

**ROUTES BETWEEN THE SEAS:  
BALTIC-BUG-BOH-PONT  
FROM THE 3RD TO THE MIDDLE  
OF THE 1ST MILLENNIUM BC**

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**BALTIC-PONTIC STUDIES**

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**V O L U M E 14 • 2009**

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Cover Design: Eugeniusz Skorwider

Linguistic consultation: Ryszard J. Reisner, Piotr T. Żebrowski

Printed in Poland

Computer typeset by PSO Sp. z o.o. w Poznaniu

Druk i oprawa: Zakłady Poligraficzne SERIGRAF w Suchym Lesie

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## Editor's Foreword

As regards the identification of the early forms of Europe's long-distance routes, the area lying between the Baltic and Black seas can be said to be one of relative neglect. Specifically, little research has been devoted to the development stages of the area's socio-cultural map, i.e. to neighbourly forays, itineraries, routes (of varied continuity, range and transport technique), stable segments of roads leading to water crossings, networks of fords and the communication channels running along watersheds. The foremost issue, at present one of great difficulty with respect to a study embracing the whole region in question, is the cultural context of these innovations and the related mechanisms that saw their creation in regard to the socio-economic basis and ritual-epistemological nature of ancient peoples in these regions.

The study by Marija Gimbutas [Gimbutas 1965] of 'amber routes', joining the west and east of Europe, may be considered the first attempt to tackle the issue of the region's early communication channels and was accordingly referred to in the analyses of the distribution of stone 'fluted maces', regarded as hypothetical markers of Baltic-Pontic routes [Koško 2001; 2002]. Generally, this conceptual leaven can be said to have provided broader intellectual stimuli for the international academic community of 'Archaeology Bimaris'. The turning point in the nascent study of ancient routes has been thus given a clear framework: an inter-university and interdisciplinary discussion (see the Poznań-Obrzycko symposium *Routes Between the Seas: Baltic-Bug-Boh (Southern Bug)-Pont* held in October 2008).

The papers included in this volume are a partial record of the discussion. The intentional selectiveness here is seen therefore in the conscious limitation of the scope of papers ('piecemeal' treatment of linguistic or ethnological and anthropological analyses). Moreover, there is a special focus on one of the inter-regional routes, namely the Baltic-Bug-Boh (Southern Bug)-Pont, or more specifically, its early evidence (generally speaking, prior to – widely known to the academia – its use in the times of Goth migrations).

## Editorial comment

1. All dates in the B-PS are calibrated [BC; see: Radiocarbon vol. 28, 1986, and the next volumes]. Deviations from this rule will be point out in notes [bc].
2. The names of the archaeological cultures and sites are standarized to the English literature on the subject (e.g. M. Gimbutas, J. P. Mallory). In the case of a new term, the author's original name has been retained.
3. The spelling of names of localities having the rank of administrative centres follows official, state, English language cartographic publications (e.g. *Ukraine, scale 1 : 2 000 000*, Kiev: Mapa LTD, edition of 1996; *Rèspublika BELARUS', REVIEW-TOPOGRAPHIC MAP*, scale 1:1 000 000, Minsk: BYELORUSSIAN CARTOGRAPHIC AN GEODETIC ENTERPISE, edition 1993).
4. As far as names of administrative units in Polish, Ukrainian, Belarusian and English are concerned, a convention has been adopted that województwo = oblast = region and powiat = raion = district.

**Miroslaw Makohonienko**

## NATURAL ASPECTS OF PREHISTORIC AND EARLY HISTORIC TRANSIT ROUTES IN THE BALTIC-PONTIC CULTURAL AREA

### 1. INTRODUCTION

The present paper has been inspired by the discussion of the rise of European transit routes in the cultural borderland between the East and West of Europe in the Early Bronze Age. The discussion was started by the study of stone fluted maces [Koško 1991a, 2001, 2002]. The distribution of this specific category of material goods in the diversified cultural environment of the area stretching between the Baltic and Black seas [see also Klochko 2002] between the 3rd and 1st millennia BC drew the attention of scholars to the potential role of the maces in the tracing of interregional routes, going beyond the limits of cultural units. Occurring in the Baltic-Pontic Area, stone fluted maces are linked, it is believed, to Mesopotamian sceptres and are interpreted as the symbols of social status of the ruling strata of warrior groups [Koško 2002].

Undertaken in reliance on the dispersion of maces, the reconstruction of inter-regional contact routes draws on the studies of M. Gimbutas [Gimbutas 1965]. She relied on the distribution of amber from the deposits on the southern shores of the Baltic and western Jutland to draw a network of hypothetical routes, covering the area between the Elbe River and the Urals. The routes traced by M. Gimbutas and the dispersion of fluted maces plotted by A. Koško coincide to a significant degree (Fig. 1). A spatial analysis of the two categories of archaeological sources made

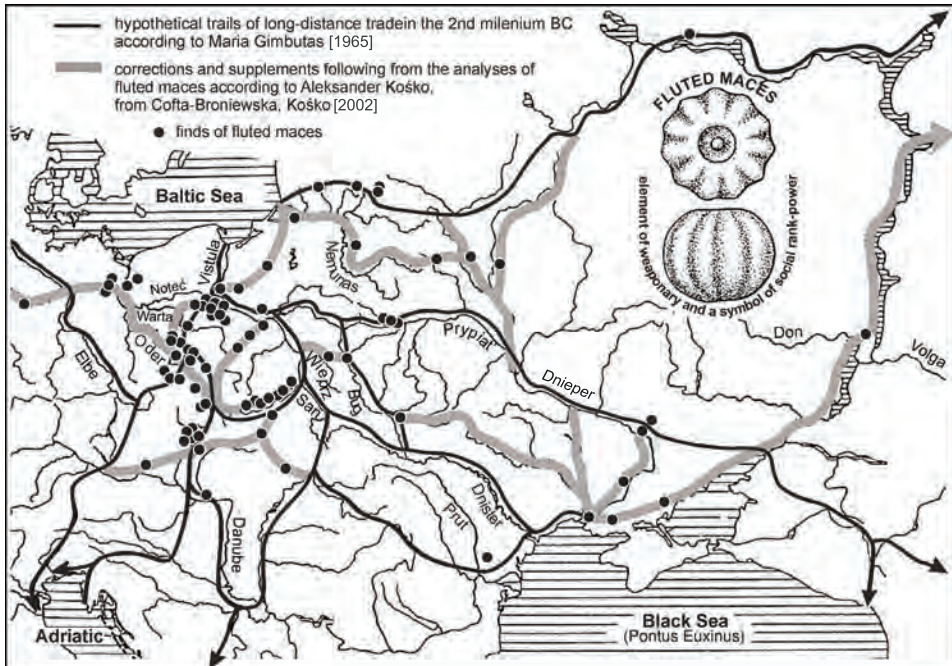


Fig. 1. Hypothetical routes of Early Bronze Age long-distance exchange reconstructed by M. Gimbutas and made more particular by A. Koško relying on the distribution of fluted maces among intercultural societies of the bordeland between Europe's east and west [foll. Koško 2002, see also Cofta-Broniewska, Koško 2002], adopted as a point of departure for the analysis of Bronze Age routes in the Baltic-Pontic Area

scholars search for other route indicators among material culture products and extra-archaeological sources, including natural ones [see Koško. . ., in this volume].

With respect to natural sources, it is suggested that their study cover two areas. First, the search for plant and animal indicators of prehistoric routes should focus on the chorology of species related to the economic activities of humans, their migrations or trade. The species should include those related to intentional activities of humans and others accompanying man only by chance. The study may rely on both fossils and the present-day chorology of species. Second, the analysis of the environmental context should aim at determining the spatial differentiation of features and identifying these elements that may have been conducive to the spontaneous or conscious choice of migration routes between the Baltic and Black Sea (*Pontus Euxinus*) by given user groups. Following A. Koško's suggestion, such geographic features conducive to migration have been called potential natural routes. In this context, as major environmental factors were recognized the following: (1) a river network taken to mean waterways or related land passages following river valleys

or lake chains, (2) land relief, (3) soil types and related (4) vegetation cover. In this paper, the ecology of landscape has been recognized, next to cultural factors, as a crucial element determining the geography of human migrations, together with goods and ideas, taking the form of penetration, migration, conquest or lasting trade ties. When tracing routes, it has been accepted as a possibility that specific human groups chose and consciously used communication courses making up a kind of 'ecological corridors'. For given users, these would be areas of uniform or similar ecological features formed naturally or secondarily due to anthropogenic changes. Generally speaking, these could be river valleys, mountain ranges, woodlands and open vegetation ecosystems. To identify any relationships between environmental features and human migration preferences some contact routes in the Baltic-Pontic Area have been analyzed, using archaeological evidence and written records. In the present paper, the concept of 'route' is taken to mean a general direction of migrations and contacts, defining a certain migration zone, rather than a communication course – lasting and man-stabilized – blazed in the landscape. A route is assumed in this case to be a zone or belt of migrations.

## 2. THE CRUCIAL FEATURES OF THE NATURAL ENVIRONMENT OF THE BALTIC-PONTIC AREA

As a point of departure for the study of natural routes, the analysis of the environmental context of the Baltic-Pontic Cultural Area has been adopted in the present paper. It makes use chiefly of present-day environment features; however, its author is fully aware that the time range set by the subject matter reaches back to the Neolithic and Bronze Age. The period, spanning about 4,500 years, covers the Late Holocene, which in terms of interglacial succession corresponds to the telocratic stage [see Tobolski 1976]. Generally speaking, the stage is characterized by natural biocoenoses resembling present-day ones. It is planned to carry out a multi-aspect study of environment changes between the Baltic and Black seas in the Late Holocene.

### 2.1. GEOBOTANICAL CONDITIONS

In the Baltic-Pontic biocultural area, two major vegetation zones can be distinguished which reflect climatic and edaphic conditions. They are respectively formed

by separate plant formations or great zonal vegetation units distinguished following the physiognomic criterion, relying on plant life forms [Kornaś, Medwecka-Kornaś 2002]. These are areas (1) dominated by deciduous forests (nemoral zone) and (2) others where steppe vegetation prevails (Fig. 2). The natural range of both plant formations is determined by climate conditions. The lowland and upland areas of western and central Europe, including the drainages of the Oder, Vistula and Pripet rivers, are dominated by deciduous and mixed forests. Of the western portion of the zone, where the impact of the oceanic climate is more strongly felt, beech woods are characteristic. The north-eastern limit of the beech crosses Poland [Boratyńska, Boratyński 1990, Podbielkowski 1991]. Beech woods grow in Pomerania, Warmia, western and central Wielkopolska, on the Łódź Upland as far as the Lublin Upland, throughout the belt of southern Poland's uplands and in the Carpathians [Zajac, Zajac 2001]. Further east, a climax plant community is formed by oak-hornbeam forests [Matuszkiewicz 1991]. The hornbeam limit (a characteristic component of these forests) extends east as far the Pripet and middle Dnieper drainages [Boratyńska 1993].

