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GENETIC FEATURES OF THE "WINGED FORELAND" COASTAL SYSTEM

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INTRODUCTION

The coastal zone is a complex natural formation that develops on the border between land and ocean. It is the most important link in the global lithodynamic system. The conceptual idea of the coastal zone as a system is reflected in the scientists' works of various scientific schools. This is what determines the generally accepted use of a systematic approach to its study[1, 2, 3, 4, 5, 6]. The main system-forming factor in the coastal zone is the flows of matter and energy of a special kind, which are called sedimentary[7, 8].

Along the shores of the World Ocean is shown a wide variety of natural conditions and factors of development. Numerous combinations of natural conditions and development factors contribute to the formation of the corresponding lower-rank systems within the coastal zone, the allocation of which is due to the nature of the transported substance, its genesis and orientation[9, 10, 11].

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[1] Зенкович В.П. Основы учения о развитии морских берегов. Москва: АН СССР, 1962. 710 с.

[2] Лонгинов В.В. Динамика береговой зоны бесприливных морей. Москва: АН СССР, 1963. 379 с.

[3] Bowen A.J., Inman D.I. Budget of littoral sands in the vicinity of Point Arguello, California. C.E.R.C. Technical Memorandum, 1966. No. 19. 41 p.

[4] Davies J.L., Clayton K.M. Geographical variation in coastal development. London; New York: Longman, 1980. 212 p.

[5] Шуйский Ю.Д. Проблема исследования баланса наносов в береговой зоне морей. Ленинград: Гидрометиздат, 1986. 240 с.

[6] Lakhan V.C., Trenhail A.S. Applications in Coastal Modeling. Elsevier Oceanography Science, 1989. Series 49. 386 p.

[7] Зенкович В.П. Потоки наносов вдоль советских берегов Черного моря. Труды Союзморпроекта ММФ, 1956. Т. 3. С. 57–66.

[8] Krumbein W.C. Statistical models in sedimentology. Sedimentology, 1968. Vol. 10. P. 7–23.

[9] Шуйский Ю.Д. Проблема исследования баланса наносов в береговой зоне морей. Ленинград: Гидрометиздат, 1986. 240 с.

All the diversity of coastal systems of various ranks is characterized by alongshore geographical differentiation of the World Ocean, which manifests itself with a certain regularity.

In the coastal zone, sedimentary flows are subdivided into muddy, sandy and boulder-gravel by the nature of the substance. According to the genesis of coastal marine sediments, these flows differ in terrigenous, biogenic, chemogenic, and volcanogenic. Depending on the dominant direction of the transported substance, transverse and alongshore flows are distinguished in the coastal zone[12, 13, 14].

The coastal zone of the World Ocean should be considered as a powerful sedimentation filter, capable of not only to pass a diverse material in genesis, mechanical composition and orientation, but also to accumulate "wave field" sediment within its limits.

Mud sediment flows, which are often manifested in the rivers estuarine areas, usually do not end in the coastal zone, but continue their movement the underwater slope down, heading to the deepest zones of the reservoir. Sand flows are characterized for deposits wave processing areas of glacial, alluvial or aeolian genesis. Boulder-gravel flows appear in areas of glacial and mountain-alluvial deposits. Moreover, these flows, in most cases, are delayed in the coastal zone and form a variety of accumulative forms.

It should be noted that the diversity of marine accumulative forms is caused not only by the mechanical composition of the sediments which they are composed from, but also by other factors mainly related to the characteristics of the wind-wave effect.

Lithodynamic systems and their diversity. The coastal zone of the oceans consists of individual sections set within which an independent

[10] Lakhan V.C., Trenhail A.S. Applications in Coastal Modeling. Elsevier Oceanography Science, 1989. Series 49. 386 p.

[11] Sherman, D.J. Perspectives on coastal geomorphology: introduction [In: Shroder, J. (Editor in Chief), Sherman, D.J. (Ed.)]. Treatise on Geomorphology. Academic Press, San Diego, CA, 2013. Vol. 10, Coastal Geomorphology. 448 p.

[12] Зенкович В.П. Основы учения о развитии морских берегов. Москва: АН СССР, 1962. 710 с.

[13] Шуйский Ю.Д. Проблема исследования баланса наносов в береговой зоне морей. Ленинград: Гидрометиздат, 1986. 240 с.

[14] Шепард Ф.П. Морская геология. Изд. – 3-е. перев. с англ. Ленинград: Недра, 1976. 488 с.

regime and sediment budget are manifested. These areas represent unified complex developing systems, which are called lithodynamic systems in specialized Russian-language literature[15, 16, 17, 18], and littoral cells in English-language literature[19, 20, 21, 22, 23].

By the nature of the substance within the lithodynamic systems, they are divided into three groups: abrasion, abrasion-accumulative and accumulative[24].

Abrasion systems are characterized by active destruction processes of the surface and underwater parts of the coastal zone, with the simultaneous formation of clastic material and its downward movement in the underwater slope. Accumulative systems develop under active formative conditions of clastic material on the underwater slope, from where it is transferred to the coastal zone due to the transverse or alongshore sediment flow, where it accumulates. Abrasion-accumulating lithodynamic systems are complex natural formations that are most widespread in the coastal zone of the World Ocean.

Structurally, within the framework of this system, three components are distinguished: the abrasion section (feeding zone), the abrasion-accumulating section (transit zone) and the accumulation

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[15] Зенкович В.П. Основы учения о развитии морских берегов. Москва: АН СССР, 1962. 710 с.

[16] Лонгинов В.В. Динамика береговой зоны бесприливных морей. Москва: АН СССР, 1963. 379 с.

[17] Шуйский Ю.Д. Проблема исследования баланса наносов в береговой зоне морей. Ленинград: Гидрометиздат, 1986. 240 с.

[18] Зенкович В.П. Потоки наносов вдоль советских берегов Черного моря. Труды Союзморпроекта ММФ, 1956. Т. 3. С. 57–66.

[19] Bowen A.J., Inman D.I. Budget of littoral sands in the vicinity of Point Arguello, California. C.E.R.C. Technical Memorandum, 1966. No. 19. 41 p.

[20] Davies J.L., Clayton K.M. Geographical variation in coastal development. London; New York: Longman, 1980. 212 p.

[21] Lakhan V.C., Trenhail A.S. Applications in Coastal Modeling. Elsevier Oceanography Science, 1989. Series 49. 386 p.

[22] Krumbein W.C. Statistical models in sedimentology. Sedimentology, 1968. Vol. 10. P. 7–23.

[23] Sherman, D.J. Perspectives on coastal geomorphology: introduction [In: Shroder, J. (Editor in Chief), Sherman, D.J. (Ed.)]. Treatise on Geomorphology. Academic Press, San Diego, CA, 2013. Vol. 10, Coastal Geomorphology. 448 p.

