Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 59, no. 2, 2025, p.684-692
DOI 10.30892/gtg.59215-1447

PROSPECTS FOR THE DEVELOPMENT OF GEOTOURISM IN THE ATYRAU REGION OF THE REPUBLIC OF KAZAKHSTAN

Jamilya B. YAKUPOVA*
M. Utemisov West Kazakhstan University, Faculty of Natural Sciences and Geography, Uralsk, Kazakhstan, e-mail: yakupova_j@mail.ru

Kazhmurat M. AKHMEDENOV
M. Utemisov West Kazakhstan University, Faculty of Natural Sciences and Geography, Uralsk, Kazakhstan, e-mail: kazhmurat78@mail.ru

Citation: Yakupova, J.B., & Akhmedenov, K.M. (2025). Prospects for the development of geotourism in the Atyrau region of the Republic of Kazakhstan. *Geojournal of Tourism and Geosites*, 59(2), 684–692. https://doi.org/10.30892/gtg.59215-1447

Abstract: Paleontology, being one of the branches of geology, is a scientific discipline that helps to understand the evolution of life on Earth. The dissemination of information about paleontology is currently based on fossil finds and descriptions of their locations. The purpose of this work was to identify potential sites for geological tourism and summarize data based on the results of field research conducted in the Atyrau region of the Republic of Kazakhstan. The article considers the possibility of developing paleontological tourism in the Atyrau region of the Republic of Kazakhstan. Significant paleontological sites such as the Koykara and Imankara Mountains, the Akkegershin Cretaceous plateau and the Sholkara upland are located in the Zhylyoy district of Atyrau region. Special attention should be paid to the Sholkara upland, located 130 km south-east of the city of Kulsary, where unique paleofauna specimens were found. The main locations of natural fossil sites (Koykara, Imankara Mountains, Akkegershin Cretaceous plateau, Sholkara) are described, and the species and genus of the found samples of invertebrates and vertebrates are determined. In 1931, the paleontologist A. Ryabinin discovered the vertebrae of a Cretaceous dinosaur in the Koykara massif, which was described as *Embasaurus minax*, which underlines the historical significance of the region for paleontological research. Various fossils have been found in these areas, including teeth and vertebrae of Otodus sharks, fragments of belemnites (*Belemnitella mucronata*), bivalves (*Gryphea dilatata*), sea urchins (*Echinocorys*), as well as single scleractinia corals (*Caryophyllum similotrochus*). Atyrau region has significant potential for the development of geological and paleontological tourism. There are resources for organizing guided tours and educational programs, including: the Paleontological Museum in Atyrau, which includes hundreds of authentic exhibits found in the region, such as teeth of prehistoric sharks, fossils of megalodons, plesiosaurs and mollusks. In general, Atyrau region has the prospect of developing geological tourism of an excursion and educational nature. For this purpose, the region has a large number of resources and various local history and environmental museums containing paleontological materials.

Keywords: Atyrau region, paleontology, geology, fossils, Cretaceous plateau, sediments, ichthyosaurus, dinosaur, mollusks, geotourism

* * * * * *

INTRODUCTION

According to Braholli & Menkshi (2021), modern geological and geomorphological objects are inanimate objects that can enhance curiosity and expand knowledge about the history of the Earth through the development of geotourism. As notes Comanescu & Dobre (2009), the process of inventory and assessment of a geomorphological object (such as scientific value, environmental, aesthetic, cultural and economic values) will lead to the development of a number of provisions for the excellent protection and promotion of tourism, including the proposal of geotourism routes. As notes Reynard (2005), Reynard & Panizza (2005), Reynard et al. (2016), geological objects are parts of the geosphere that are of particular importance for understanding the history of the Earth, geological and geomorphological objects that have acquired scientific, cultural-historical, aesthetic and/or socio-economic value due to human perception or research, as part of geodiversity.

Geotourism is a type of natural tourism that pays special attention to the landscape and geology, the preservation of cultural heritage and traditions, the study of history, geography, the popularity of the unique nature of the territory, and attracting investment (Sergeyeva et al., 2022). Paleontological tourism is a type of scientific tourism, or ecotourism, associated with geotourism (Gaworecki, 2003). Tourist destinations in paleontological tourism include parks, trails, routes and excavation sites, all of which become a factor in both the economic and social development of territories associated with the opening of museums and the preservation of scientifically valuable objects and specimens (Schwanke & Silva, 2004).