The zone of deciduous forests tapers off at the southern Urals (Fig. 2). In the south, the occurrence of deciduous species is prevented by low precipitation while in the north by low temperatures. When one moves east, the number of deciduous tree species falls. The species that are found as far as the Russian Plain include European ash (*Fraxinus excelsior*), small-leaved linden (*Tilia cordata*), pedunculate oak (*Quercus robur*), Norway maple (*Acer platanoides*) (see Fig. 3) as well as more common species in the boreal zone such as birch or aspen (*Populus tremula*). Moving north, the share of coniferous forests grows, with dominating species being pine (*Pinus sylvestris*) and spruce (*Picea abies*), to change finally into the zone of Boreal forests known as the taiga.

South-eastern Europe, covering the vast expanses of Ukraine and southern Russia, is dominated by a formation of herbaceous xerophytic plants, known as steppes (Fig. 2). The steppe vegetation of eastern Europe has a zonal pattern. In the north, where steppes meet the forest zone, under wetter conditions, an intermediate form of forest-steppe occurs. Next come relatively wet meadow steppes dominated by perennial broad-leaved (mesomorphic) grasses and herbaceous dicots. Further south, the steppes are covered by feather grasses (so called grass steppes) dominated by narrow-leaved, xeromorphic tuft species. The next belt is made up of a dry wormwood (*Artemisia*) steppe, supporting fewer species and bordering on semideserts in the south. The changes in steppe vegetation are determined by the precipitation gradient and access to water during the vegetation period. The zone of eastern European steppes reaches now with its western arm Poland's south-eastern border and the drainages of the upper Bug and San rivers. The prevailing form here is forest-steppe, covering western Ukraine – parts of Volhynia and Podolia, as well as part of left-bank Ukraine on the Dnieper

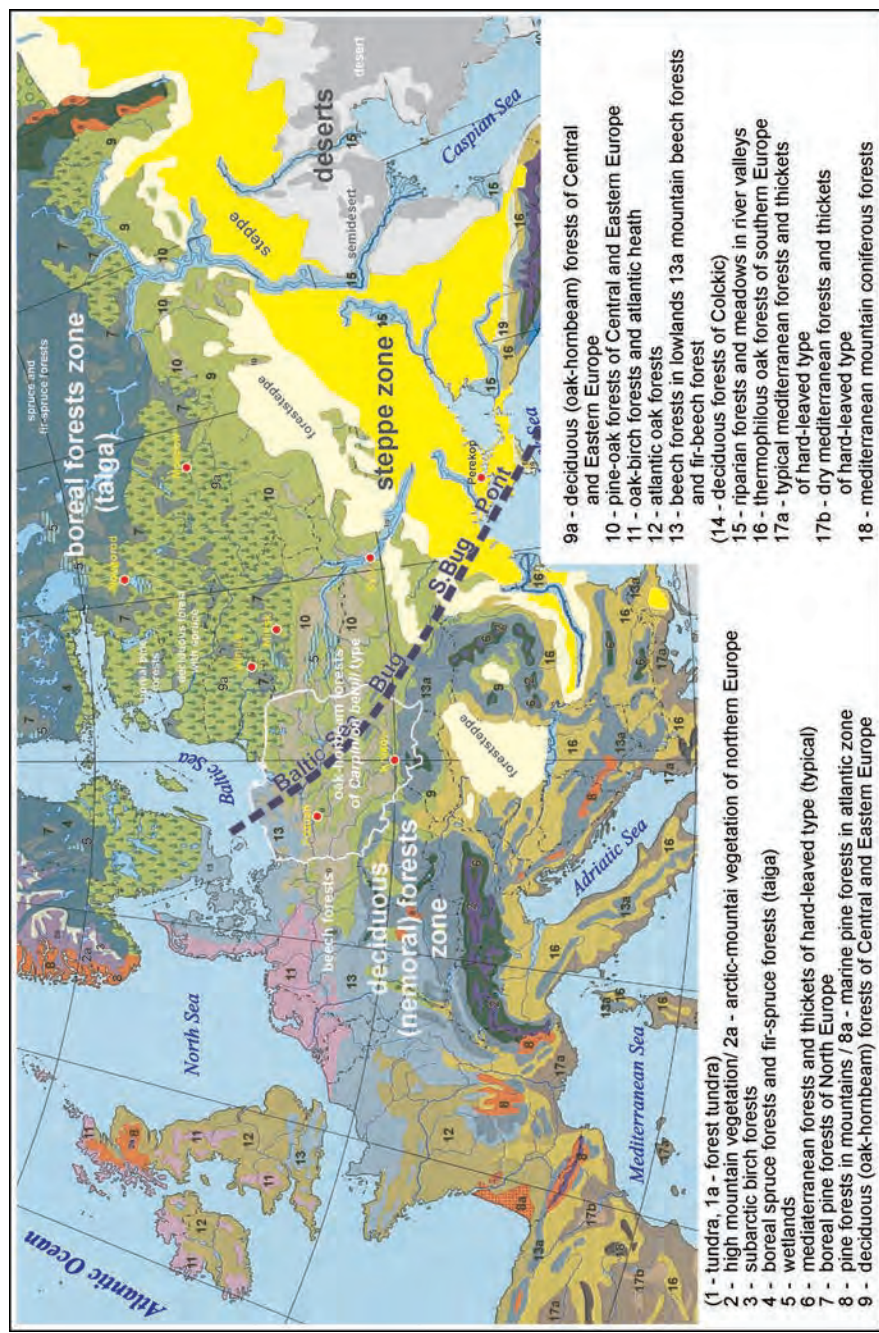


Fig. 2. Europe's natural vegetation between the Baltic and Black seas showing the distribution of steppe environments in eastern and central Europe [after Zemanek 1998, originally developed for *Atlas świata*, PWN 1962, modified]

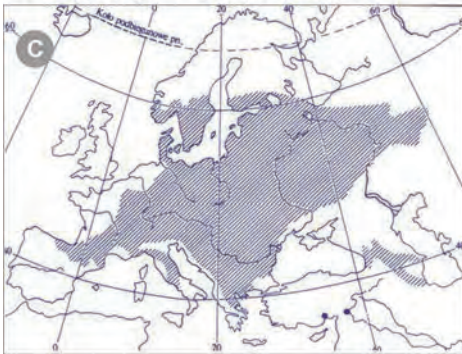
**European beech - *Fagus sylvatica***



**European hornbeam - *Carpinus betulus***



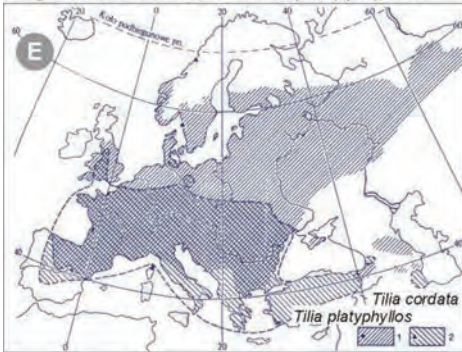
**Norway maple - *Acer platanoides***



**European ash - *Fraxinus excelsior***



**small-leaved linden - *Tilia cordata*  
large-leaved linden - *Tilia platyphyllos***



**pendunculate oak - *Quercus robur*  
sessile oak - *Quercus petraea***

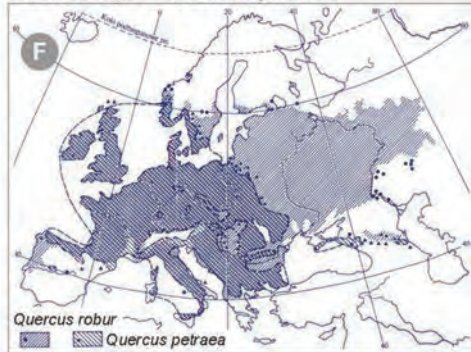


Fig. 3. Geographic limits of deciduous tree species in eastern Europe distributed in the form of a belt tapering off at the southern Urals and wedged between the boreal and steppe zones [after Podbielkowski 1991, limit of beech after Boratyńska, Boratyński 1990, limit of hornbeam after Boratyńska 1993, modified]

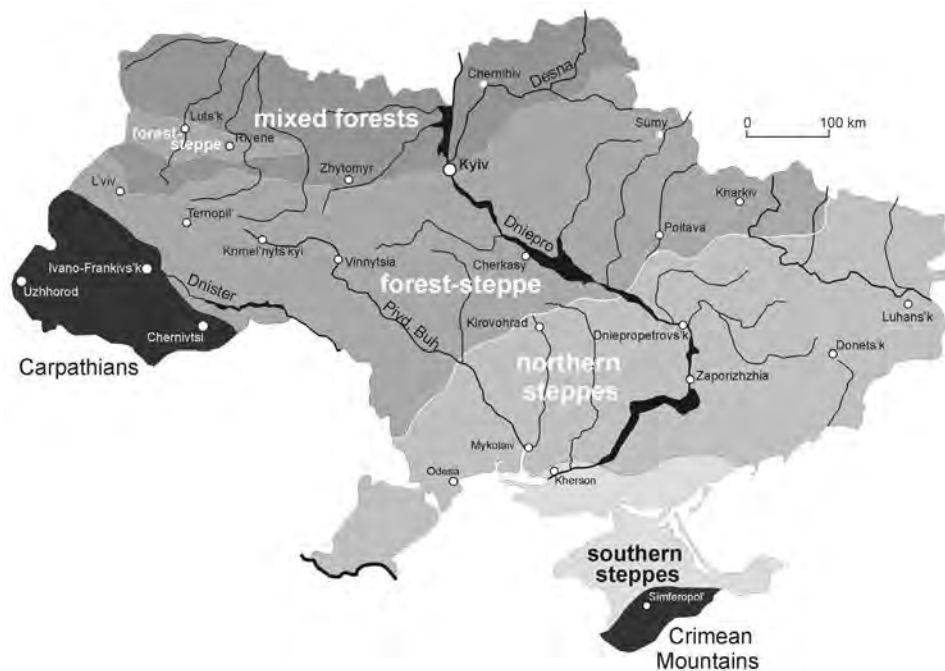


Fig. 4. Ecoregions of Ukraine showing the range of steppes (including forest-steppes) and borders with the zone of mixed forests in Polissya and mountain forests in the Carpathians [after Zastawnyj, Kusiński 2003, modified]. In the picture stand out two forest-steppe fragments reaching the current Polish eastern border (in western Volhynia and Przemyśl Gate), separated by a narrow strip of forest penetrating the Polish region of Rostocze

Lowland (Fig. 4). A stretch of European steppes extends along the lower and middle Danube to reach the Hungarian Plain, where steppe areas are called the *Puszta*.

The European steppes form only a fragment of the Eurasian Great Steppe. Its broad belt extends east as far as the Dzungarian Basin where through narrow passes it joins the eastern Asian steppe area in Mongolia, northern China and Manchuria (Fig. 5). In the western portion of the Eurasian steppe, precipitation is higher and the vegetation season is longer (approx. 190 days, and about 160-175 days in the eastern portion) [after Pobiolkowski 1991]. In the European part, natural steppe vegetation has been subjected to a very strong anthropopressure, following from intensive agricultural use. Almost all the European steppe area has been either brought under cultivation or extensively transformed due to animal grazing [Wtorow, Drozdow 1988; Zastawnyj, Kusiński, 2003]. Natural forms have survived only on small stretches of land protected as nature reserves.