[24] Шуйский Ю.Д. Проблема исследования баланса наносов в береговой зоне морей. Ленинград: Гидрометиздат, 1986. 240 с.

section (unloading zone). The system-forming process and, at the same time, an important genetic feature of abrasion-accumulating systems is the alongshore sediment flow [25, 26, 27, 28].

Abrasion-accumulating systems are characterized by a significant variety of morphogenetic and lithodynamic features, which contributes to the manifestation of their morphological diversity. The most specific coastal systems of this type are the so-called "winged foreland", which were first described in English-language literature as "winged beheadland (headland)"[29, 30]. In morphological terms, this system is an abrasion section of the root coast, to which accumulative coastal forms adjoin from opposite sides.

The lack of clear criteria for distinguishing this system and understanding its place in the evolution of the coast, contributed to the fact that they were not deservedly deprived of attention and did not have an appropriate level of study. That is why we decided to analyze the history of this system isolation and determine its main genetic features.

A brief history of allocation and description of the "winged foreland" coastal system. The definition of the term "winged foreland", in the original English interpretation of "Winged beheadland", was first proposed by the American scientist F. Gulliver[31] in 1898. The basis for highlighting this formation, among other objects of the coastal zone, was the author's own research on the United States Atlantic coast, in the Sandy Hook Spit area (near the Long Branch,

[25] Зенкович В.П. Основы учения о развитии морских берегов. Москва: АН СССР, 1962. 710 с.

[26] Шуйский Ю.Д. Проблема исследования баланса наносов в береговой зоне морей. Ленинград: Гидрометиздат, 1986. 240 с.

[27] Зенкович В.П. Потоки наносов вдоль советских берегов Черного моря. Труды Союзморпроекта ММФ, 1956. Т. 3. С. 57–66.

[28] Морская геоморфология: Терминологический справочник. Береговая зона: процессы, понятия, определения [науч.ред. В.П. Зенкович, Б.А. Попов]. Москва: Мысль, 1980. 280 с.

[29] Gulliver F.P. Shoreline topography. Proceeding of the American Academy of Arts and Sciences, 1898. Volume 34. P. 151–258.

[30] Johnson D.W. Shore process and development. New York: John Wiley&Sons,INC/ London: Chapman&Hall, Limited, 1919. 584 p.

[31] Gulliver F.P. Shoreline topography. Proceeding of the American Academy of Arts and Sciences, 1898. Volume 34. P. 151–258.

New Jersey), as well as materials analysis of the Cape Peninsula-Code, Massachusetts study, which were described by W. Davis[32] (Fig. 1).

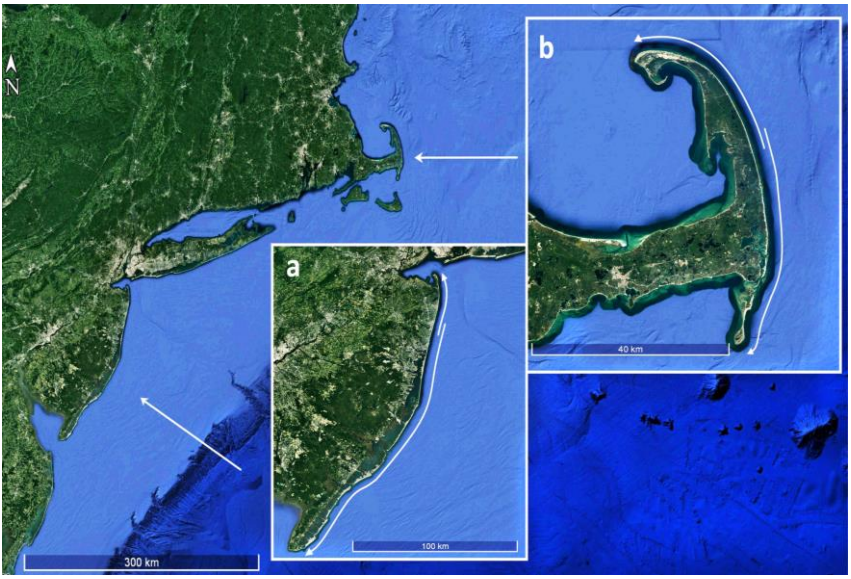

Fig. 1. The geographical location of the "winged foreland" coastal systems within the United States Atlantic coast: a) Sandy Hook Coast Bar and Spit in the area of Long Branch; b) Cape Cod Peninsula. White lines with arrows indicate the direction of alongshore sediment flows (developed on the basis of Google Earth resource).

F. Gulliver[33] as a part of the formation "winged foreland" identifies three components: a promontory of the root coast and two accumulative forms symmetrically located from this protrusion.

It should be noted that in determining the genetic characteristics of accumulative formations, the author focuses on the coastal sediment movement from the abrasion to accumulative.

[32] Davis W.M. The outline of Cape Code. Proceedings of the American Academy of Arts and Sciences, Vol. 31 (May, 1895 – May, 1896). P. 303–332.

[33] Gulliver F.P. Shoreline topography. Proceeding of the American Academy of Arts and Sciences, 1898. Volume 34. P. 151–258.

Thus, we can state that F. Gulliver considers the "winged foreland" as a complex coastal lithodynamic system in which the features of the accumulative forms formation and evolution are inseparable from the abrasion section and the nature of the alongshore sediment flow.

The complexity of this abrasion-accumulative system is caused not only by the presence of two accumulative forms instead of one, but also by certain morphogenetic characteristics. So, genetically, the formation of accumulative forms within the "winged foreland" system is due to the interaction of both transverse and alongshore sediment flow[34, 35].

F. Gulliver describing this system, uses an evolutionary approach and justifies the formation of the coastal system "winged foreland" in the context of the general transformation of the bay coast, stating that these formations arise at the stage of "youth".

In his work[36], this American scientist also considers the geographical extension of the same coastal systems on the Earth surface. According to him, the abrasive-accumulative systems of the "winged foreland" are not very widespread along the World Ocean shores of the, but at the same time they develop under very diverse environmental conditions. As an example, he shows coastal formations in the region of separate islands and peninsulas in the southwestern and southeastern parts of the Baltic Sea, namely, in the area of the Jutland and Sambian peninsulas, as well as the Pomeranian protrusion[37].

It should be emphasized that special attention he pays to the coast area in the north-west of the Crimean peninsula, where the "striking", according to him, the area of the "winged foreland" is located. He describes the coast with a very rugged primary coastline, which is separated from the open sea by protruding accumulative forms. F. Gulliver writes: "Despite the lack of good quality and large scale

[34] Gulliver F.P. Shoreline topography. Proceeding of the American Academy of Arts and Sciences, 1898. Volume 34. P. 151–258.

[35] Davis W.M. The outline of Cape Code. Proceedings of the American Academy of Arts and Sciences, Vol. 31 (May, 1895 – May, 1896). P. 303–332.

[36] Gulliver F.P. Shoreline topography. Proceeding of the American Academy of Arts and Sciences, 1898. Volume 34. P. 151–258.