According to Antczak (2020), the fossils of dinosaurs and other quadrupeds are of interest to humans. Each find of a new (especially large) species receives coverage in national and international media, and thus local finds serve as the basis for the development of local tourism. An integral part of paleontological tourism is visiting the sites of fossil and places of their storage and study, i.e. local history and environmental museums. Visiting parks and exhibitions of fossil reconstructions is also an integral part of paleotourism (Yakupova et al., 2024). Among the local museums where the finds of fossils are kept, the paleontological branch of the Museum of History and Local Lore of Atyrau region can be

* Corresponding author

distinguished. Currently, the museum's collection contains about 8 thousand storage units. A unique part of the collection is the paleontological collection. There are fossil sponges, corals, mollusks, bivalves, ammonites, belemnites, sea lilies, sea urchins. The museum also displays teeth of sharks, rays, fossilized vertebrae of *Plesiosaurus*, *Ichthyosaurus*. All of them are found on the Cretaceous plateaus of the Atyrau region. The range of tourist resources in Atyrau region is quite extensive to attract tourists to travel. Of particular interest are the natural locations of the Atyrau region, such as the mountain uplifts of Koykara, Imankara, the Cretaceous plateau Akkegershin and Sholkara (Figure 1).

Figure 1. Geographical location of the described geological objects: 1 - Cretaceous plateau of Akkegershin; 2 - Koykara Mountains; 3 - Imankara Mountains; 4 – Sholkara Mountains (Source: https://www.nationsonline.org/oneworld/map)

The purpose of this work is to study potential locations for the development geological tourism and summarize data based on the results of field research conducted in the Atyrau region of the Republic of Kazakhstan.

MATERIALS AND METHODS

The objects of the study were the natural locations of the Atyrau region and the fossils found on their territory in August, 2024. In preparing the article, we used field research materials (August, 2024), statistical, reference, stock and literary materials on the natural conditions and resources of the Atyrau region. Descriptive, comparative geomorphological research methods were used to characterize the territory (Tikhonovich, 1915; Ryabinin, 1931; Chigarkin, 2006; Akhmedenov et al., 2022), methods of their systematic and structural analysis, current information and empirical base on geology. The method of collecting and processing paleontological and stratigraphic material was carried out according to the method of Krymgolts (1954). The species and genera of the finds were determined (Mirkamalov, 1966; Ivakhnenko & Korabelnikov, 1987; Bodylevsky, 1990; Miller et al., 2022). All samples are stored in the paleontological branch of the Museum of Local Lore of Atyrau region.

RESULTS DISCUSSIONS

Imankara Mountain Uplift

We have studied the Imankara object (Figure 2), which is located in the Zhylyoy district. The district was established in 1928 under the name Zhilokosinsky district. In 1963, it was renamed the Embinsky district. The current name since October 7, 1993 (Kaiyrzhanova et al., 2023). Photo of Imankara Mountain uplift was taken in Zhylyoy district, Atyrau region by Yakupova in August, 2024. The territory of the district is 29.4 thousand km^2. The area is located on the northeastern coast of the Caspian Sea. The terrain of the territory is flat. The western part of the district is occupied by the Caspian lowland, the eastern plateau is Ustyurt. In the northern part there are salt marshes, in the southern part there are Karakum sands. Absolute heights range from 26 to 221 m; the highest point is Mount Zheltau. The Emba River flows through the territory of the Zhylyoy district. The soils are gray-earth and saline, clay surfaces are also common (Akhmedenov et al., 2022).

Figure 2. Imankara Mountain uplift, Atyrau region, Republic of Kazakhstan**,** 2024 (Source: Authors)

Geologically, the territory of the Zhylyoysky district is divided into two parts: the eastern part, composed of outcrops of Cretaceous deposits and the western part, represented by a complex of Paleocene-Oligocene deposits of marine and Aeolian origin (Chigarkin, 2006). The general direction of the mountain is meridional. To the south, it decreases and the strata composing it go under the thickness of the chalk, which further forms the vast Akkegershyn plateau. Mount Imankara has many features in common with Mount Koykara both in terms of orographic outlines and tectonic structure. It is also a brachyanticline, broken off in the arch by a large discharge (Kaiyrzhanova et al., 2023).