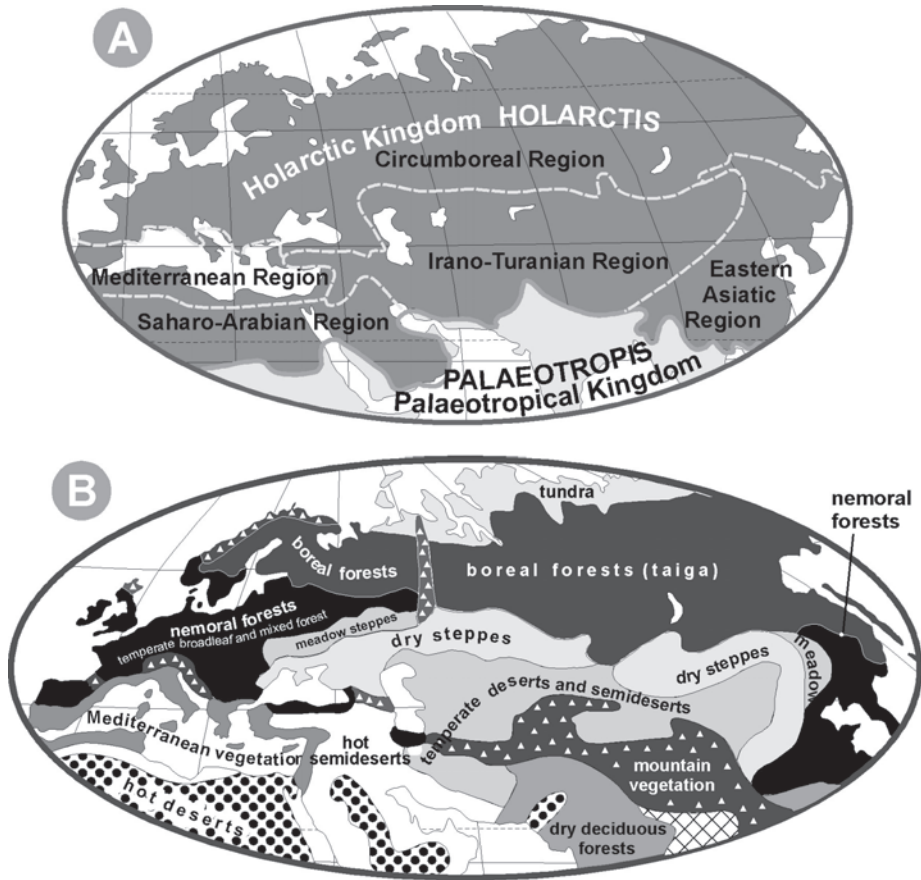


Fig. 5. Main floral and vegetation divisions in northern Eurasia: (a) floral regions [after Takhtajan 1986] and (b) vegetation formations [from Kornaś, Medwecka-Kornaś 2002]

In Europe's forest zone, human activity taking the form of forest clearing, field cultivation and animal grazing has resulted in the growth of vegetation resembling that of the steppes, which is sometimes referred to as cultural steppe. It is believed that human activity has moved the zone of Russian steppes about 200-300 km deep into the forest zone [Alechin 1951, quoted in Kostrowicki 1999]. In this way, human activity may expand the range of formations resembling steppes. The origins of the process reach back to early crop cultivation and animal breeding, i.e. the Neolithic.

In the phytogeographic division, hierarchically distinguishing territorial units using the criterion of floral affinity, almost all northern Eurasia, together with the steppe belt, belongs to the so called Circumboreal (Eurosiberian) Area, subsumed

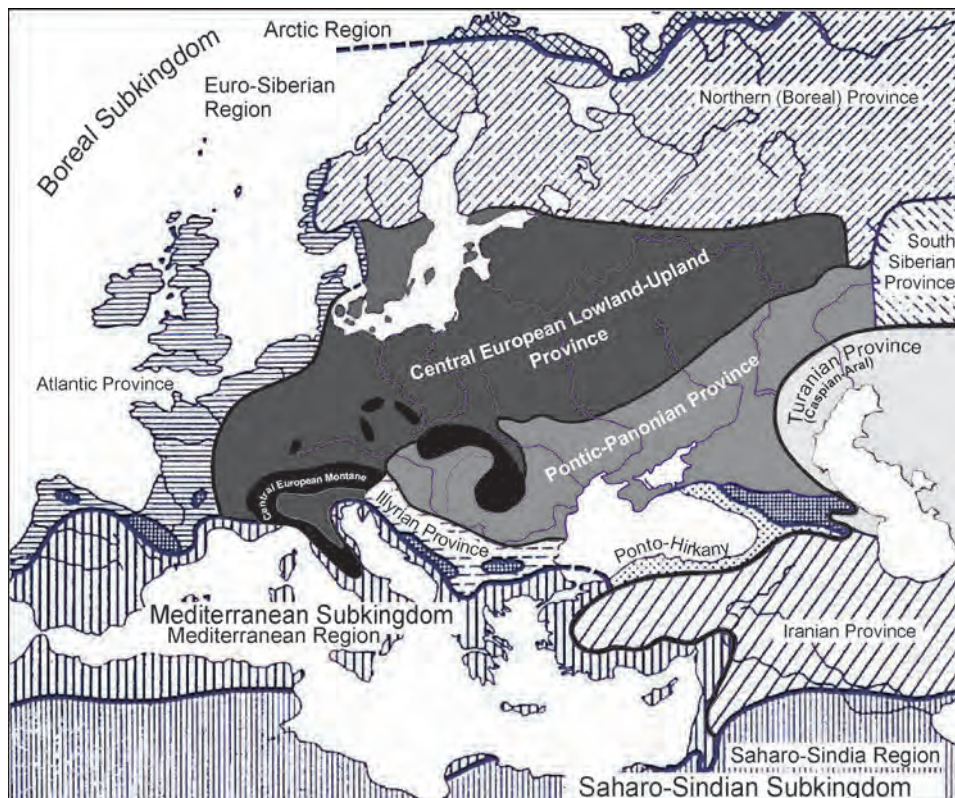


Fig. 6. Geobotanical division of Europe reflecting the affinity (similarity) of florae and giving special prominence to two plant provinces (Lowland-Upland Central European and Pontic-Pannonian) characterizing the Baltic-Pontic Area [from Medwecka-Kornaś 1972, see also Kornaś, Medwecka-Kornaś 2002]

under the higher rank category of Holarctic Domain (*Holarctis*) (Fig. 5). This means that the florae of this vast area show close affinity with one another. In the region of Europe of interest to us here, between the Baltic and Black seas, two lower rank phytogeographic units have been distinguished, namely, Lowland-Upland Central European Province and Pontic-Pannonian Province [Medwecka-Kornaś 1977; Kornaś, Medwecka-Kornaś 2002; Matuszkiewicz 1991] (Fig. 6). The Pontic-Pannonian Province, also known as the ‘Sarmatian Domain’, encompasses lands surrounding the Black Sea from the north and west, including Podolia and part of Volhynia, as well as lands lying on the Danube as far as the Hungarian Plain, southern Moravia and eastern Lower Austria.

The Pontic-Pannonian Province approaches south-eastern Poland in the area of the upper Bug and San rivers. In the geobotanical division of the country developed

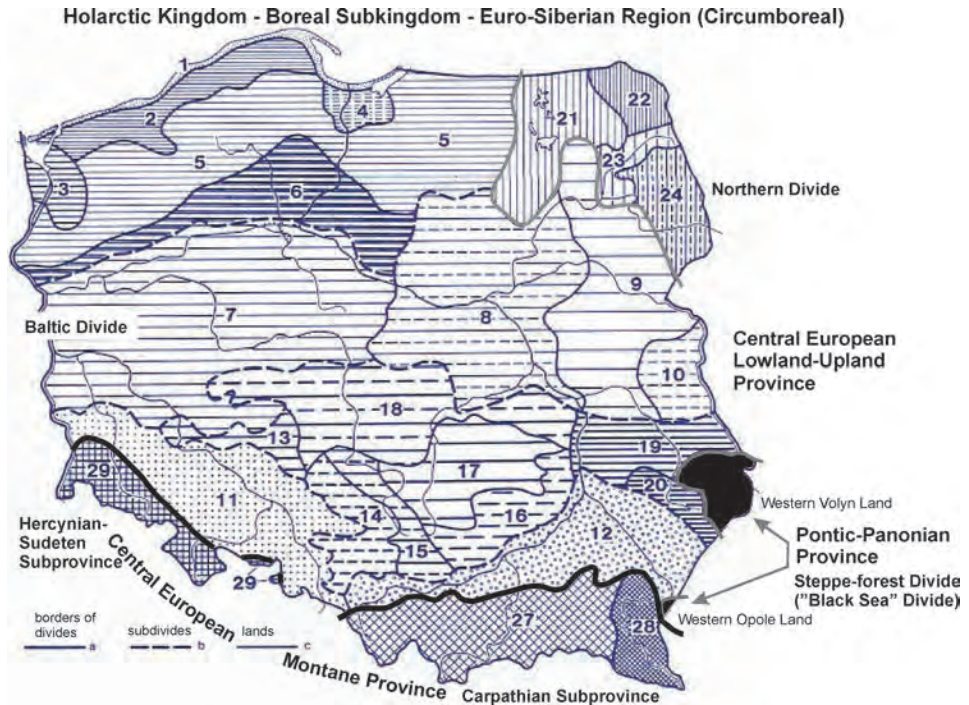


Fig. 7. Geobotanical division of Poland [after Szafer, Pawłowski 1977] giving special prominence to areas genetically related to the environment of eastern Europe and distinguished as Western Opole Region and Western Volhynia Region, belonging to the Steppe-Forest Division ('Black Sea') of the Pontic-Pannonian Province

by W. Szafer and B. Pawłowski [Szafer, Pawłowski 1977], the area was divided, respectively, into the Western Volhynia Region and Western Opole Region, subsumed under the Steppe-Forest Division ('Black Sea') of the Pontic-Pannonian Province (Fig. 7). The distinguished units suggest close floral affinity between western Volhynia and western Opole, on the one part, and the Black Sea Area, on the other part.