[37] Gulliver F.P. Shoreline topography. Proceeding of the American Academy of Arts and Sciences, 1898. Volume 34. P. 213–214.

maps, as well as geological studies materials, this coastal system should be interpreted as a "winged foreland", due to the typical contour of the coast"[38]. In our opinion, this description fits the Tendra – Dzharylgach natural coastal system.

No less interesting is the information that to the north of this system he describes a similar formation, which the genesis is not very clear, but it looks like very much a "winged foreland", noting that a large number of lakes are located within it and the Dnieper delta is nearby[39]. Based on the description, we defined this system as the Kinburn Peninsula distal part.

In summarizing the work of Douglas Johnson[13] "Development of the coastline", these natural coastal systems had already identified as "winged headland". The author, referencing F. Gulliver, describes them as very specific coastal forms, having the appearance of a cape, bounded on both sides by bays and braids.

At the same time, he confirms F. Gulliver's idea[40] that such formations appear within the limits of the originally bay coast, at the stage of its youth, when active abrasion of capes occurs and young accumulative forms begin to form[41].

In the mid-twentieth century, the American scientist R.Nikols, examined the "winged foreland" natural systems in the context of the evolution of drumlins coast[42]. This genetic type of coast is developed in the areas of glacier retreat[43], where it is represented by rather easily collapsing coastal sections, on both sides of which specific accumulative formations, called "flying bars", are located.

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[38] Gulliver F.P. Shoreline topography. Proceeding of the American Academy of Arts and Sciences, 1898. Volume 34. P. 214.

[39] Gulliver F.P. Shoreline topography. Proceeding of the American Academy of Arts and Sciences, 1898. Volume 34. P. 214.

[40] Gulliver F.P. Shoreline topography. Proceeding of the American Academy of Arts and Sciences, 1898. Volume 34. P. 151–258.

[41] Johnson D.W. Shore process and development. New York: John Wiley&Sons, INC / London: Chapman&Hall, Limited, 1919. P. 329–330.

[42] Nichols R.L. Flying bars. American Journal Science, 1948. CCXLVI. P. 96–100.

[43] Морская геоморфология: Терминологический справочник. Береговая зона: процессы, понятия, определения [науч.ред. В.П. Зенкович, Б.А. Попов]. Москва: Мысль, 1980. 280 с.

V. Zenkovich often paid attention to "winged foreland" coastal systems[44, 45, 46]. Initially he describes the "winged foreland" as the abrasion-accumulative pair (system) kind of variety, paying attention to the specific appearance of the formation, but stating that the formation of these coastal systems in most cases is due to different processes.

The identification of this system common features was made by V. Zenkovich after a detailed analysis of specialized literature in English[47, 48, 49, 50] and his own detailed studies of various seas shores[51, 52, 53]. The final definition of the coastal system "winged foreland" was presented by V. Zenkovich in the terminological reference[54]:

"The Winged foreland – a combination of eroded root cape and two braids, growing due to the transfer of destruction products on both sides of it. Examples are frequent on the Drumlin shores. In native literature, the term has not been disseminated".

It should be noted that in this reference manual[55] according to natural system also includes wellhead area of single-arm deltas that are

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[44] Зенкович В.П. Основы учения о развитии морских берегов. Москва: АН СССР, 1962. 710 с.

[45] Зенкович В.П. Берега Черного и Азовского морей. Москва: Географгиз, 1958. 371 с.

[46] Зенкович В.П. Морфология и динамика советских берегов Черного моря. Т. II (Северо-западная часть). Москва: АН СССР, 1960. 216 с.

[47] Gulliver F.P. Shoreline topography. Proceeding of the American Academy of Arts and Sciences, 1898. Volume 34. P. 151–258.

[48] Johnson D.W. Shore process and development. New York: John Wiley&Sons,INC / London: Chapman&Hall, Limited, 1919. 584 p.

[49] Davis W.M. The outline of Cape Code. Proceedings of the American Academy of Arts and Sciences, Vol. 31 (May, 1895 – May, 1896). P. 303–332.

[50] Nichols R.L. Flying bars. American Journal Science, 1948. CCXLVI. P. 96–100.

[51] Зенкович В.П. Берега Черного и Азовского морей. Москва: Географгиз, 1958. 371 с.

[52] Зенкович В.П. Морфология и динамика советских берегов Черного моря. Т. II (Северо-западная часть). Москва: АН СССР, 1960. 216 с.

[53] Зенкович В. П. Динамика и морфология морских берегов. Ч. 1. Волновые процессы. Москва - Ленинград: Морской транспорт, 1946. 496 с.

[54] Морская геоморфология: Терминологический справочник. Береговая зона: процессы, понятия, определения [науч.ред. В.П. Зенкович, Б.А. Попов]. Москва: Мысль, 1980. 280 с.

[55] Морская геоморфология: Терминологический справочник. Береговая зона: процессы, понятия, определения [науч.ред. В.П. Зенкович, Б.А. Попов]. Москва: Мысль, 1980. С. 134.

released as “flanking bars”[19]. The isolation of the “winged foreland” natural system in the area of the river estuarine region does not correspond to the initial definition of such systems, at the same time, indicates the lithological and morphological emphasis of these formations.

Analysis of materials submitted by V. Zenkovich in his work “Fundamentals of Seashores Development”[56], has helped us to define the generalized genetic traits that can be used to interpret the studied coastal system among others. These features are lithodynamic, morphodynamic and morphological in nature.

Highlighted “winged foreland” coastal system common features, suggested V. Zenkovich, are the best examples of these formations and can be considered the abrasion-accumulative systems of the Cheleken Peninsula (eastern coast of the Caspian Sea) and Yeisk (eastern coast of the Azov Sea). At the same time, in his opinion, the Tendra-Dzharylgach lithodynamic system is not a “winged foreland” due to the specific location of the feeding zone, but has morphological similarity[57].

In 1980, I. Shchukin in his encyclopedic dictionary[20] presented the following definition: “a winged foreland is a cape from which braids extend from both sides – “wings” washed by the sea”. This definition gives only a general idea of the formation and does not fully describe its specific features.

In 1982, the fundamental work “The Encyclopedia of Beaches and Coastal Environments” was edited by Maurice L. Schwartz. In this work, the “winged foreland” is considered not as a natural system, but as one of the specific types of accumulative coastal forms – braids, which develop under the conditions of manifestation of divergent sediment flows[58].

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[56] Зенкович В.П. Основы учения о развитии морских берегов. Москва: АН СССР, 1962. 710 с.

[57] Зенкович В.П. Основы учения о развитии морских берегов. Москва: АН СССР, 1962. 710 с.

[58] The Encyclopedia of Beaches and Coastal Environments. Volume XV. [Edited by Maurice L. Schwartz]. Stroudsburg, Pennsylvania: Hutchinson Ross Publishing Company, 1982. P. 790.

The scientists Yu. Shuisky and G. Vykhovanets (Odesa) paid attention to this specific type of coastal system. Detailed studies of the Black Sea northwestern coastal zone carried out in the 70–90s allowed them[59, 60, 61] to develop the idea of V. Zenkovich on the existence and diversity of these entities in this region. So, on the coastal section between the Danube and the Dniester, the "winged foreland" coastal system is located, which was called Burnas-Budak.