Jurassic deposits on the territory are represented by clay sands with nodules of dense sandstone, clays with bright yellow ferruginous crusts, sandstones with aggregations of siderite, limonite and plant residues. Cretaceous deposits are represented by greenish-gray loose sandstones with Lower Albian fauna: *Cuculaeaglabra Parkinson; Cerithium aff. Wundstorfi 'Wollm.; Naticagaultianad'Orb.; Leeymeriella tardefurcata* Leym. Cenomanian sediments are represented by lemon-yellow sandy clays with interlayers of gray clays and fauna of *Caryophyllum similotrochus* (Kaiyrzhanova et al., 2023). The Cretaceous deposits are composed of sands, Cretaceous clays and marls. Remains of invertebrate fossil fauna have been found, such as cephalopods *Belemnitella mucronata*, bivalves *Gryphea dilatata*, the shell of the sea urchin *Echinocorys* sp., single corals-scleractinium *Caryophyllum similotrochus* (Kaiyrzhanova et al., 2023).

Fossils found from Cretaceous deposits of the Imankara mountain uplift are shown in Figure 3-6.

Echinocorys is an extinct genus of sea urchins that lived from the Late Cretaceous Period to the Paleocene. The genus belongs to the family *Holasteridae*. His remains have been found in Asia, Europe, Australia and North America. Representatives of the genus *Echinocorys* form one of the most widespread groups of irregular sea urchins in the rocks of the Upper Cretaceous and Paleocene (Figure 3). *Belemnitella mucronata* (Schlotheim) (Figure 4).

Upper Cretaceous, Campanian. When viewed from the abdominal side, the rostrum has a cylindrical shape. The top of the rostra ends in a long spike. The alveolus occupies more than half the length of the rostrum; its apex is close to the abdominal side. The abdominal fissure is short (less than half the depth of the alveoli).

Figure 3 Fossil sea urchin *Echinocorys sp*., Atyrau region, Imankara, 2024 (Source: Authors)

Figure 4. *Belemnitella mucronata* (from the dorsal side) Atyrau region, Imankara, 2024 (Source: Authors)

Ostrea inflata (Trautschold) (Figure 5). Lower Cretaceous, lower Valanginian (rarely middle Valanginian). The shell is rounded-triangular, steeply truncated on the high front side and slightly depressed under the tops. Both valves are strongly and almost equally swollen (Bodylevsky, 1990). *Exogyra flabellata*, Cenomanian-Turonian (Figure 6). Both

valves are radially folded. The ligamentous platform is of the exogyroid type. On the lower valve under the platform, there is a groove for the tooth-shaped protrusion of the upper valve.

The inner edges of both valves are serrated. The muscular imprint of a pear-shaped, or triangular-oval shape, is located in the central part of the valve or slightly shifted to the posterior edge (Mirkamalov, 1964).

Figure 5. *Ostrea inflata* (Trautschold)
Atyrau region, Imankara, 2024 (Source: Authors)

Figure 6. Shellfish *Exogyra flabellate*
Atyrau region, Imankara, 2024 (Source: Authors)

The Cretaceous plateau of Akkegershin

The Akkegershin Cretaceous plateau is located 240 km from the city of Atyrau and 48.8 km from the city of Kulsary in the Atyrau region. The distance from the Beineu-Dossor highway to the Akkegershin Cretaceous plateau is 41 km (Akhmedenov et al., 2022). The chalk mountains of Akkegershin stretch from the southeast to the northwest for 11.6 km. The width of the plateau in some areas reaches 7.5 km. Here, the chalk cliffs resemble the ruins of an ancient city (Figure 7).

Figure 7. The Cretaceous plateau of Akkegershin, Atyrau region, Republic of Kazakhstan**,** 2024 (Source: Authors)

Figure 8. Single coral – *Scleractinium, Caryophyllum Similotrochus* Atyrau region, Akkegershin, 2024 (Source: Authors)

Figure 9. *Belemnitella lanceolata* Schloth.
Atyrau region, Akkegershin, 2024, (Source: Authors)

Akkergeshin looks like castles built in a row. The plateau is called Akkegershin. There are several opinions about why it is called that way. According to one of them, the name comes from "ak kögershin" (white dove). According to another version, the word consists of three parts – "ak" (white), "kergu" (to soar upward) and "shyn" (peak) (Akhmedenov et al., 2022).