The distinctive geobotanical character of Western Volhynia, setting it apart from the other Polish lands, is seen in the nature of oak-hornbeam forests growing there. The forests are marked by the highest continentality index of all the forests of this type in Poland. The index was calculated using the A. Ewert method [Ewert 1972] [see Matuszkiewicz 1991, from Matuszkiewicz, Matuszkiewicz 1985] (Fig. 8A). Important indications of the changes in the degree of continentality of the Polish lands, as reflected in the floral picture, were obtained by analyzing ecological indicator numbers of plants calculated by Ellenberg. The indicators of continentality,

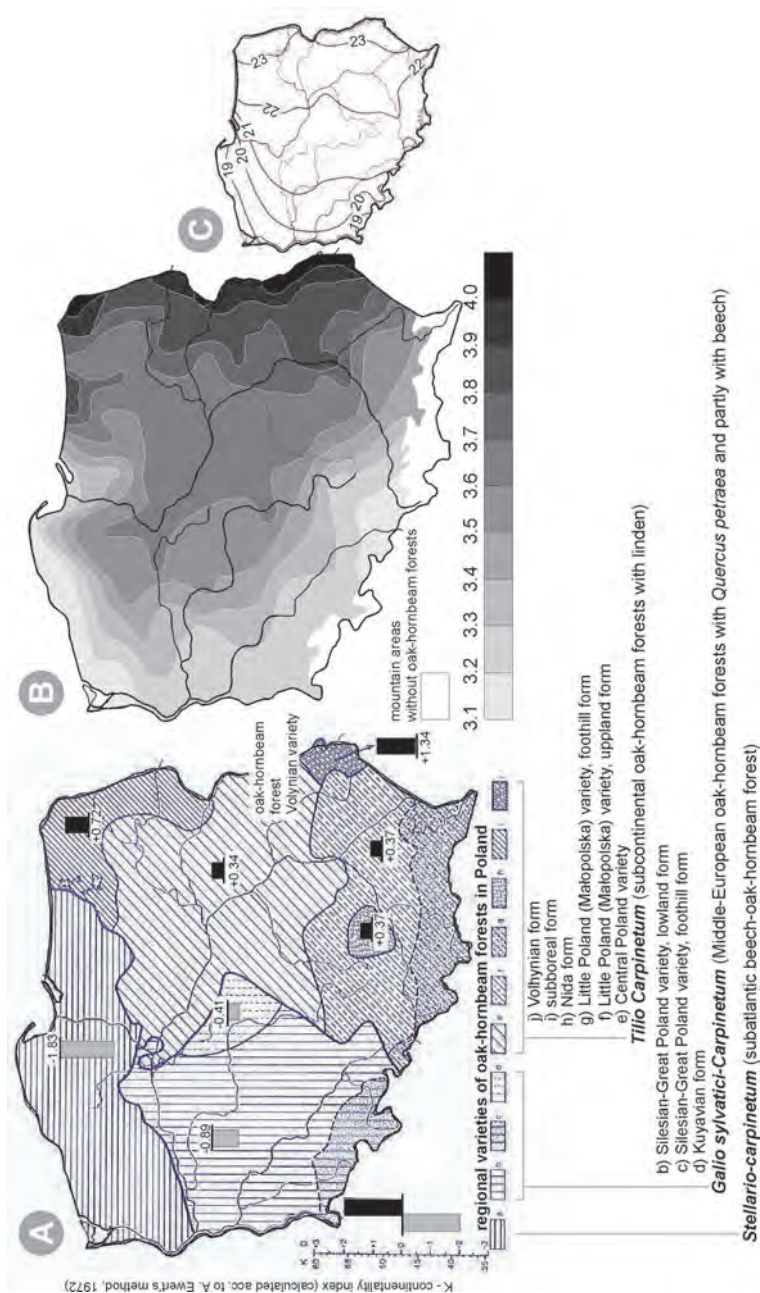


Fig. 8. (A) Types of oak-hornbeam forests in Poland [Matuszkiewicz 1991], (B) changes in the degree of continentality in Poland as seen in the floral composition of oak-hornbeam phytocoenoses traced by calculating the ecological continentality index (Ellenberg's method) [foll. Degórski 1984] and (C) mean annual amplitudes of air temperatures in 1931-1960 [Wiszniewski, Chelchowski 1975]

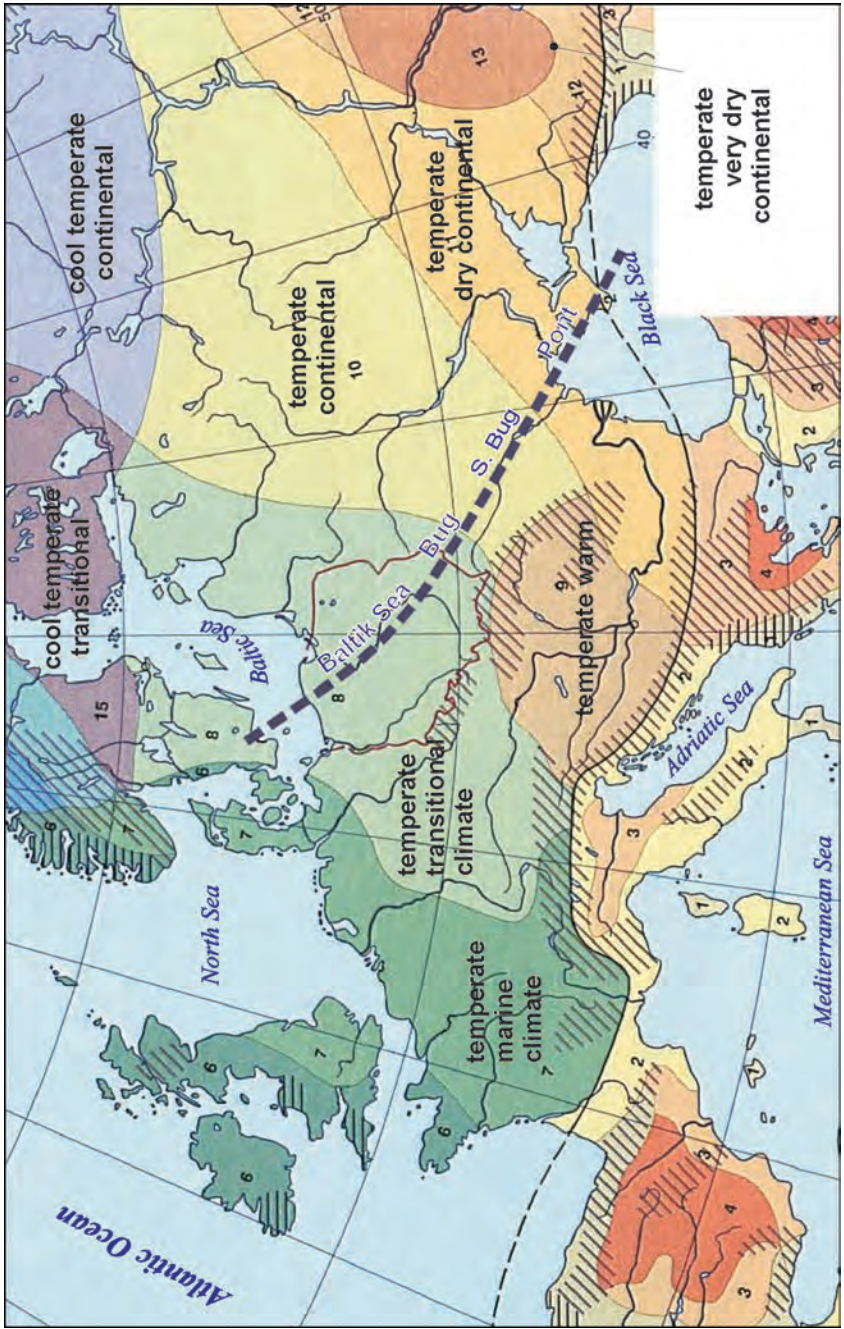


Fig. 9. Climatic zones of Europe showing the transition from a moderately warm and relatively humid climate on the Baltic to a moderately warm and dry continental climate in the Pontic Area [from Lewik 1998, modified]

designated as 'K', calculated for the floral composition of oak-hornbeam forests [Degórski 1984] are the highest in eastern Poland, especially in the south-east, in Volhynia and on the Lublin Upland (Fig. 8B). The areas where the continentality index is high stretch the furthest west in Kujawy, the Chełmno Land and adjacent Pomerania while in Lower Silesia the index drops. The geographic changeability of ecological continentality indices correlates roughly with the distribution of annual amplitudes of mean air temperatures (Fig. 8C).

## 2.2. CLIMATIC CONDITIONS

The distribution of south-eastern Europe's steppes is related to the moderately warm and dry continental climate which is characterized by high seasonal thermal contrasts and low annual precipitation totals (Fig. 9). Summers on the steppes are hot and relatively dry, while winters are frosty. The annual precipitation totals are between 300 and 500 mm. Low precipitation is the major limiting factor to the development of forest communities. Higher precipitation, between 500 and 700 mm, is witnessed in the forest-steppe zone. A distinctive characteristic of the steppe climate is the deficit of moisture in summer. Dry periods are characterized by Gaussen-Walter pluviothermic diagrams (Fig. 10A). Owing to seasonal temperature and precipitation variations, steppe vegetation follows a clear seasonal rhythm as well. It grows most profusely in spring and early summer. In high summer, when water is scarce, steppe vegetation dries up only to revive somewhat again in autumn. Winter is the period of complete vegetative rest. The regular rhythm of weather and vegetation changes influences the economic activity of steppe peoples, including migrations in search for pastures. The critical factors for the herding economy on steppes include, on the one hand, overly dry summers and overly severe winters on the other.

Snowfall on steppes is low; snow cover is not thick but it supplies a substantial amount of moisture during spring thaws. A characteristic weather phenomenon is relatively strong winds that contribute to the drying of the soil in summer and aggravate eolian erosion [Podbielkowski 1991].

Unlike steppes, deciduous forest areas enjoy moderately humid conditions throughout the year with a surplus of available moisture over evaporation. Seasonal thermal contrasts between summer and winter are less strongly marked here (for a typical pluviothermal diagram of a nemoral zone see Fig. 10B). In the Baltic-Pontic area a climatic gradient is marked when one moves from the north-west towards the south-east, i.e. from a temperate, relatively humid climate to a continental dry one (Fig. 9).

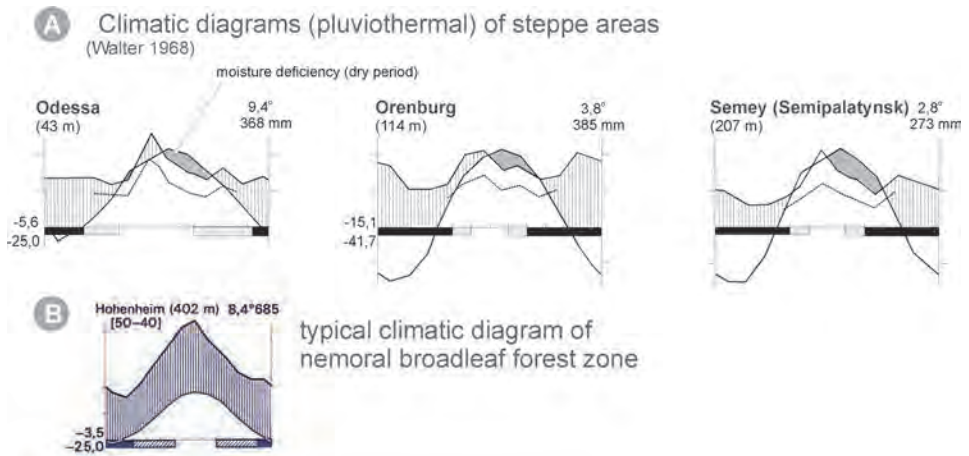


Fig. 10. Pluviothermal (Gausson-Walter) diagrams showing seasonal changes in temperatures and precipitation in (a) the steppe zone of south-eastern Europe (climatological stations at Odessa, Orenburg, Semipalatynsk) and (b) deciduous forests of central Europe (climatological station at Hohenheim) [from Walter 1968]

### 2.3. EDAPHIC ENVIRONMENT

Steppe vegetation reflects a zonal arrangement of soils. In south-eastern Europe, on steppes and forest-steppes, in the continental climate, a dominant type of soil is *chernozems*. They are formed on a loess substratum, loess-like deposits or clays with the participation of herbaceous plants, supplying huge amounts of biomass to the substratum [Bednarek, Prusinkiewicz 1997]. Meadow steppes may primarily produce as much as 15 t/ha of biomass annually, while the same figure for dry steppes is lower and reaches 8-10 t/ha [Wtorow, Drozdow 1988]. The climatic conditions on the steppes are conducive to the accumulation of large amounts of humus. During dry summer and frosty winter periods, the activity of microorganisms is slowed down thus preventing the mineralization of organic remains. This helps humus to accumulate in the upper layers of soil and produce a fertile and thick humus stratum of neutral reaction. In the steppe climate, with small precipitation and strong evaporation, weathering products are much less likely to be leached.