Within this system, the bars of the Burnass and Budak estuaries are separated by an abrasion step, i.e. morphologically the formations are similar to "winged foreland".

However, unlike the "classical" examples of "winged foreland", the accumulative formations located here do not belong to free, but to closing forms. It should also be noted that within this coastal system only a unidirectional sediment flow appears, which is not a characteristic feature of "winged foreland".

It should also be noted that the Tendra-Dzharylgach coastal system which is located in the Black Sea northwestern region unambiguously distinguishes as a "winged foreland" Yu. Shuisky[62], not supporting the opinion of V. Zenkovich about its "only resemblance" to formations of the type.

Thus, for more than a century of coastal studies development, a complete scientific description of the coastal system has not yet occurred; there is no consensus on its genetic characteristics, its diversity, and its place in the system of the coastal zone of the World Ocean.

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[59] Шуйский Ю.Д., Выхованец Г.В. Экзогенные процессы развития аккумулятивных берегов в Северо-западной части Черного моря. Москва: Недра, 1989, 198 с.

[60] Шуйский Ю.Д., Выхованец Г.В., Борисевич Т.Д. Современная динамика абразионных и аккумулятивных форм береговой системы "Тендра – Джарылгач" на побережье Черного моря. Фальцфейнівські читання: Зб.наук.праць [відп.ред. С.В.Шмалей]. Херсон, 2005. Т. 2. С. 270–278.

[61] Выхованец Г.В., Гыжко Л.В., Вербжицкий П.С., Стоян А.А., Гыжко А.А., Муркалов А.Б. Физико-географическая характеристика лимана Бурнас на северо-западном побережье Черного моря. Вісник Одеського національного університету. Географ. та геол.науки, 2008. Т. 13. Вип. 6. С. 44–56.

[62] Шуйский Ю.Д., Выхованец Г.В., Борисевич Т.Д. Современная динамика абразионных и аккумулятивных форм береговой системы "Тендра – Джарылгач" на побережье Черного моря. Фальцфейнівські читання: Зб.наук.праць [відп.ред. С.В.Шмалей]. Херсон, 2005. Т. 2. С. 271.

Genetic features of the "winged foreland" coastal system. After analyzing the literature devoted to the study and description of these coastal systems[63, 64, 65, 66, 67, 68, 69, 70, 71] we identified its main genetic features: lithodynamic, hydrodynamic, morphological and evolutionary.

Lithodynamic sign. In a generalized understanding, this coastal system is a section of the root coast, on both sides of which coastal accumulative forms are located. The root site is actively destroyed, retreats and supplies the accumulative formations that have joined it with detrital material. The most important connecting link for the entire system is alongshore sediment flows that begin within the divergent zone and diverge in opposite directions, thereby forming the morphological features of the "winged foreland" coastal system.

Hydrodynamic sign. Within the framework of the studied natural formation, two adjacent abrasion-accumulative pairs interact, which develop in a reverse mode, depending on the wave's nature. When a certain direction of disturbance manifests itself, between the abrasion section and one of the braids, the sediment flow is activated, while the other braid does not receive power, it remains blocked. In a situation where the waves appearance of a different direction develops, the braids, as it were, exchange places. It is the factor that determines the existence of two accumulative forms within the "winged foreland".

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[63] Зенкович В.П. Основы учения о развитии морских берегов. Москва: АН СССР, 1962. 710 с.

[64] Шуйский Ю.Д. Проблема исследования баланса наносов в береговой зоне морей. Ленинград: Гидрометиздат, 1986. 240 с.

[65] Морская геоморфология: Терминологический справочник. Береговая зона: процессы, понятия, определения [науч.ред. В.П. Зенкович, Б.А. Попов]. Москва: Мысль, 1980. 280 с.

[66] Gulliver F.P. Shoreline topography. Proceeding of the American Academy of Arts and Sciences, 1898. Volume 34. P. 151–258.

[67] Johnson D.W. Shore process and development. New York: John Wiley&Sons,INC/ London: Chapman&Hall, Limited, 1919. 584 p.

[68] Nichols R.L. Flying bars. American Journal Science, 1948. CCXLVI. P. 96–100.

[69] Зенкович В.П. Берега Черного и Азовского морей. Москва: Географгиз, 1958. 371 с.

[70] Зенкович В.П. Морфология и динамика советских берегов Черного моря. Т. II (Северо-западная часть). Москва: АН СССР, 1960. 216 с.

[71] Зенкович В. П. Динамика и морфология морских берегов. Ч. 1. Волновые процессы. Москва - Ленинград: Морской транспорт, 1946. 496 с.

Morphological sign. Within this system, on both sides of the abrasive portion, arranged coastal accumulative forms that in most cases pushed into the sea, so, they are free. Considering such systems, using the cartographic method, one gets the impression of "wings" formed at Cape, which in fact allowed F. Gulliver to apply the term "winged headland" to this formation.

Evolutionary sign. It should be noted that in most descriptions the "winged foreland" coastal system is considered as an integral part of the evolution of the dissected bay coast to varying levels. According to American researchers, the "winged foreland" coastal system is formed within a dissected coast at the initial stage of its alignment and transformation into an abrasion-aligned[72, 73].

V. Zenkovich[74] developed a theoretical scheme for the development of this coastal system. In his opinion, all "winged foreland" at the initial stage of their development are characterized by braids that are bent towards the land and make up a certain angle with the edges of the foreland. Subsequently, the entire system is aligned in one line due to the abrasion of the foreland and the simultaneous accumulation at the extremities of both braids, as a result of their extension. Accordingly, the coast, within which there are "winged foreland" with braids bent towards the land, is at a youth stage, while such formations with aligned contours are the evidence of the coast maturity.

In this case, the alignment of the "winged foreland" and the subsequent adjoining of the accumulative forms to the root sections of the coast is a natural stage of the coast evolution, which ultimately leads to the formation of an abrasion-accumulative leveled coast.

Geomorphologic analysis of the most typical "winged foreland" coastal systems examples. To determine the most complete genetic signs of this coastal system, we analyzed the lithodynamic, hydrodynamic, morphological and evolutionary features of the most typical formations of this type.

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[72] Gulliver F.P. Shoreline topography. Proceeding of the American Academy of Arts and Sciences, 1898. Volume 34. P. 151–258.

[73] Johnson D.W. Shore process and development. New York: John Wiley&Sons, INC / London: Chapman & Hall, Limited, 1919. 584 p.

[74] Зенкович В.П. Основы учения о развитии морских берегов. Москва: АН СССР, 1962. 710 с.