In August 2024, bivalves, solitary corals and belemnites have been found in the Cretaceous plateau of Akkegershin.

The single coral Caryophyllum similotrochus (Figure 8) is descended of the Upper Cretaceous. A large polyp lives on a ribbed convex or concave stand, which has been preserved in a fossil state (Ivakhnenko & Korabelnikov, 1987). *Belemnitella lanceolata* Schloth. (Figure 9) is descended of Maastricht, Upper Cretaceous. Fusiform in shape, with a shallower alveolus (about 1/3 of the length of the rostrum) (Bodylevsky, 1990).

The Mountains of Sholkara

The Sholkara Mountains (Figure 10), poorly preserved remnants of the Ustyurt plateau, are located 114 kilometers southeast of the district center – Kulsary, 105 kilometers east and slightly north of the Karakum sands, 20.4 kilometers northwest of the Zheltau mountains, 79 kilometers northeast of the village of Borankul in the in the Zhylyosky district in the southeast of the Atyrau region. The dominant unnamed mark is located in the northern part of the upland and is 121.9 meters above sea level, in the central part of the mountains a mark with a height of 120.3 meters above sea level dominates. The mountains are located at the junction of Atyrau, Aktobe and Mangystau regions, where part of the Atyrau region has an elongated appendicitis from southeast to northwest. The territory of the mountains is one of the most inaccessible, least studied, the nearest settlement is 79 kilometers in the southwest - the village of Borankul (formerly Oporny).

Figure 10. The Mountains of Sholkara, Atyrau region, Republic of Kazakhstan**,** 2024 (Source: Authors)

The relief of the mountains is distinguished by areas of flat surfaces and residual plateaus, the western part of the mountains is the steepest and most sheer, the eastern part is smoothed. The Sholkara Mountains are rich in paleontological finds - oyster shells, teeth of Paleogene sharks, vertebrae of bony fish that lived in the Tethys Ocean about 40 million years ago.

Figure 11. Bivalve mollusk Venericardia (Pacificor) Hornii Calafia Stewart, 1930 Atyrau region, Sholkara, 2024 (Source: Authors)

Figure 12. Vertebra of a marine reptile remain, Mesozoic Atyrau region, Sholkara, 2024 (Source: Authors)

These fossils were found at the foot of Mountains of Sholkara in Atyrau region in August 2024 by the authors. Currently, the samples are stored in the paleontological branch of the Museum of Local History of the Atyrau region of the Republic of Kazakhstan. The bivalve mollusk *Venericardia (Pacificor)* Hornii Calafia Stewart, 1930 is descended of

Middle Eocene (Lutetian) (Figure 11); the vertebra of a marine reptile is descended of Mesozoic, Cretaceous (Figure 12); rounded fragments of Jurassic belemnites (Figure 13) were found from the mountainside. These fossils were found at the foot of Mountains of Sholkara in Atyrau region in August 2024 by the authors. Currently, the samples are stored in the paleontological branch of the Museum of Local History of the Atyrau region of the Republic of Kazakhstan. The following samples were also found here in August 2024: vertebrae of fossil fish (Figure 14), teeth of fossil sharks, *Striatolamia macrota* (Figure 15), *Turania* (Figure 16), *Otodus* (Figure 17), which are descended of Cenozoic, Paleogene (41-38 million years), bivalve mollusk *Ostrea mosquensis* is descended of Upper Jurassic (Figure 18). Currently, the samples are stored in the paleontological branch of the Museum of Local History of the Atyrau region of the Republic of Kazakhstan.

Figure 13. Belemnite fragments,
Atyrau region, Sholkara, 2024 (Source: Authors)

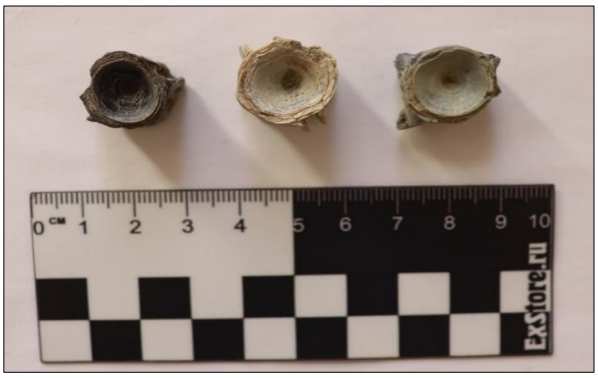

Figure 14. Vertebrae of a fossil fish
Atyrau region, Sholkara, 2024 (Source: Authors)