The *chernozems* forming under northern meadow steppes are among the most fertile soils in the world [Wtorow, Drozdow 1988]. The thickness of the humus layer and humus content drop in *chernozem* profiles depending on the amount of available moisture and the prevailing type of vegetation. The highest humus content (10-12%, at times 20%) and the thickest humus layer (100-120 cm) are characteristic

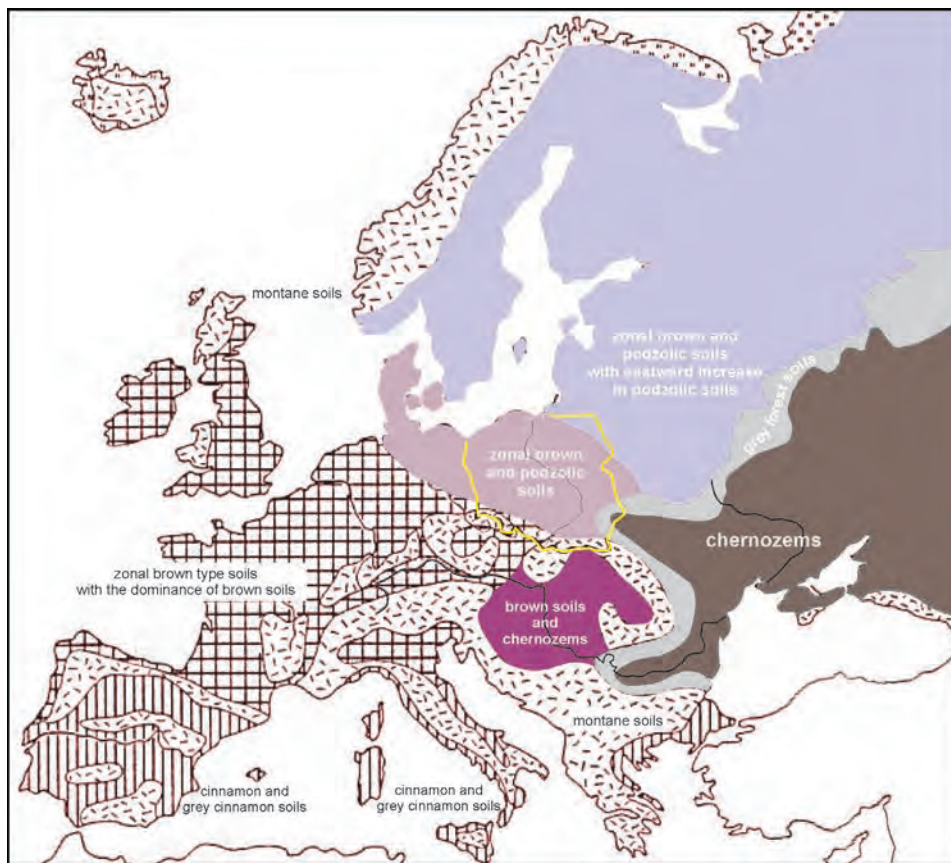


Fig. 11. Bioclimatic and soil zones of Europe with special prominence given to the area between the Baltic and Black seas [Gilewska 1991]

of the *chernozems* proper found in the northern portion of the steppe zone (meadow steppes). Further south, common *chernozems* are found whose humus layer is less thick (65-90 cm) and the humus content is about 6-9 per cent. Southern *chernozems* have the lowest humus content (4-6%) and a relatively thin humus layer (45-65 cm) [Bednarek, Prusinkiewicz 1997]. In the driest steppe areas, as for instance on the Caspian Lowland, chestnut soils (*Kastanozems*) develop.

*Chernozems* are widespread in Ukraine, stretching like a belt as far as the Urals and Central Asia to continue further east to Manchuria. In Europe, apart from the south-east, they occur as islands among other soil types on the Thracian, Wallachian and Hungarian plains. In Poland, they are found on loess deposits on Volhynia, Lublin and Małopolska uplands.

Differences in the substratum are crucial for determining the type of vegetation which grows in the forest-steppe zone. On a fine-grain substratum, precipitation water slowly percolates down through the soil and is completely absorbed by dense root systems of grasses and dicots. Whereas on a coarse-grained substratum, water percolates through the soil much quicker and deeper, where it can be absorbed by tree roots [Podbielkowski 1991]. This relationship between vegetation and a substratum type can be seen in the intermediate zone of forest steppe where on loose coarse-grained soils forest communities are found while on fine-grained soils open steppe vegetation communities grow. The relationship is responsible for the mosaic distribution of vegetation in the intermediate zone between the forest and steppe.

The steppes of eastern Europe are covered with deposits of loess (Fig. 12). The loess substratum is widespread in south-eastern Europe, forming parent rock for *chernozems*. Their formation, however, depends on climate features and prevailing herbaceous plants.

The Central European Plain, the central part of the East European Plain and the northern part of Western Europe, dominated by deciduous and mixed forests, have different soil covers. On the Central European Plain and on lowlands and uplands located further west brown soils (*Cambisols*) and gray soils (*Luvisols*) are dominant. They developed on Quaternary clay, argillaceous or dusty deposits and are among fertile soils highly suitable for farming. In the northern portion of the Central European Plain and in the north-eastern part of the East European Plain, dominant soil types are *Orthic Podzol* and *Leptic Podzol*, which form on sandy deposits grown over by coniferous tree communities.

In the zone of deciduous and mixed forests, islands of *chernozem* occur. In Poland, in the drainages of the Vistula and Oder rivers, chiefly in the upland belt, they occur in five regions, namely on the Volhynia Upland (Hrubieszów *chernozems*) belonging to the steppe Pontic-Pannonian Province, Sandomierz Upland (Sandomierz-Opatów *chernozems*), Proszowice Plateau (Proszowice *chernozems*), Rzeszów Foothills (Rzeszów *chernozems*) and Głubczyce Plateau (Opole *chernozems*). *Chernozems* are considered relict soils in Poland. They formed on loess patches under topographically favourable conditions, under steppe and forest-steppe vegetation [after Wicik 2005]. In Poland, degraded *chernozems* prevail. The humus content in the Polish *chernozems* is on average 2.8 per cent.

#### 2.4. GEOLOGY, LAND RELIEF AND PHYSIOGRAPHIC UNITS

Along the line drawn between the Baltic and Black seas goes one of the most important divisions of the continent of Europe – the physiographic border between

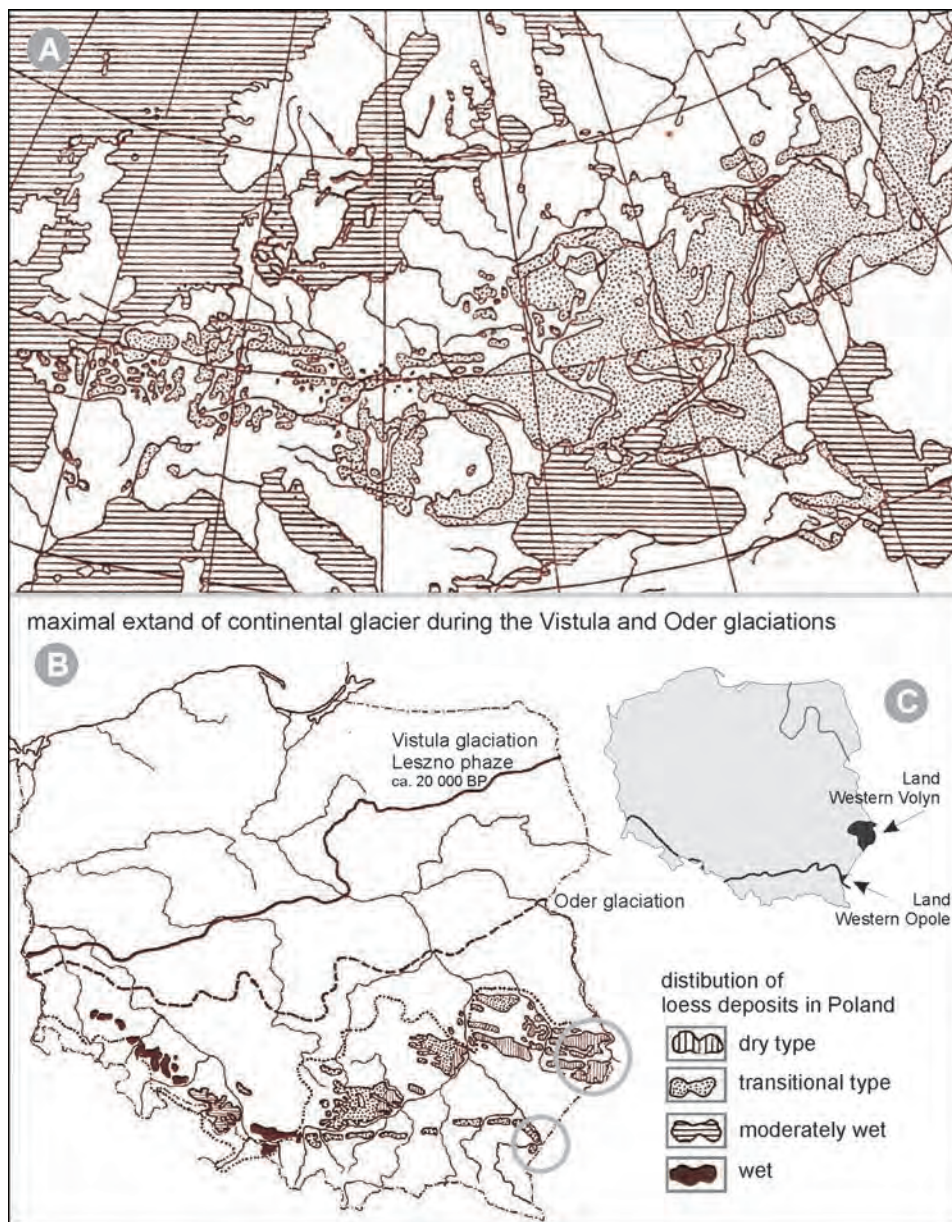


Fig. 12. Distribution of loess covers in (A) Europe [from Jersak *et al.* 1992, originally s.i. Lazukov 1980] and (B) Poland [after Jersak *et al.* 1992] showing (C) areas belonging in terms of geobotany to the Pontic-Pannonian Province (Western Opole Region and Western Volhynia Region) (see Fig. 7)