The "winged foreland" coastal system of the Cheleken Peninsula. The considered peninsula is located on the border between the eastern and southeastern coast of the Caspian Sea, south of the Turkmenbashi Gulf[75] (Fig. 2). The central part of the peninsula is occupied by the Chokrak Upland, which is a strongly denuded surface of the arch part of the brachianticline structure[26]. In lithological terms, this object is composed of clay and sandy rocks with a large number of abrasion terraces in the east and dunes in the west[76, 77, 78].

From the north and south to the peninsula the South Cheleken and North Cheleken spits adjoin. They are free and extended towards the sea. Both accumulative forms have similar morphological features, they expand towards the distal part and taper towards the basal. This similarity indicates the manifestation of accumulation only in the distal braids, while erosion and retreat simultaneously with the cliff occur in the basal areas. It is this feature that allows V. Zenkovich[79, 80] conclude that the evolution of the "winged foreland" coastal system occurs in the direction of its alignment in one line, and this is the most important theoretical justification of the evolutionary sign.

Investigations of the coastal zone of the Caspian Sea in the second half of the 60s, in the mid-70s of the 20th century made it possible to determine the genesis of the accumulative forms adjacent to the Cheleken Peninsula[81, 82, 83, 84]. The lithological analysis of these

[75] Davydov O.V., Kotovsky I.N. Geographical allocation of "winged foreland" abrasion-accumulative systems. Leidinyje pateikiama 12-osios mokslines-praktines konferencijos "Jurosir krantu tyrimai 2019". Klaipedoje, medziaga, 2019. P. 49–52.

[76] Леонтьев О.К., Маев Е.Г., Рычагов Г.И. Геоморфология берегов и дна Каспийского моря. Москва: МГУ, 1977. 208 с.

[77] Леонтьев О.К., Халилов А.И. Природные условия формирования берегов Каспийского моря. Баку: АН Азербайджанской ССР, 1965. 215 с.

[78] Курбанов Р.Н. Береговые процессы на полуострове Челекен. Проблемы освоения пустынь, 2011. Т. 1. № 2. С. 17–20.

[79] Зенкович В.П. Основы учения о развитии морских берегов. Москва: АН СССР, 1962. 710 с.

[80] Зенкович В. П. Динамика и морфология морских берегов. Ч. 1. Волновые процессы. Москва - Ленинград: Морской транспорт, 1946. 496 с.

[81] Никифоров Л. Г. Структурная геоморфология морских побережий. Москва: МГУ, 1977. 176 с.

[82] Леонтьев О.К., Маев Е.Г., Рычагов Г.И. Геоморфология берегов и дна Каспийского моря. Москва: МГУ, 1977. 208 с.

formations led to the conclusion that their bodies are composed of oolitic and shell sands, with a slight admixture of abrasive material. It is these data that allowed researchers to come to the conclusion that the accumulative forms studied are a coastal bar that has shifted and subsequently joined the root protrusion of the Cheleken Peninsula.

Fig. 2. The geographical location of the Cheleken Peninsula "winged foreland" coastal system within the southeastern part of the Caspian Sea. White lines with arrows indicate the direction of alongshore sediment flows (developed on the basis of Google Earth resource)

[83] Леонтьев О.К., Халилов А.И. Природные условия формирования берегов Каспийского моря. Баку: АН Азербайджанской ССР, 1965. 215 с.

[84] Курбанов Р.Н. Береговые процессы на полуострове Челекен. Проблемы освоения пустынь, 2011. Т. 1. № 2. С. 17–20.

An analysis of the hydrometeorological conditions of the southeastern coast of the Caspian Sea[85, 86] indicates that the wind-wave regime of the Cheleken Peninsula region is characterized by dominance of northwestern and northern winds exposure, and this does not contribute to the formation of symmetrical accumulative forms.

Accordingly, lithodynamically, this coastal system does not develop due to abrasion of the root site, since the underwater slope is the main source of nutrition. Modern hydrodynamic conditions of the region cannot lead to the formation of accumulative forms symmetry. However, the morphological features of the distals of both braids allow us to conclude that within the system there is sediment divergence and two alongshore sediment flows. Evolutionarily, considering the deviation angle of the accumulative forms relative to the root protrusion of the coast, these formations indicate the initial stage of alignment of the complex bay coast.

The Tendra – Dzharylgach "winged foreland" coastal system. This natural system occupies a central place in the northwestern part of the Black Sea[87] (Fig. 3). In geological terms, its axial place is occupied by two gentle anticlinal folds composed of clay and forest-clay rocks[88, 89].

18 km took part in this race, which was called "headland"[90, 91,92, 93]. On the other hand, two accumulative forms

[85] Леонтьев О.К., Халилов А.И. Природные условия формирования берегов Каспийского моря. Баку: АН Азербайджанской ССР, 1965. 215 с.

[86] Курбанов Р.Н. Береговые процессы на полуострове Челекен. Проблемы освоения пустынь, 2011. Т. 1. № 2. С. 17–20.

[87] Davydov O.V., Kotovsky I.N. Geographical allocation of "winged foreland" abrasion-accumulative systems. Leidinyje pateikiama 12-osios mokslines-praktines konferencijos "Jurosir krantu tyrimai 2019". Klaipedoje, medziaga, 2019. P. 49–52.

[88] Котовский И.Н. Морфология и динамика берегов Черного моря в пределах Херсонской области УССР. Автореф. дисс. …. канд. геогр. наук: 11.00.04. Киев, 1991. 19 с.

[89] Давидов О.В., Котовський І.М., Зінченко М.О., Сімченко С.В. Аналіз тектонічної зумовленості геоморфологічних умов берегової зони Херсонської област. Науковий вісник Херсонського державного університету. Серія Географічні науки. 2017. Вип. 6. С. 134–140.

[90] Зенкович В.П. Берега Черного и Азовского морей. Москва: Географгиз, 1958. 371 с.

[91] Шуйский Ю.Д., Выхованец Г.В., Борисевич Т.Д. Современная динамика абразионных и аккумулятивных форм береговой системы "Тендра – Джарылгач"

adjoin the “headland”: in the west – the Tendra Spit, in the east – the Dzharylgach Spit. These are characterized by the formation of accumulative seated participants and expanded distal aspects. This is an indicator of the entire system in the direction and manifestations of accumulation only at their extremities[94].