Figure 15. The tooth of a fossil shark *Striatolamia Macrota* Atyrau region, Sholkara, 2024 (Source: Authors)

Figure 16. The tooth of a fossil shark *Turania*
Atyrau region, Sholkara, 2024 (Source: Authors)

Figure 17. The tooth of a fossil shark *Otodus*
Atyrau region, Sholkara, 2024 (Source: Authors)

Figure 18. Bivalve mollusk *Ostrea mosquensis*
Atyrau region, Sholkara, 2024 (Buch) (Source: Authors)

Koykara Mountain Uplift

The Koykara uplifts (Figure 19) were examined in detail by geologist Tikhonovich (1915) at the beginning of the XX century. According to this researcher, Mount Koykara, 103 meters above sea level, is "an elevation consisting of several isoclinal beds, each corresponding to the outcrop of successively higher sediment horizons, starting from the Middle Jurassic. Since the dislocation in the northern half of the mountain was more intense, this part of it is more elevated. The eastern slope coincides with the dip of the Cenomanian strata lying on the top of the mountain and very gently descends into the above-mentioned trough. The photo (Figure 19) was taken at the foot of Koykara mountain in Atyrau region in August 2024 by the authors. Currently, the samples are stored in the paleontological branch of the Museum of Local History of the Atyrau region of the Republic of Kazakhstan.

Figure 19. Koykara mountain uplift, Atyrau region, Republic of Kazakhstan, 2024 (Source: Authors)

Figure 20. Bivalve mollusk *Ostrea mosquensis* (Buch) Atyrau region, Koykara, 2024 (Source: Authors)

The tectonic form of Mount Koykara is a brachyanticline, slightly elongated in the meridional direction and most intensely curved at the northern end, and gradually plunging at the southern end. Due to this, the lowest horizons of deposits developed in this area, clays, coal-bearing shales and sandstones of the Jurassic age, come to the surface here. The opposite slope, which forms the gentle foot of Mount Koykara, is strewn with many large sandstone concretions. Here we found numerous bivalve mollusks *Ostrea mosquensis* (Buch) (Figure 20). Upper Jurassic, lower and middle substages of the Volgian stage. The shell is oblique, unequal-valve and unequal-sided. The left valve is convex, with a protruding and strongly curved umbonal part. The right valve is almost flat, steeply descending to the rear edge; its front part protrudes forward.

It is of interest that Ryabinin in 1931 described vertebrae from the Koykara uplifts, belonging to the anterior part of the dorsal vertebrae of theropod dinosaurs of the Early Cretaceous period, which is known as *Embasaurus*, which means "Emba lizard" (Ryabinin, 1931). Since it is known only from fragmentary remains, some consider *Embasaurus* to be a possible nomen dubium. It was named after the Emba River and is thought to have lived during the Berriasian stage, about 140 million years ago. Olshevsky believes that *Embasaurus* to be a megalosaurid, closely related to *Magnosaurus*, *Megalosaurus*, and *Torvosaurus* (Olshevsky, 1991). Due to the fragmentary nature of the remains, the question of its classification has been raised: it could be a *Megalosaurus*, close to *Torvosaurus* or *Megalosaurus*, or it could be a basal *Tyrannosaurus*. Figure 21 shows a reconstruction of *Embasaurus* made by the Kazakh designer I. Iskhakov and a reconstruction made by foreign specialists (Figure 22) (Weishampel et al., 2004).