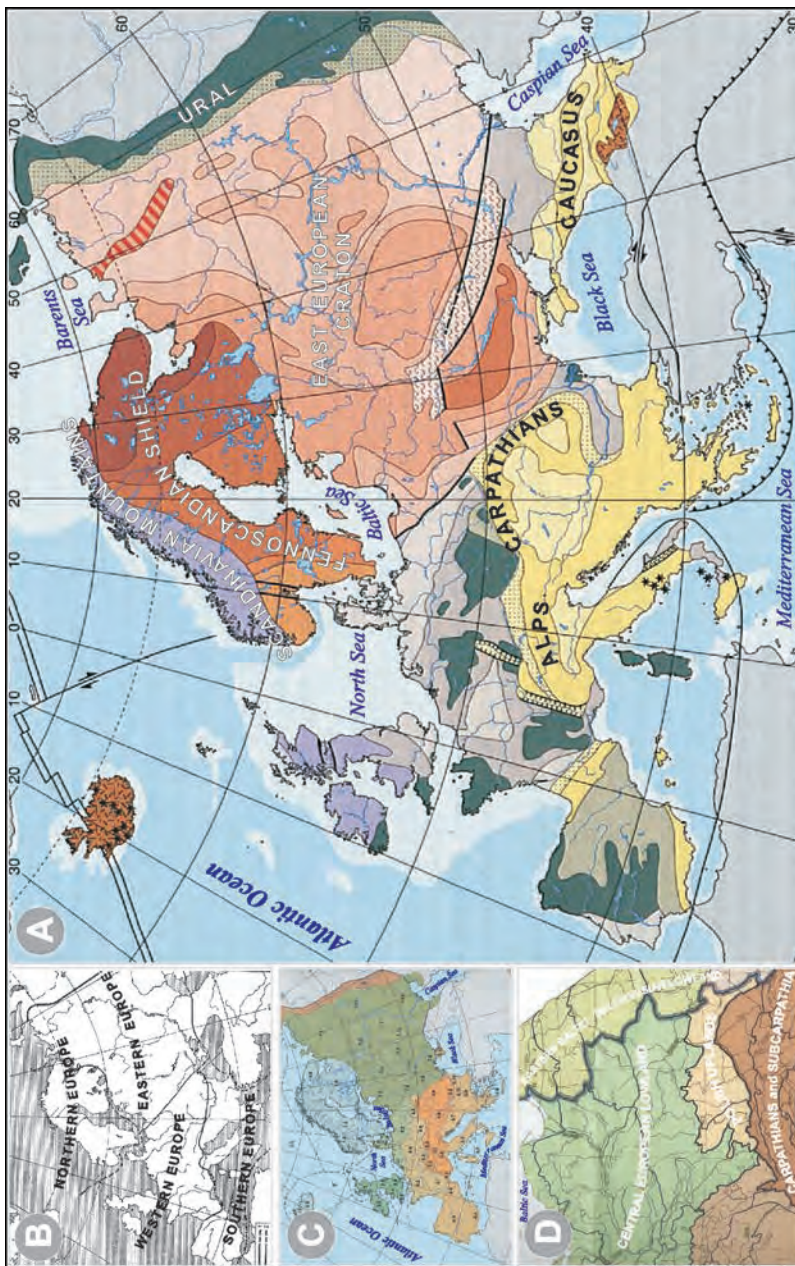


Fig. 13. (A) Tectonics of Europe [from Ramomski 1998] and (B) major regional divisions defining the border between Eastern and Western Europe [foll. Mityk 1986], (C) physiographic division of Europe using the decimal classification adopted by the International Federation for Documentation [from Balon 1998], (D) physiographic division into regions using decimal classification according to J. Kondracki [Kondracki 1998; see also Kondracki, Rychling 1998]

western and eastern Europe. One of the criteria used to draw the dividing line is the geological structure. In this area, Europe's three major tectonic units meet: the Precambrian East Asian Platform, a younger Palaeozoic platform and the area of Alpine folding of southern Europe [Mizerski 2002] (Fig. 13A). The oldest part of the continent, the so called craton formed in the Precambrian period, is made up of the Fennoscandian Shield and Eastern European Platform. It covers the area from the Urals in the east to the Teiseyere-Tornquist dislocation line in the west crossing Poland [Ramomski 1998]. The western younger part of the European continent was formed in the Palaeozoic during the Caledonian and Hercynian foldings. The formations that were uplifted last include the Alps, Carpathians, Crimean Mountains and the Caucasus. They were formed in the late Tertiary, during the Alpine orogeny. The western end of the Eastern European Platform, crossing the central portion of Poland's Baltic coast and continuing south-east, along the outer arch of the Carpathians as far as the Black Sea is deemed the borderline between Western and Eastern Europe (Fig. 13B) [Mityk 1986].

A different approach to the delineation of the border between eastern and western Europe is offered by the physiographic division of Europe following the decimal classification adopted by the International Federation for Documentation (Fig. 13C). The division relies on land contours, geological structures, and Europe's climate and biogeographic differences. Taking into account these factors, J. Kondracki has delineated a border between eastern and western Europe which crosses eastern Poland and runs between two regions of the Central European Plain and Eastern Baltic-Belarusian Plain, i.e. from the Pasłęka River in the north, along a portion of the Pisa and Bug rivers, next between the regions of Polish Uplands and Ukrainian Uplands – along the Wieprz River to reach the Dniester [Kondracki 1998; Kondracki, Rychling 1998] (Fig. 13D).

The land relief between the Baltic and Pontic zones does not create any significant barriers to human migrations, but it is responsible for considerable landscape diversity. In the Baltic zone, glacier accumulation forms prevail (Fig. 14). In the northern portion of the zone, a young glacier landscape, featuring numerous lakes and peat bogs, dominates while in the southern portion, an old glacier landscape, with some loess reliefs, is prevalent. The extent of the landscapes coincides with the limit of the last glaciation. In the Pontic zone, we are faced with plate formations and loess reliefs (see also Fig. 12). In the land relief between the Baltic and Black seas, three separate zones, (1) mountainous, (2) upland and (3) lowland, can be distinguished joined by alluvial plains in the Pripet drainage. Mountain areas and vast swampy lowlands form barriers to travel overland. A convenient land corridor, however, runs along the upland zone, between the Eastern Carpathians and the swampy lowlands in the Pripet drainage.

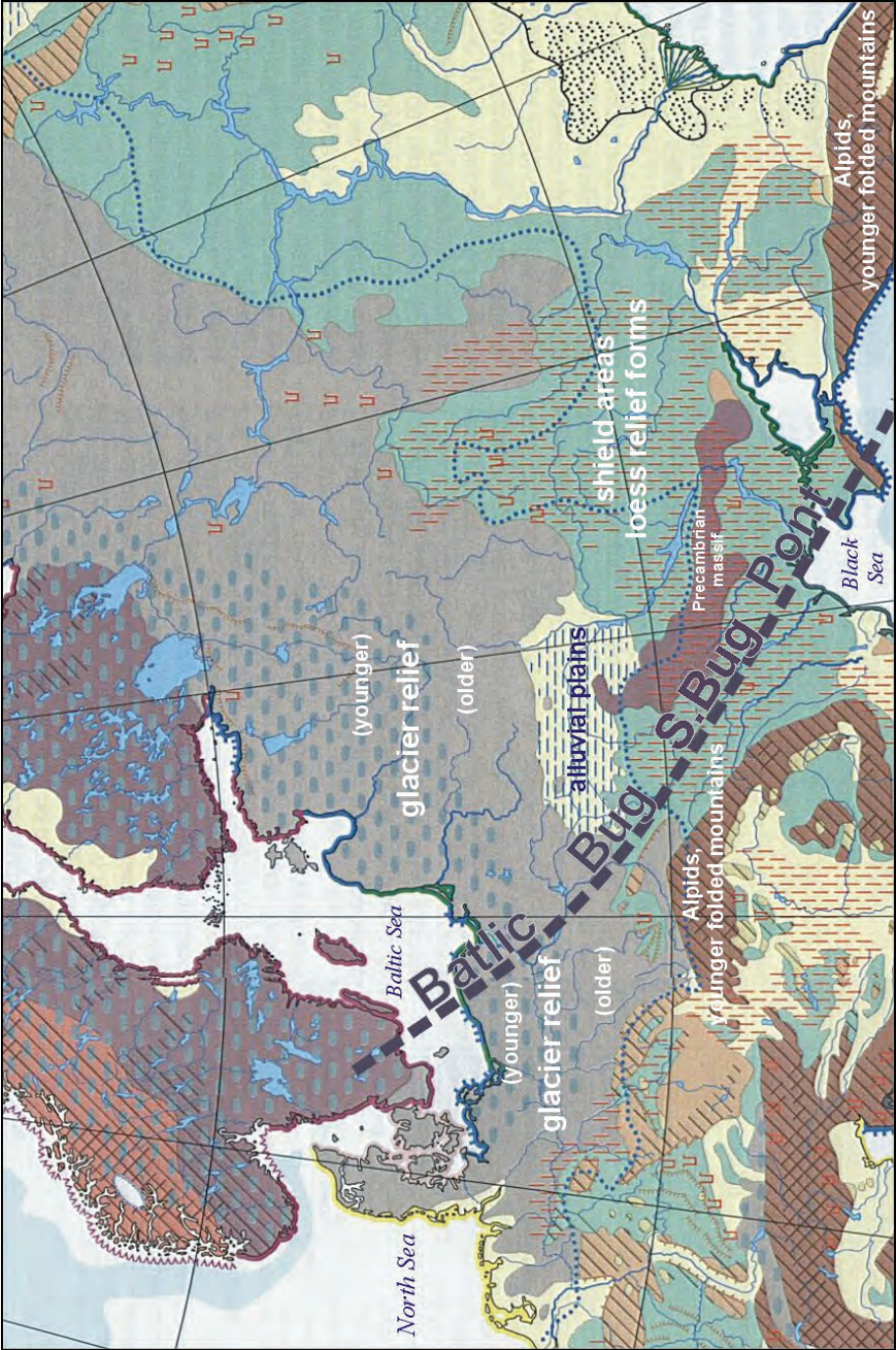


Fig. 14. Relief of Europe between the Baltic and Black seas [from Zięta 1998, modified]