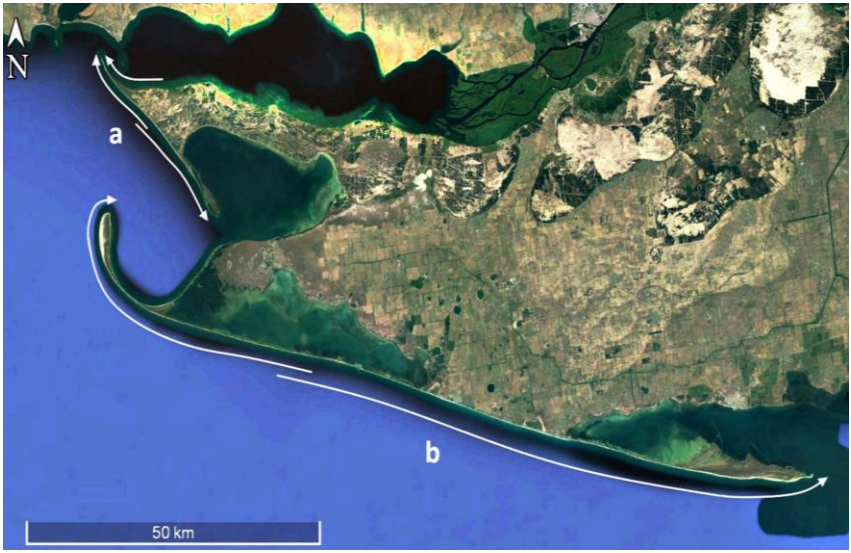

Fig. 3. The geographical location of the “winged foreland” coastal systems within the northwestern part of the Black Sea: a) Kinburnska – Pokrovska – Dovgiy; b) Tendra – Dzharylgach. White lines with arrows indicate the direction of alongshore sediment flows (developed on the basis of Google Earth resource)

на побережье Черного моря. Фальцфейнівські читання: Зб. наук. праць [відп.ред. С.В.Шмалей]. Херсон, 2005. Т. 2. С. 270–278.

[92] Котовский И.Н. Морфология и динамика берегов Черного моря в пределах Херсонской области УССР. Автореф. дисс. …. канд. геогр. наук: 11.00.04. Киев, 1991. 19 с.

[93] Давидов О.В., Котовський І.М., Ціомашко О.В., Герасимчук А.М. Аналіз морфогенетичних особливостей коси-острова Джарилгач. Науковий вісник Херсонського державного університету. Серія Географічні науки. 2018. Вип. 8. С. 169–176.

[94] Зенкович В.П. Основы учения о развитии морских берегов. Москва: АН СССР, 1962. 710 с.

The lithodynamic feature of this coastal system is that the nutrition of both accumulative forms does not occur due to the destruction of the abrasion site, but is the result of erosion of the underwater accumulative terraces and the influx of a large amount of biogenic sediment[95, 96, 97, 98].

Within this system, alongshore sediment transport is represented by two sediment flows[99, 100, 101], which diverge in opposite directions from the divergence zone in the region of the Tendra spit central part. The presence of a divergence zone within a given coastal system is an important genetic sign of "winged foreland".

Analysis of the hydrodynamic factor[102] indicates the dominance of south-western, southern and eastern waves exposure. Considering the orientation of the coastal system, it should be noted that these wind-wave regime conditions are important morphogenetic sign and they correspond to the formation of the "winged foreland" conditions.

So, lithodynamically, this natural formation is not a classical abrasion-accumulative system, because its nutrition is not carried out

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[95] Зенкович В.П. Берега Черного и Азовского морей. Москва: Географгиз, 1958. 371 с.

[96] Зенкович В.П. Морфология и динамика советских берегов Черного моря. Т. II (Северо-западная часть). Москва: АН СССР, 1960. 216 с.

[97] Шуйский Ю.Д., Выхованец Г.В., Борисевич Т.Д. Современная динамика абразионных и аккумулятивных форм береговой системы "Тендра – Джарылгач" на побережье Черного моря. Фальцфейнівські читання: Зб. наук. праць [відп. ред. С.В. Шмалей]. Херсон, 2005. Т. 2. С. 270–278.

[98] Котовский И.Н. Морфология и динамика берегов Черного моря в пределах Херсонской области УССР. Автореф. дисс. …. канд. геогр. наук: 11.00.04. Киев, 1991. 19 с.

[99] Зенкович В.П. Морфология и динамика советских берегов Черного моря. Т. II (Северо-западная часть). Москва: АН СССР, 1960. 216 с.

[100] Котовский И.Н. Морфология и динамика берегов Черного моря в пределах Херсонской области УССР. Автореф. дисс. …. канд. геогр. наук: 11.00.04. Киев, 1991. - 19 с.

[101] Давидов О.В., Котовський І.М., Ціомашко О.В., Герасимчук А.М. Аналіз морфогенетичних особливостей коси-острова Джарилгач. Науковий вісник Херсонського державного університету. Серія Географічні науки. 2018. Вип. 8. С. 169–176.

[102] Котовский И.Н. Морфология и динамика берегов Черного моря в пределах Херсонской области УССР. Автореф. дисс. …. канд. геогр. наук: 11.00.04. Киев, 1991. 19 с.

due to abrasion of the root coast protrusion. From the point of view of the hydrodynamic feature, the Tendra-Dzharylgach natural system is an indicative "winged foreland", as evidenced by two symmetrical accumulative forms. In evolutionary terms, this coastal system fits very well into the alignment scheme of a complex bay coast, which is at the maturity stage[103].

The Kinburnska – Pokrovska – Dovgiy "winged foreland" coastal system. This coastal system is located in the northwestern part of the Black Sea, to the northeast of the Tendra Spit tip, within the Kinburn Peninsula western tip[104] (Fig. 3).

Unlike all the coastal systems described earlier, a root abrasion site is absent within this formation; the central place of the system is occupied by the Kinburn Peninsula sandy protrusion, which is periodically eroded. The Kinburnska Spit adjoins this protrusion in the northwest, and in the southeast there is a complex formation represented by the Pokrovska Spit, Krugliy and Dovgiy islands. The total length of this system is 35 km[105], [106].

Lithodynamically, the described formation is characterized by bottom feeding and reverse alongshore sediment movement, which creates divergent developmental conditions. In morphological terms, this system is a complex formation, where the north-western part is an arrow, and the south-eastern part is a spit and two accumulative islands, interconnected by an underwater coastal bar[107].

Accordingly, this coastal system can be classified as "winged foreland" according to morphological characteristics and partly

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[103] Зенкович В.П. Основы учения о развитии морских берегов. Москва: АН СССР, 1962. 710 с.

[104] Davydov O.V., Kotovsky I.N. Geographical allocation of "winged foreland" abrasion-accumulative systems. Leidinyje pateikiama 12-osios mokslines-praktines konferencijos "Jurosir krantu tyrimai 2019". Klaipedoje, medziaga, 2019. P. 49–52.

[105] Шуйский Ю.Д. Распределение наносов вдоль морского края Кинбурнского полуострова (Черное море). Доклады НАН Украины. 1999. № 8. С. 119–123.

[106] Кривульченко А.І. Кінбурн: ландшафти, сучасний стан та значення: Монографія. Кропивницький: Центрально-Українське видавництво, 2016. 416 с.

[107] Шуйский Ю.Д. Распределение наносов вдоль морского края Кинбурнского полуострова (Черное море). Доклады НАН Украины. 1999. № 8. С. 119–123.

according to lithodynamic characteristics due to the absence of an abrasion section between the braids, however, in the presence of a zone of sediment flows divergence. In evolutionary terms, the coastal system of Kinburnska – Pokrovska – Dovgiy is not the result of the bay coast abrasion alignment, but is the result of coast alignment due to the outgoing bar from the water and its subsequent adjoining to the Kinburn Peninsula protrusion.

