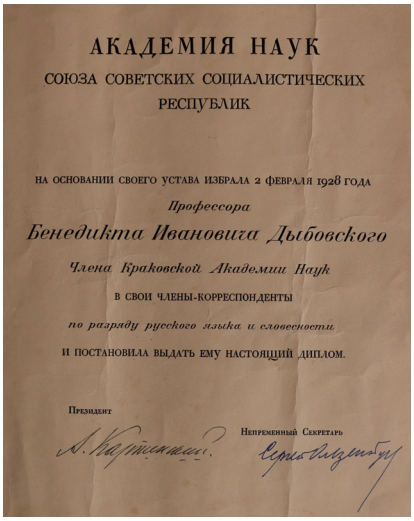
74 Ecology was then a science which was only taking shape without its own methodology.

75 G. Brzęk, *Benedykt Dybowski*, p. 167–169.

6. At the beginning of the thermal stratification of the waters, a shallow epilimnion formed, reaching a depth of 15 m. In autumn, it deepened to 100–150 m, and the thermocline lay as deep as 200 m.
7. They initiated water-level surveys in the lake, which were continued by Jan Czerski.
8. They were the first to conduct long-term meteorological observations.
9. They established that Baikal lies in a graben, and its basin is divided into three basins: southern, central and northern, separated by a ridge.
10. Water transparency in the lake was estimated at 12 m in summer and 40 m in winter.
11. They conducted a preliminary assessment of the chemical processes occurring in the lake's water. The samples collected were examined by a lecturer of the Imperial University of Dorpat and director of its chemical laboratory, Carl Ernst Schmidt (1822–1894).[76] He found that the submitted samples resembled distilled water and were rich in organic matter.[77]

Forms of recognition and commemoration of Dybowski's Baikal research

In 1870, the Tsarist authorities awarded Dybowski, then a Siberian exile, a gold medal and membership of the Irkutsk Regional Branch of the IRGS. The following year, he was admitted to the IRGS, based in St. Petersburg. In 1876, he was awarded the gold medal of the Imperial Russian Geographical Society for his research on golomyanka (Baikal oilfish). He rejected the proposal to add the honorific epithet *Bajkalski* (meaning 'of Baikal') to his surname, arguing that such an honour was unnecessary. He received honorary doctorates from the University of Warsaw (1921), Jan Kazimierz University in Lviv (1923) and Stefan Batory University in Vilnius (1924). In 1928, he became a corresponding member of the USSR Academy of Sciences (Fig. 12). In 1921, he was awarded the Commander's Cross with the Star of the Order of Polonia Restituta. Dozens of new species of Baikal fauna were named after him.[78] In 1930, the inspection and research boat of the Ministry of Agriculture, intended for research on the Vistula River, was named 'Benedykt Dybowski'.[79]



АКАДЕМИЯ НАУК
СОЮЗА СОВЕТСКИХ СОЦИАЛИСТИЧЕСКИХ
РЕСПУБЛИК

НА ОСНОВАНИИ СВОЕГО УСТАВА ИЗБРАЛА 2 ФЕВРАЛЯ 1928 ГОДА
Профессора
Бенедикта Ивановича Дыбовского
Члена Краковской Академии Наук
В СВОИ ЧЛЕНЫ-КОРРЕСПОНДЕНТЫ
по разряду русского языка и словесности
И ПОСТАНОВИЛА ВЫДАТЬ ЕМУ НАСТОЯЩИЙ ДИПЛОМ.

Президент — Непременный Секретарь

Fig. 12. Diploma of the corresponding member of the Academy of Sciences of the USSR for Dybowski, dated 2 February 1928 (source: APAN, III – 327, f. 8)

76 B. Dybowski, *O faunie mięczaków,* p. 960; G. Brzęk, *Udział Polaków*, p. 143–145; idem, *Benedykt Dybowski,* p. 193–196; 358–359, 363; Z. Wójcik, *Wiktor Ignacy Godlewski – zesłaniec i badacz przyrody Syberii*, "Studia Łomżyńskie" 2003, vol. 14, p. 87–88.

77 G. Brzęk, *Benedykt Dybowski,* p. 176.

78 Ibidem, p. 198–199; J. Arvaniti, I. Gass, H. Krajewska, *Materiały Benedykta Dybowskiego (1833–1930) (III–327)*, "Biuletyn Archiwum Polskiej Akademii Nauk" 2009, vol. 50, p. 15.