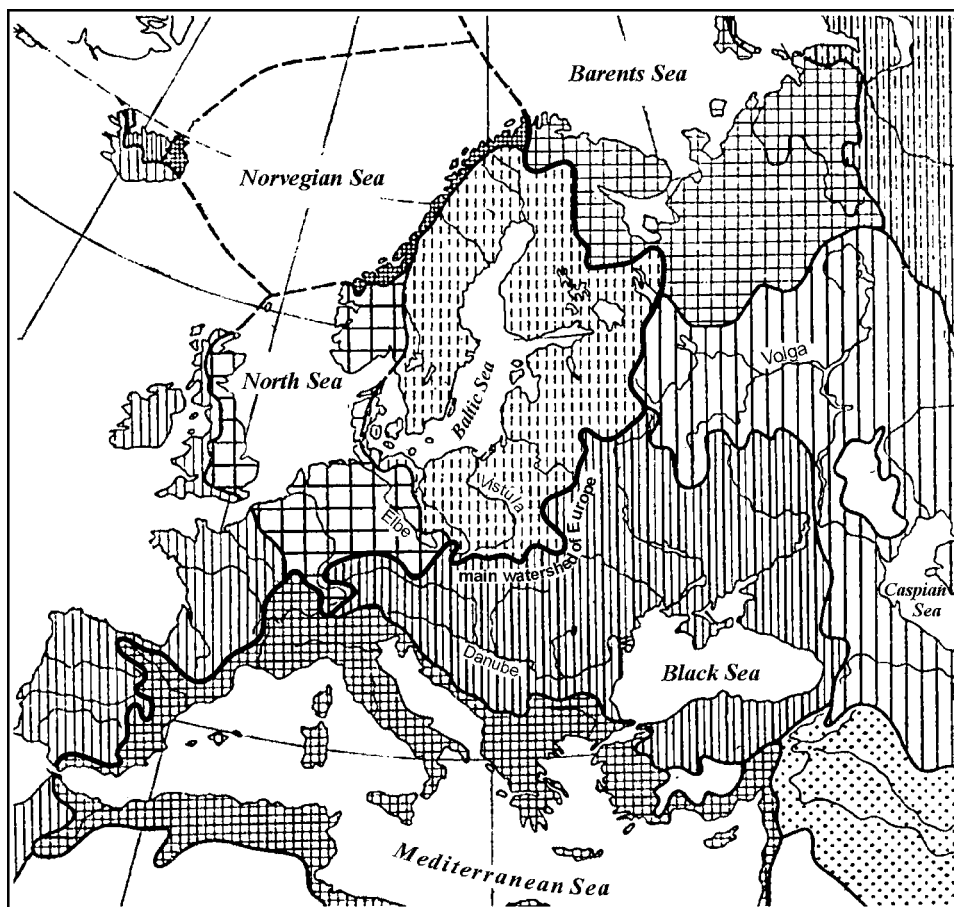


Fig. 15. European watersheds showing the course of the main watershed line separating the Atlantic and Mediterranean catchment areas [from Mityk 1986, modified]

## 2.5. HYDROLOGY

The Baltic-Pontic Area is divided by the main watershed of Europe. The northern areas, covering the drainages of the Oder, Vistula and Neman rivers, all of which empty into the Baltic, belong to the Atlantic catchment area while the southern ones, covering the drainages of the Danube, Dniester and Boh rivers, which empty into the Black Sea, belong to the Mediterranean catchment area (Fig. 15). Europe's main watershed does not run along the highest mountain ridges. By de-

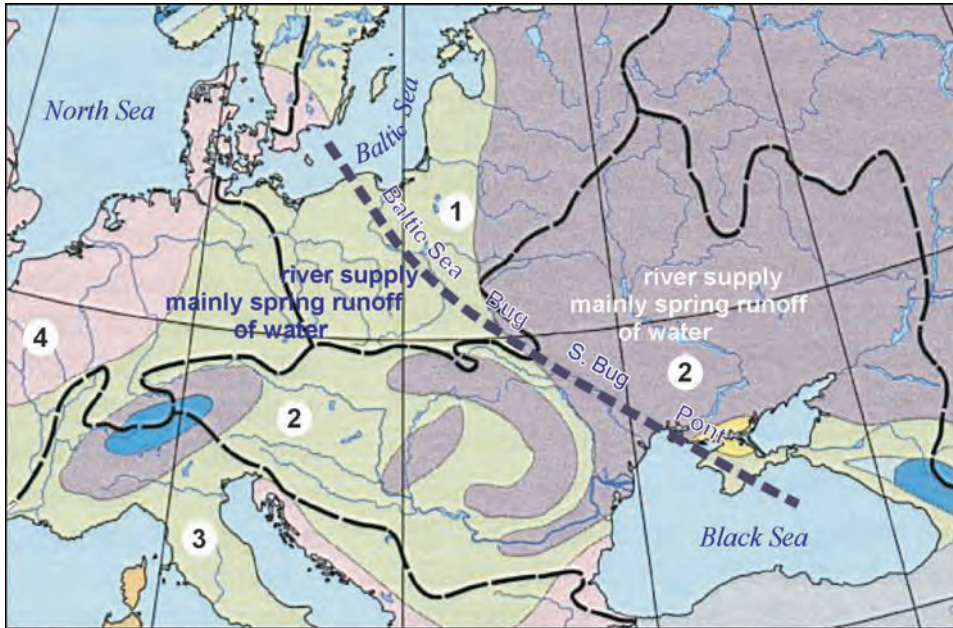


Fig. 16. River supply types in Baltic-Pontic Area against the catchment areas of 1 – Baltic, 2 – Black Sea, 3 – Mediterranean Sea, 4 – North Sea [from Żółkiewski 1998, modified]

scending into uplands and lowlands in many places, it facilitates communication ties [Mityk 1986]. Such convenient routes run north-east of the Carpathian arch where the watershed line descends into the depression of the Przemyśl Gate and moves towards the East European Plain along the edge of Podolia. Here, the watershed runs between the upper San and Bug drainages and the drainages of the Dniester and Pripet rivers. On the Wisznia River (in the village of Rudki), in the depression of the Przemyśl Gate, a bifurcation can be observed whereby some water flows into the San drainage while another part flows into the Dniester drainage [Żółkiewski 1998].

Taking into account land relief and climate characteristics, one can distinguish several types of hydrological regimes in Europe. On the Central European Plain (Elbe, Vistula and Oder rivers), an intermediate type prevails characterized by two maximum floods. In spring, floods due to thaws take place. Second summer floods are caused by rainfall. The lowest water stages occur in autumn. The period when rivers are icebound varies from about 20 days in the west to up to 60 days in the east. The eastern European hydrological regime (Dnieper, Volga, Don) is characterized by high water stages only in spring, with water coming mainly from melting snow (Fig. 16). Floods are caused by snow melt and precipitation. Severe and long winters make the thaws longer and more violent. The lowest water stages occur in summer

and winter. Eastern European rivers freeze for longer periods than those on the Central European Plain: they remain icebound for 100-140 days a year [Żółkiewski 1998]. A long icebound period makes even great rivers passable for about one-third of a year.

### 3. EVIDENCE OF NATURAL ROUTES

The westernmost frontier between the two environment systems of the forest and steppe zones, north of the Carpathians, runs across the drainages of the upper Bug and Dniester rivers, which at the same time form the watershed between the catchment areas of the Baltic and Black seas. Under the phytogeographic division of Europe, as it has been indicated earlier, it is here that the north-westernmost tip of the Pontic-Pannonian Province reaches, being a domain of steppe elements. The Province reaches Poland's territory in the eastern part of the Lublin Upland, which in terms of geobotanic divisions belongs to the Western Volhynia Region, and in the middle San area, in the vicinity of Przemyśl, belonging to the Western Opole Region. These two areas are considered natural migration routes of steppe plants from eastern Europe towards the west [Matuszkiewicz 1991] (Fig. 17).

#### 3.1. MIGRATION DIRECTIONS OF THE GENUS ARTEMISIA AS A STEPPE COMPONENT IN THE LATE GLACIAL AND HOLOCENE

The migration of steppe components in the east-west direction, across western Volhynia is confirmed by palaeobotanical data obtained by the isopollen method for the Late Glacial and Holocene (Fig. 18). A good indicator of these migrations is the genus *Artemisia*, being a natural component of steppe vegetation. In the times of anthropopressure, *Artemisia* is also found in the so called cultural steppe. In the cool periods of the Late Glacial, *Artemisia* was a natural component of the then steppe-tundra, while in warmer periods (in Allerød and in the early Holocene) it would withdraw from the territory of Poland in the south-eastern direction [Makohonienko *et al.* 2004], to areas dominated today by steppe vegetation. The last period when *Artemisia* expanded its range in Poland, with a maximum representation in Volhynia, was the cooler spell of the Younger Dryas. The Holocene climate warming brought about again a drop in the share of *Artemisia* in the area of Poland.

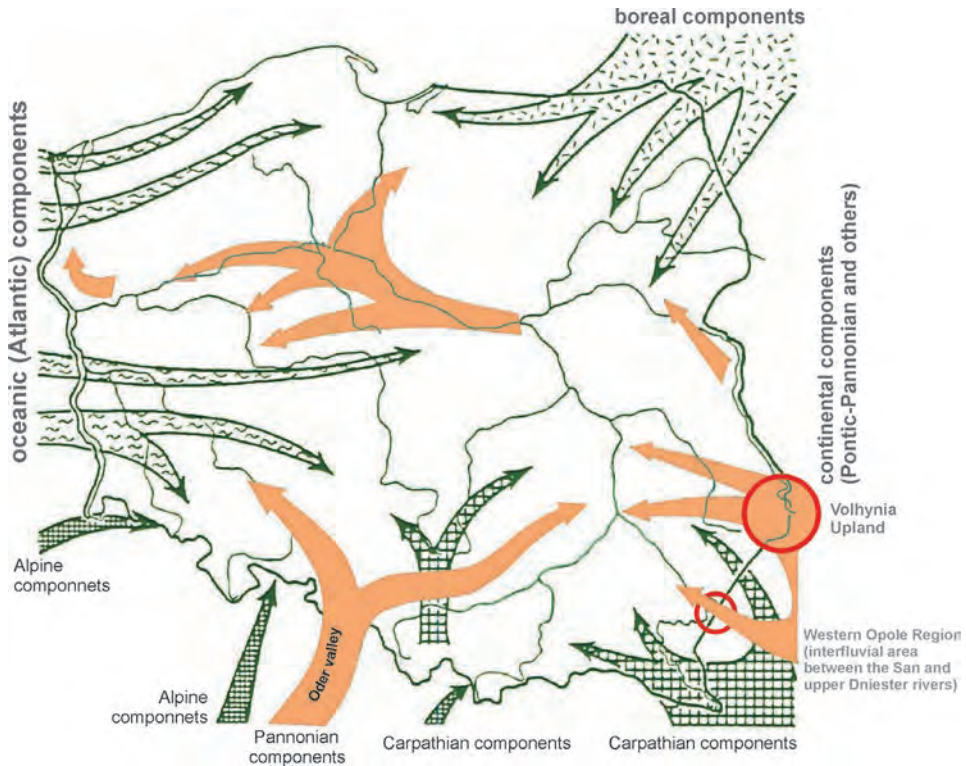


Fig. 17. Migration routes (directions) of geographic elements of Polish flora [Matuszkiewicz 1991]. Pontic-Pannonian elements, originating on the steppes, migrate to the territory of Poland from the East via the Volhynia Upland and the interfluvial area between the San and upper Dniester rivers in the area of the Przemyśl Gate, while from the south, from the Pannonian zone, they move along the Oder valley through the Moravian Gate