The Burnass – Budak "winged foreland" coastal system. The studied coastal system is located in the northwestern part of the Black Sea, on a coastal segment between the Dniester and Danube rivers estuarine areas[108, 109, 110]. The central place of the system is occupied by the section of the abrasive coast between the settlements of Kurortne and Lebedivka. There is a Burnass estuary bar in the south-west, and Budak estuary bar in the north-east (Fig. 4).

Lithodynamically, this section is characterized by a longshore sediment flow, which is southwest directed toward the Zhebriyanska bay[111, 112]. However, in the warm period of the year, in the area of the Budak bar, a divergence zone appears and a sediment flow forms, directed towards the Odesa Gulf[113, 114]. In morphogenetic terms, the accumulative forms of this region are a coastal bar, which, as a result

[108] Зенкович В.П. Берега Черного и Азовского морей. Москва: Географгиз, 1958. 371 с.

[109] Зенкович В.П. Морфология и динамика советских берегов Черного моря. Т. II (Северо-западная часть). Москва: АН СССР, 1960. 216 с.

[110] Davydov O.V., Kotovsky I.N. Geographical allocation of "winged foreland" abrasion-accumulative systems. Leidinyje pateikiama 12-osios mokslines-praktines konferencijos "Jurosir krantu tyrimai 2019". Klaipedoje, medziaga, 2019. P. 49–52.

[111] Шуйский Ю.Д., Выхованец Г.В. Экзогенные процессы развития аккумулятивных берегов в Северо-западной части Черного моря. Москва: Недра, 1989, 198 с.

[112] Выхованец Г.В., Гыжко Л.В., Вербжицкий П.С., Стоян А.А., Гыжко А.А., Муркалов А.Б. Физико-географическая характеристика лимана Бурнас на северо-западном побережье Черного моря. Вісник Одеського національного університету. Географ. та геол.науки, 2008. Т. 13. Вип. 6. С. 44–56.

[113] Зенкович В.П. Морфология и динамика советских берегов Черного моря. Т. II (Северо-западная часть). Москва: АН СССР, 1960. 216 с.

[114] Шуйский Ю.Д., Выхованец Г.В. Экзогенные процессы развития аккумулятивных берегов в Северо-западной части Черного моря. Москва: Недра, 1989, 198 с.

of displacement, joined the protrusion of the root coast. Subsequently, along the coastal zone of this accumulative form, alongshore movements of sediments were actively manifested, which led to its transformation into bar. The narrowed character of the bar indicates the dominance of sediment transport within their limits without a tendency to accumulation[115].

So, this formation, in morphological and lithodynamic terms, can be attributed to the classic "winged foreland" very conditionally. In evolutionary terms, the Burnass – Budak coastal system is a mature stage of the bay abrasive coast alignment and its transformation into an abrasion-accumulating coast.

Fig. 4. The geographical position and structure of the Burnas – Budak "winged foreland" coastal system of the Black Sea. White lines with arrows indicate the direction of alongshore sediment flows (developed on the basis of Google Earth resource)

[115] Зенкович В.П. Основы учения о развитии морских берегов. Москва: АН СССР, 1962. 710 с.

The Dolgaya – Kamyshevatskaya "winged foreland" coastal system. This example of the "winged foreland" coastal system is located within the eastern coast of the Azov Sea, in the Yeisk Peninsula region[116] (Fig. 5).

The central part of the system is occupied by an abrasion clay protrusion, which is a slope of the Mill zone of the Yeisk monocline elevation, within the Rostov arch[117]. The Dolgaya Spit adjoins this protrusion, which stands out as a "headland", in the northwest, and the Kamyshevatskaya spit in the southeast.

Fig. 5. The geographical position and morphological structure of the Dolgaya – Kamyshevatskaya "winged foreland" coastal system of the Azov Sea. White lines with arrows indicate the direction of alongshore sediment flows (developed on the basis of Google Earth resource)

[116] Davydov O.V., Kotovsky I.N. Geographical allocation of "winged foreland" abrasion-accumulative systems. Leidinyje pateikiama 12-osios mokslines-praktines konferencijos "Jurosir krantu tyrimai 2019". Klaipedoje, medziaga, 2019. P. 49–52.

[117] Геология Азовского моря [Отв. ред. д-р геол.-минерал. наук Е.Ф.Шнюков]; АН УССР. Ин-т геохимии и физики минералов. Киев: Наукова думка, 1974. 247 с.

The nutrition of this system is carried out mainly due to the biogenic material coming from the underwater slope. However, a significant part of these sediments is involved in the longshore movement, which is characterized by a divergent character due to the hydrodynamic factor specific manifestation. It is the divergent nature of the sediment movement that contributes to the formation of accumulative forms on both sides of the Dolgaya and Kamyshevatskaya abrasion protrusions[118]. In morphogenetic terms, the Dolgaya Spit is an arrow, as it develops in the convergence of two sediment flows, and the Kamyshevatskaya is a typical spit[119, 120, 121].

So, in morphological and hydrodynamic terms, this coastal system is a classic "winged foreland". The lithodynamic analysis allows us to state that it is manifested only partially, due to the existing divergence of the sediment flow. In evolutionary terms, the Dolgaya-Kamyshevatskaya coastal system represents the youth stage of the bay coast which is aligned.

The Curonian-Baltic "winged foreland" coastal system. This coastal system is located in the southeastern part of the Baltic Sea, it is a Sambian Peninsula protrusion and two accumulative forms on both sides adjoin it: the Curonian and Baltic (Vistula) spits[122] (Fig. 6).

The Sambian Peninsula is a section of the root coast composed of glacial and fluvioglacial deposits and located in the central part. The Curonian Spit adjoins this cape in the north, and the Baltic (Vistula) Spit in the south. In morphogenetic term, these accumulative forms are coastal bars, within which alongshore sediments movement has manifested at certain stages.

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[118] Мамыкина В.А., Хрусталев Ю.П. Береговая зона Азовского моря. Ростов-на-Дону: Ростовский университет, 1980. 174 с.

[119] Мамыкина В.А., Хрусталев Ю.П. Береговая зона Азовского моря. Ростов-на-Дону: Ростовский университет, 1980. 174 с.

[120] Есин Н.В., Савин М.Т., Жиляев А.П. Абразионный процесс на морском берегу. Ленинград: Гидрометеоиздат, 1980. 200 с.

[121] Шуйский Ю.Д., Губкин Н.М. Исследование скоростей абразии клифов на восточном побережье Азовского моря. Литодинамические процессы береговой зоны южных морей и ее антропогенное преобразование. Ленинград: Наука, 1982. С. 43–51.

[122] Davydov O.V., Kotovsky I.N. Geographical allocation of "winged foreland" abrasion-accumulative systems. Leidinyje pateikiama 12-osios mokslines-praktines konferencijos "Jurosir krantu tyrimai 2019". Klaipedoje, medziaga, 2019. P. 49–52.