79 *Z Instytucyj i Towarzystw Rybackich. Delegacja rybacka na Zamku*, "Przegląd Rybacki. Dwutygodnik poświęcony sprawom rybactwa" 1930, no. 21, p. 703.

The memory of Dybowski and Godlewski's Baikal research remains alive.[80] At the 2018 IFNU conference, held to mark the 185th anniversary of the scientist's birth,[81] representatives of the scientific communities of Poland, Belarus, and Ukraine delivered speeches. Scientific articles on Baikal research were published in the post-conference proceedings.[82] Among the major exhibitions organised over the last 30 years, at least two are worth mentioning. In 1993, on the occasion of the 160th anniversary of Dybowski's birth, the first large exhibition in 100 years was held at the Museum of Independence in Warsaw from 25 June to 31 October, which placed special emphasis on his faunistic research in Siberia, including Baikal.[83] At the 2009 exhibition, 429 exhibits were presented.[84]

Conclusions

Despite the refusal of the Imperial Russian Geographical Society and the Imperial St. Petersburg Academy of Sciences to fund his Baikal research, Dybowski decided to conduct it at his own expense and with simple methods, which yielded excellent results. By discovering species of fish, crustaceans, molluscs and sponges unknown to science, Dybowski and his collaborators refuted the widely accepted claim that the fauna in the lake's deepwater layers was very poor or did not exist at all. They presented their own theory of the lake's origin and its fauna. They thus proved that the results of earlier expeditions by Pallas, Radde, Konov, and Middendorff were inaccurate. The Polish scientists made successful attempts to measure the depth of Baikal. They initiated studies of the chemistry of its waters. They were also the originators of establishing a biological station on Baikal and the university in Irkutsk. The fruit of almost 9 years of research was an important scientific work investigating, among other topics, the biology and ecology of golomyanka and gammarids. By exploring the lake's fauna, Dybowski joined the group of the most distinguished limnologists of his era.

80 See J. Dziekońska-Rynko, D. Mierzwa-Szymkowiak, M. Słupek, *Benedykt Dybowski (1833–1930) – lekarz, przyrodnik, społecznik, patriota. Wydarzenia upamiętniające polskie badania na Syberii i Kamczatc*e, "Biuletyn Panorama Oddziału Polskiej Akademii Nauk w Olsztynie i w Białymstoku" 2018, no. 4 (6), p. 14–15.

81 See. P. Brzegowy, *Międzynarodowa konferencja naukowa z okazji 185. rocznicy urodzin prof. dra Benedykta Dybowskiego*, "Cracovia Leopolis" 2018, no. 2 (91), p. 54.

82 W. Adamowski, T. Białopiotrowicz, *Profesor Dybowski a limnologia, czyli woda a życie biologiczne*, [in:] *Professor Benedykt Dybowski an Outstanding Researcher of Common Natural Heritage of Poland, Belarus and Ukraine*, ed. by M. Martyniak-Zhovtanetska, T.M. Dutkievich, Y. Tsaryk, Lviv 2018, p. 13–24; Ł. Gawor, P. Dolnicki, *Benedykt Dybowski – prekursor badań limnologicznych i badacz terenów peryglacjalnych*, [in:] *Professor Benedykt Dybowski*, p. 25–40.

83 The exhibition "Benedykt Dybowski (1833–1930)" was organised by the Museum of Independence, the Museum and Institute of Zoology of the Polish Academy of Sciences in Warsaw, the Seweryn Udziela Ethnographic Museum in Kraków, and the Historical Museum of Warsaw. Cf. M. Woltanowska, *Wystawy w Muzeum Niepodległości*, p. 155–158.

84 "Benedykt Dybowski 1833–1930. Rycerz Niezłomny" was organized by: Jacek Malczewski Museum in Radom, Museum and Institute of Zoology of the Polish Academy of Sciences in Warsaw, and the Museum of Independence in Warsaw.

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Wkład Benedykta Dybowskiego w faunistyczne poznanie Bajkału

Benedykt Dybowski (1833–1930) – jeden z najważniejszych europejskich zoologów drugiej połowy XIX w. i pierwszych dziesięcioleci XX w. – był człowiekiem niezwykle aktywnym naukowo i społecznie. Przyjmowany głównie za pioniera darwinizmu na ziemiach polskich, największy sukces zawodowy odniósł, zajmując się ichtiofauną jeziora Bajkał i rzek wschodniosyberyjskich: Angary, Jeniseju i Selengi. Niniejsza praca poświęcona jest syberyjskiemu okresowi z życia Dybowskiego w kontekście jego badań faunistycznych najgłębszego jeziora świata.