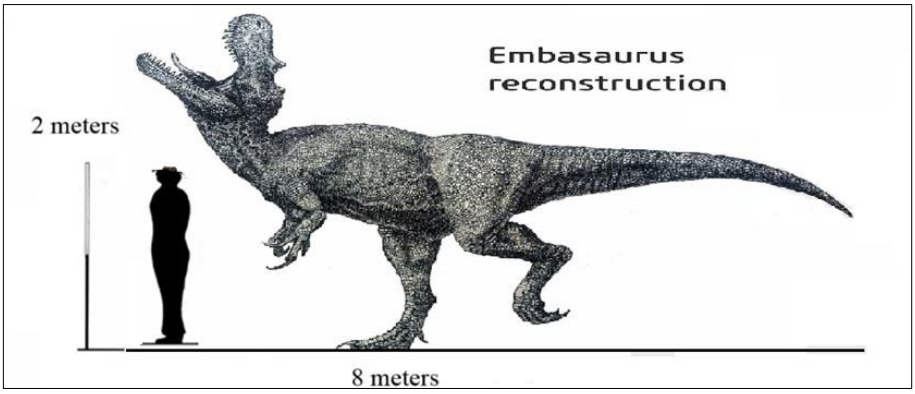

Figure 21. One of the reconstructions of *Embasaurus minax*, Riabinin, 1931 (variant 1)

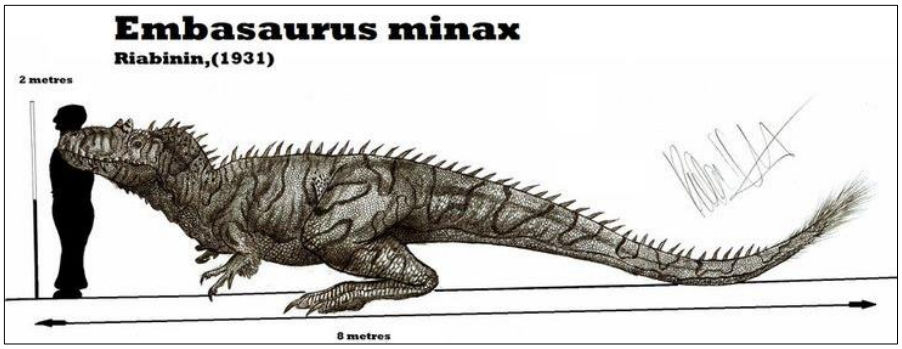

Figure 22. One of the reconstructions of *Embasaurus minax*, Riabinin, 1931 (variant 2) (Weishampel, 2004)

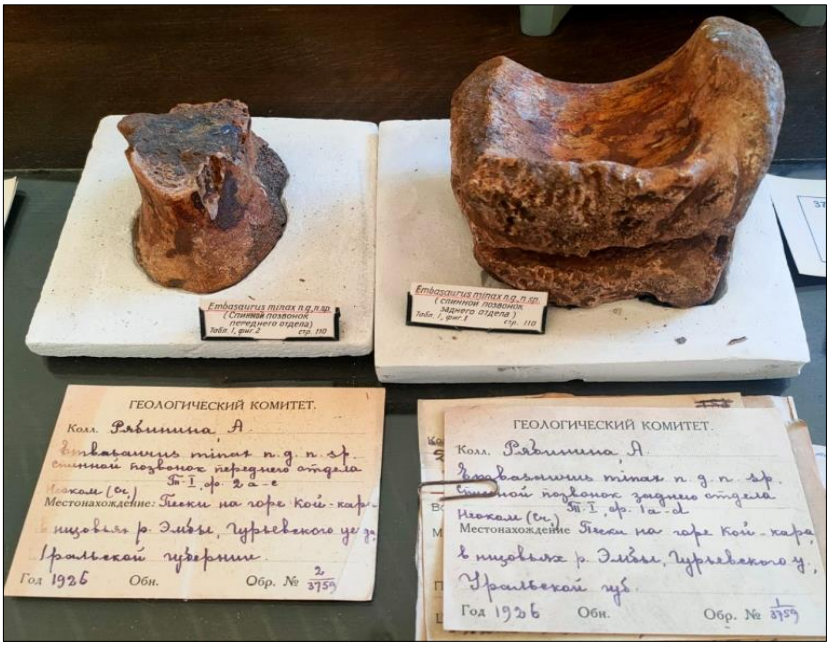

Figure 23. *Embosaurus* Vertebrae, A. P. Karpinsky Geological Research Institute, 2024 (Source: Authors)

Currently, the dorsal vertebra (large) and the vertebra from the anterior section of the dorsal vertebrae of Embasaurus are stored in the A. P. Karpinsky Russian Geological Research Institute (Figure 23), St. Petersburg, Russia (noted by one of the authors Akhmedenov during the excursion, August, 2024). Unfortunately, we did not find any dinosaur fossils during the expedition. We believe that *Embasaurus* can be considered a paleontological highlight of the Atyrau Museum and that this unique find for world science should be reflected in the future exhibition.