R. Knaps[123] distinguished alongshore sediment movement within the southeastern part of the Baltic Sea, directed from the Sambian Peninsula to Cape Kolkasrags, located in the Irbensky Strait region. The author also pays attention to the sediment flow directed to south from the Sambian Peninsula, but as not clearly expressed. V. Boynagryan[124], V. Gudelis[125],V. Boldyrev[126] also studied and described the coastal sediment flows in this region.

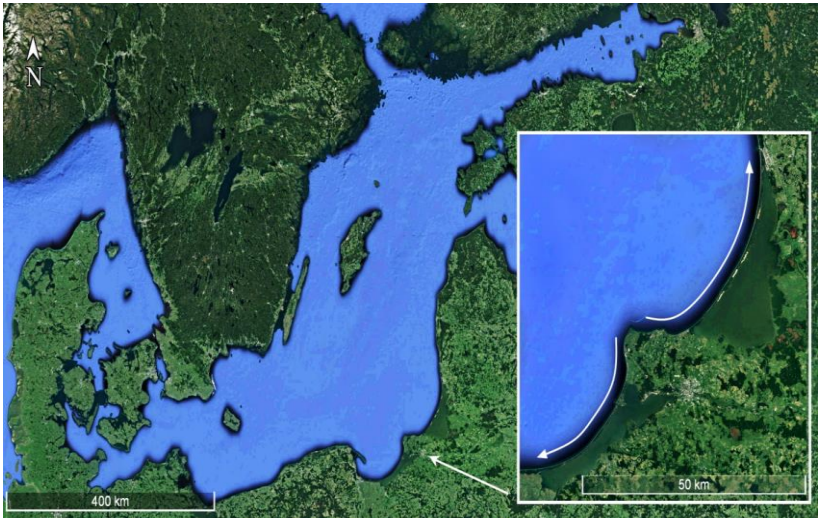

Fig. 6. The geographical position of the Curonian-Baltic "winged foreland" coastal system of the Baltic Sea. White lines with arrows indicate the direction of alongshore sediment flows (developed on the basis of Google Earth resource)

[123] Кнапс Р.Я. Перемещение наносов у берегов Восточной Балтики. Развитие морских берегов в условиях колебательных движений земной коры. Таллин: Валгус, 1966. С. 21–29.

[124] Бойнагарян В.Р. Абразия берегов Самбийского полуострова как источник материала для потока наносов. Развитие морских берегов в условиях колебательных движений земной коры. Таллин: Валгус, 1966. С. 61–65.

[125] Гуделиса В.К., Емельянова Е.М., Шуйский Ю.Д. и др. Геология Балтийского моря. Вильнюс: Мокслас, 1976. 336 с.

[126] Болдырев В.Л., Гуделис В.К., Кнапс Р.Я. Потоки песчаных наносов юго-восточной Балтики. Исследования динамики рельефа морских побережий. Москва, 1979. С. 14–19.

During the many years of research and subsequent calculations, A. Babakov[127] concluded that within the southeast coast of the Baltic Sea, from the Gulf of Gdansk to Kolkasrags Cape, there is no single unidirectional sediment flow and there is a system of local countervailing flows, located on both sides of the Sambian Peninsula. Thus, this peninsula is a zone of sediment flows divergence[128, 129], which corresponds to the genetic feature of the "winged foreland" coastal system.

An analysis of the hydrodynamic factor in the development of the southeastern Baltic coasts indicates the dominance of the west, northwest, and southwest winds exposure[130, 131]. The winds of these directions are the most important from the morphogenetic point of view, they determine the direction of wave processes, alongshore and sediment flows. Thus, this factor contributes to the formation of the "winged foreland" coastal system type.

According to morphological characteristics, the Sambian Peninsula coastal system is a typical example of a "winged foreland". In evolutionary terms, this coastal system does not fit into the concept of an aligning bay coast.

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CONCLUSIONS

We came to the conclusion that the most typical natural formations belonging to the "winged foreland" are not characterized by full compliance with all the genetic features of these coastal systems.

Lithodynamic sign. Analysis of coastal systems data from the perspective of lithodynamics allowed us to determine that within the majority of "winged foreland" there is no dominant nutrition due to the abrasion section destruction. We find an explanation of this situation in the abrasion protrusions lithological structure:

a) Cheleken, Tendra-Dzharylgach, Burnas-Budak, Dolgaya-Kamyshevatskaya – are composed of clay and loamy rocks;

b) The Sambian Peninsula, the Cape Cod Peninsula – are represented by moraine deposits, composed of more than a third of the rocks, which produce sediments of a non-wave field upon destruction.

The analysis allowed us also come to the conclusion that the divergence zone is not always located in front of the surface area abrasion, in most cases it is somewhat biased towards one of the accumulative forms.

It should be also noted that there are "winged foreland" where the lithodynamic situation significantly differs the generally accepted one. So, for example, in the area of the flanking bars of the Ebro River single-armed delta the divergence zone is connected with the river branch and not with the root section of the coast. Within the Burnas-Budak coastal system, the divergence zone, at the moment, does not appear at all, although it was described in earlier sources.

Thus, the most important lithodynamic feature of the "winged foreland" coastal system is the divergence zone of alongshore sediment flows. This zone can be confined to the coast abrasion section or underwater slope, and in some cases, even to the river branch. The absence of a divergent zone within these formations may be due to the modern coastal evolution peculiarity. However, it must necessarily appear at earlier stages of the system development, when its morphological appearance was formed.

Morphological sign. The analysis allows to think about a significant variety of accumulative forms that make up the "winged foreland" coastal system. So, within the formations there can be both free, adjoining and closing accumulative forms.

Accordingly, the formation of these coastal relief forms may be due to the action of both transverse and alongshore sediment flows. However, in most cases, these processes occur simultaneously or alternately. It is the morphological accumulative forms diversity that make up the formation of the "winged foreland" that makes us think that their appearance is not a determining system genetic feature. The most important is the presence of two accumulative forms located symmetrically relative to the extended stretch of the shore as a rule.

Hydrodynamic sign. Analysis of the wind-wave regime of "winged foreland" coastal systems areas spread allows us to say that modern conditions do not always contribute to these coastal systems formation. Therefore, for the occurrence of symmetrical to the abrasion protrusion accumulative forms, the requied conditions for hydrodynamic blocking at the initial stage of system formation must necessarily appear.

Evolutionary sign. An analysis of the most typical of the "winged foreland" coastal systems from the position of their place in the general evolution of the bay coast tells us that the occurrence of these systems is naturally associated with the coast alignment. However, it has not sense to talk about the belonging of this system to any development particular stage.

SUMMARY

The article presents the results of literary and geomorphological analyzes of a specific coastal abrasion-accumulative systems variety It is known as the "winged foreland". The features of their geographical spread, general and specific characteristics are described. Based on the results of the analysis, the main genetic features of this coastal systems type are identified. It must be very important for the identification, understanding the evolutionary orientation and determining the most rational way of their use.

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