Photo of the *Embasaurus* vertebrae was taken by Akhmedenov in August, 2024.

CONCLUSION

In this paper, potential locations for geological tourism are identified and data on the results of field studies conducted in the Atyrau region of the Republic of Kazakhstan are summarized. The main locations of the natural sites of fossils (Koykara, Imankara mountains, Akkegershin Cretaceous plateau, and Sholkara) are described, the species and generic affiliations of the found samples of invertebrates and vertebrates are determined. Fossil-bearing sites are considered natural cultural monuments and should be considered as territories of great practical importance for scientists and local communities. These sites offer unique information about the geological and biological history of the region.

According to Sergeyeva et al. (2022), the popularity of the Cretaceous plateaus as an object of mass tourism will increase in proportion to the dissemination of information. Over time, this will make it possible to create the infrastructure and necessary modern services. The development of the tourism industry, which is of crucial importance for the region, should take into account the geological structure of the territory and the presence of a large number of interesting and unique objects of geological heritage that provide opportunities for organizing geotourism.

Thus, the territory of the Atyrau region of the Republic of Kazakhstan has the opportunity to develop geological (paleontological) tourism of an excursion and educational nature. For this purpose, the region has a large number of necessary resources and there is a paleontological museum containing paleontological specimens.

Author Contributions: Conceptualization, methodology, software, validation, formal analysis, J.Y.; investigation, J.Y. and K.A.; data curation, J.Y.; writing - original draft preparation, J.Y.; writing - review and editing, K.A.; visualization, K.A.; supervision, K.A.; project administration, K.A. All authors have read and agreed to the published version of the manuscript.

Funding: The research has been funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AR 19177208).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgments: The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

Conflicts of Interest: The authors declare no conflict of interest.

REFERENCES

Akhmedenov, K. M., Bakiev, A. G., Golovachev, I. V., Davygora, A. V., Laktionov, A. P., Ramazanov, S. K., & Shpigelman, M. I. (2022). Prirodnoe nasledie Severnogo Prikaspiya: dnevnik mezhdunarodnoj nauchno-poznavatel'noj ekspedicii posvyashchennoj 90-letiyu Zapadno-Kazahstanskogo universiteta imeni Mahambeta Utemisova [The natural heritage of the Northern Caspian Region: diary of an international scientific and educational expedition dedicated to the 90th anniversary of the Makhambet Utemisov West Kazakhstan University], Uralsk: *RIC M.Utemisov WKU*, 134 p. (in Russian).

Antczak, M. (2020). Are fossils enough? Palaeontological tourism based on local dinosaur discoveries. *Geography and Tourism, Uniwersytet Kazimierza Wielkiego (Bydgoszcz)*, 8 (2), 15-27. https://doi.org/10.36122 /GAT20200812

Braholli, E., & Menkshi E. (2021). Geotourism potentials of geosites in Durrës municipality, Albania. *Quaestiones Geographicae*, 40(1), Bogucki Wydawnictwo Naukowe, Poznań, 63–73. https://doi.org/ 10.2478/quageo-2021-0005

Bodylevsky, V. I. (1990). Malyj atlas rukovodyashchih iskopaemyh [Small atlas of guiding mineral resources] *Moskva: Nedra*, 263 p. (in Russian).

Chigarkin, A. V. (2006). Geoekologiya Kazahstana (geograficheskie aspekty prirodopol'zovaniya i ohrana prirody) [Geoecology of Kazakhstan (geographical aspects of nature management and nature protection] *Textbook. – 2-nd ed., reprint. and additional – Almaty: Kazak University*, 414 p. (in Russian).

Comanescu, L., & Dobre, R. (2009). Inventorying evaluating and tourism valuating the geomorphosites from the central sector of the Cealhau National park. *GeoJournal of Tourism and Geosites*, 1(3), 86-96.

Ivakhnenko, M. F., & Korabelnikov, V. A. (1987). Zhivoe proshloe Zemli [The living past of the Earth], A book for students. - *M.: Prosveshchenie*, 255 p. (in Russian).

Gaworecki, W. (2003). Turystyka. Polskie Wydawnictwo Ekonomiczne, *Warszawa*, 430 p. [In Polish].

Kaiyrzhanova, A. R., Kuanyshkyzy, A., Serik, A. S., Yakupova, D. B., & Akhmedenov, K. M. (2023). Yurskie i melovye otlozheniya ZHylyojskogo rajona Atyrauskoj oblasti Respubliki Kazahstan [Jurassic and Cretaceous deposits of the Zhylyoysky district of the Atyrau region of the Republic of Kazakhstan], *Bulletin of the WKU*, 3 (91), 94-101 (in Russian).

Krymgolts, G. Ya. (1954). Metodika sbora i obrabotki paleontologo-stratigraficheskogo materiala. V pomoshch' geologu-stratigrafu [Methods of collecting and processing paleontological and stratigraphic material. To help the geologist-stratigrapher], *Publishing House of the Leningrad University*, Leningrad, 46 p.

Map of Kazakhstan [Electronic resource]: https://www.nationsonline.org/oneworld/map/kazakhstan-political-map.htm

Miller, H. S., Avrahami, H. M., & Zanno, L. E. (2022). Dental pathologies in lamniform and carcharhiniform sharks with comments on the classification and homology of double tooth pathologies in vertebrates. *PeerJ*, 1-35. https://doi.org/10.7717/peerj.12775

Mirkamalov, Kh. (1966). Ekzogiry, ih sistematika i znachenie dlya stratigrafii melovyh otlozhenij yugo-zapadnyh otrogov Gissarskogo hrebta [Exogyres, their systematics and significance for the stratigraphy of Cretaceous deposits of the southwestern spurs of the Hissar ridge], *Tashkent: «Fan» UzSSR*, 135 p. (in Russian).

Olshevsky, G. (1991). Peresmotr parainfraklassa Archosauria Cope, 1869, isklyuchaya prodvinutyh krokodilij [Revision of the parainfraclass Archosauria Cope, 1869, excluding advanced crocodylians], *San Diego*, 196 p. (in Russian).

Reynard, E. (2005). Geomorphological sites, public policies and property right. Conceptualization and exemples for Zwitzerland. *Italian Journal of Quaternary Science* 18(1), 323–332.

Reynard, E., & Panizza, M. (2005). Geomorphosites: Definition, assessment and mapping. An introducion. Geomorphologie, *Relief, Processus, Environement*, 3, 177–180.

Reynard, E., Coratza, P., & Hoblea, F. (2016). Current research on Geomorphosites. *Geoheritage*, 8, 1–3. https://doi.org/10.1007/s12371- 016-0174-3

Ryabinin, A. N. (1931). Dva pozvonka dinozavra iz nizhnego mela Zakaspijskih stepej [Two dinosaur vertebrae from the Lower Cretaceous of the Transcaspian steppes] *Zapiski Russkogo Min. Obshchestva (seriya 2)* 60: 110-113 (in Russian).

Schwanke, C., & Silva, M. A. (2004). Educaçao e Paleontologia. In: Carvalho, I.S. (Ed.), Paleontologia: cenários da vida. Interciencia 2, *Rio de Janeiro*, 123-130.

Tikhonovich, N. N. (1915). Ural'skij neftenosnyj rajon: Koj-Kara, Iman-Kara, Kizil-Kul [Ural oil-bearing area: Koy-Kara, Iman-Kara, Kizil-Kul], *Petrograd*, 115 p. (in Russian).

Sergeyeva, A. M., Abdullina, A. G., Akhmet, G. Z., Koshim, A. G., Saparov, K. T., & Yeginbayeva, A. Y. (2022). Protection of the geological heritage of the Aktobe oblast and its use for the development of geotourism. *GeoJournal of Tourism and Geosites*, 40(1), 111–119. https://doi.org/10.30892/gtg.40113-809

Weishampel, D. B., Dodson, P., & Osmólska, H. (2004). The Dinosauria. Second Edition. *University of California Press*, Berkeley, Los Angeles, London: VII-XVIII. 78 p.

Yakupova, J. B., Khalelova, R. A., Khairullina, A. K., Zharmaganbetova, N. S., & Abdusheva, G. J. (2024). Prospects for the development of geological tourism in West Kazakhstan. *GeoJournal of Tourism and Geosites*, 55 (3), 1219-1226. https://doi.org/10.30892/gtg.55322-1294

Article history: Received: 27.11.2024 Revised: 19.03.2025 Accepted: 16.04.2025 Available online: 21.05.2025