However, they maintained a high share only in the south-east, preserving, presumably, their ecological ties with Eastern European steppes. A decline in the share of *Artemisia* can be seen in successive time horizons, set every 500 years, until ca. 7500 BP (dates are given here as radiocarbon uncalibrated dates). In the 7000 BP horizon, a small increase is observed, possibly reflecting the synanthropic spread of *Artemisia*, owing to the activities of the first Neolithic societies north of the Carpathians. A clear change in their geographical distribution is recorded by the 5500 BP horizon, and even more so by the 5000 BP one. The horizons show insular occurrence of a greater share of *Artemisia* presumably related to the development of agriculture in the Middle Neolithic by the populations of the Funnel Beaker and Globular Amphora cultures. In the 4500 BP horizon, a concentration of *Artemisia*

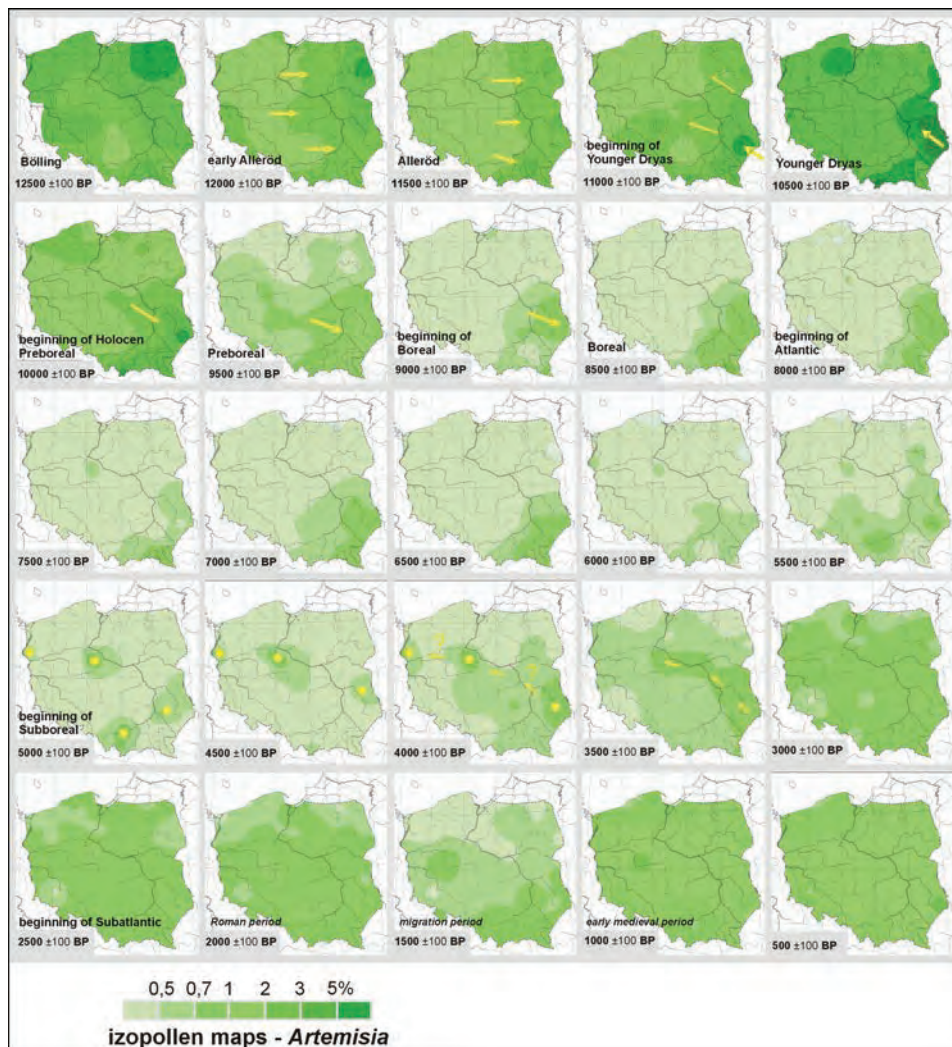


Fig. 18. Changes in the range of *Artemisia* in the Late Glacial and Holocene based on *Late Glacial and Holocene history of vegetation in Poland based on isopollen maps* [Ralska-Jasiewiczowa *et al.* (Eds) 2004, chapter on *Artemisia* – Makohonienko *et al.* 2004]. The isopollen maps of the genus *Artemisia* show the directions of migrations of steppe components and mark the areas where an anthropogenic landscape ('cultural steppe') developed.

in Kujawy clearly stands out, while they are poorly represented in other regions, including southern and south-eastern Poland. High shares of *Artemisia* in Kujawy seem to be visible as early as around 8000 BP, which may indicate a natural procli-

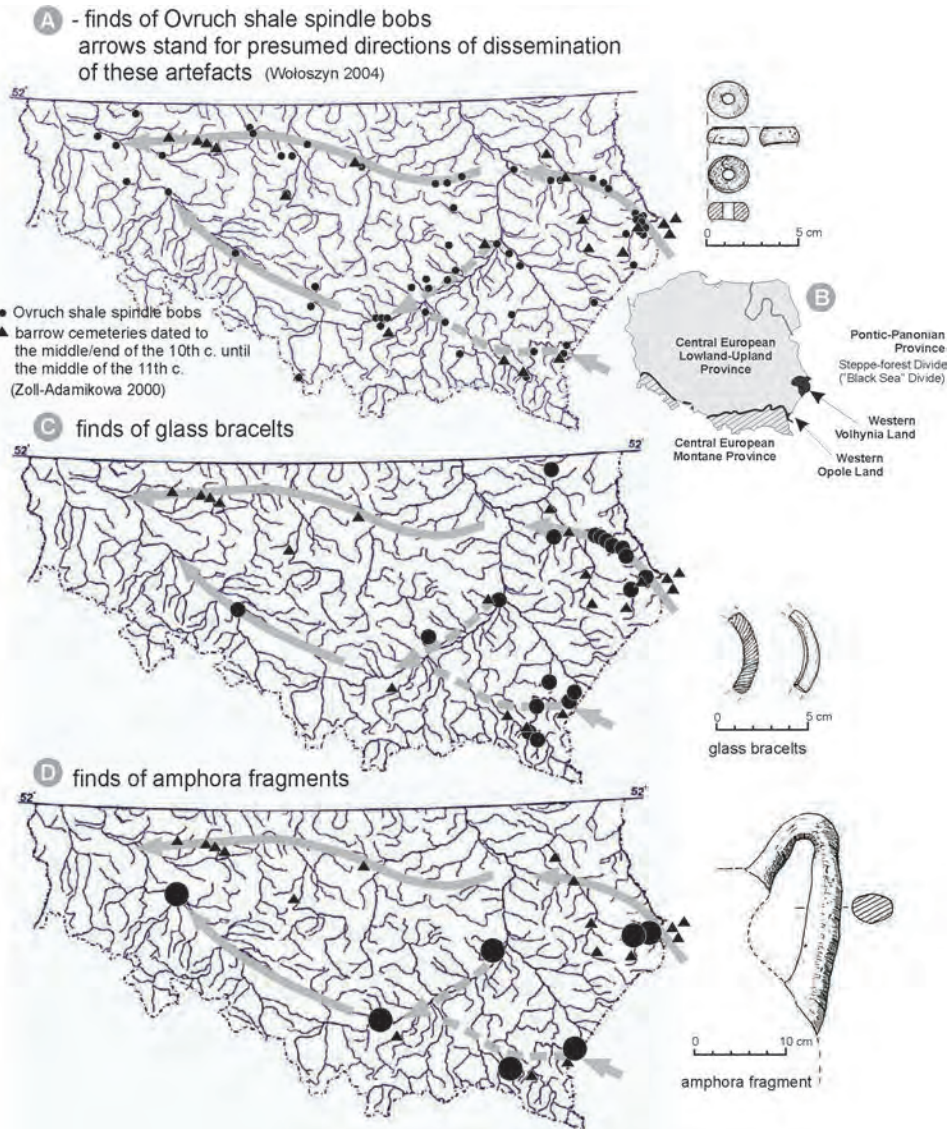


Fig. 19. Finds of artefacts of eastern (Ruthenian) provenance in Poland [fol. Woloszyn 2004, modified]. (A) finds of Ovruch shale spindle bobs, (B) areas in south-eastern Poland belonging to geobotanic Pontic-Pannonian Province (forest-steppe area), (C) finds of glass bracetls, (D) finds of amphora fragments. Arrows stand for presumed directions of dissemination of these artefacts

vity of the area to support thinned forests or open plant communities. The rise of *Artemisia* should be linked to the spreading of a cultural steppe – an anthropogenic landscape resulting from forest clearings and creating patches of open vegetation.

In the isopollen picture of the *Artemisia* history, attention is drawn to the 3500 BP horizon when a tendency is marked to record higher shares of the plants along the line running from the south-east, across Volhynia, the middle Vistula to Kujawy. The direction, as it seems, was right for the migration of plants, showing continental preferences (see Figs. 8B, 17). The migration may already be seen in the 4000 BP horizon. The spreading of *Artemisia* may have been in this case stimulated by climatic factors, specifically by the increasing drying of soil. Successive periods of high shares of *Artemisia* plants in the territory of present-day Poland are related to the rise of a cultural landscape in the Bronze Age and later periods. To the anthropogenic origins of open communities with *Artemisia* indirectly testify their susceptibility to retreat, brought about by the decline in settlement in the Migration Period (illustrated by the 1500 BP horizon, Fig. 18).

The history of the genus *Artemisia* illustrates the natural directions of exchange of steppe components in the Baltic-Pontic Area. They migrated to the area of present-day Poland along a corridor passing north-east of the Carpathians, across the upland area as far as Volhynia and south of the Pripet drainage, which is marked by the presence of vast swampy areas. The *Artemisia* migration route is a kind of a natural corridor joining Black Sea steppe environments to the forest zone of central Europe. Contemporary botanical data indicate two narrower passages for migration of steppe components in the area in question: via Western Volhynia and the Przemyśl Gate (Western Opole).

### 3.2. PENETRATION OF CENTRAL EUROPE BY EASTERN CULTURAL ELEMENTS ALONG THE 'STEPPE ROUTE' IN THE EARLY HISTORIC PERIOD

Interesting evidence of relationships between the natural environment and cultural processes in the area in question is supplied by the distribution of Ruthenian provenance artefacts dated to the Early Middle Ages such as Ovruch shale spindle bobs, glass bracelets and amphorae for storing wine. The distribution of these artefacts was studied by M. Wołoszyn [Wołoszyn 2004]. When comparing their chorology with environmental factors, the role of the two geobotanic regions mentioned earlier, namely Western Volhynia and Western Opole, becomes evident as gates through which eastern cultural elements spread across Poland's present-day territory (Fig. 19). It is this way, across the westernmost reaches of the geobotanic steppe region, that the material elements of eastern culture entered the Polish terri-

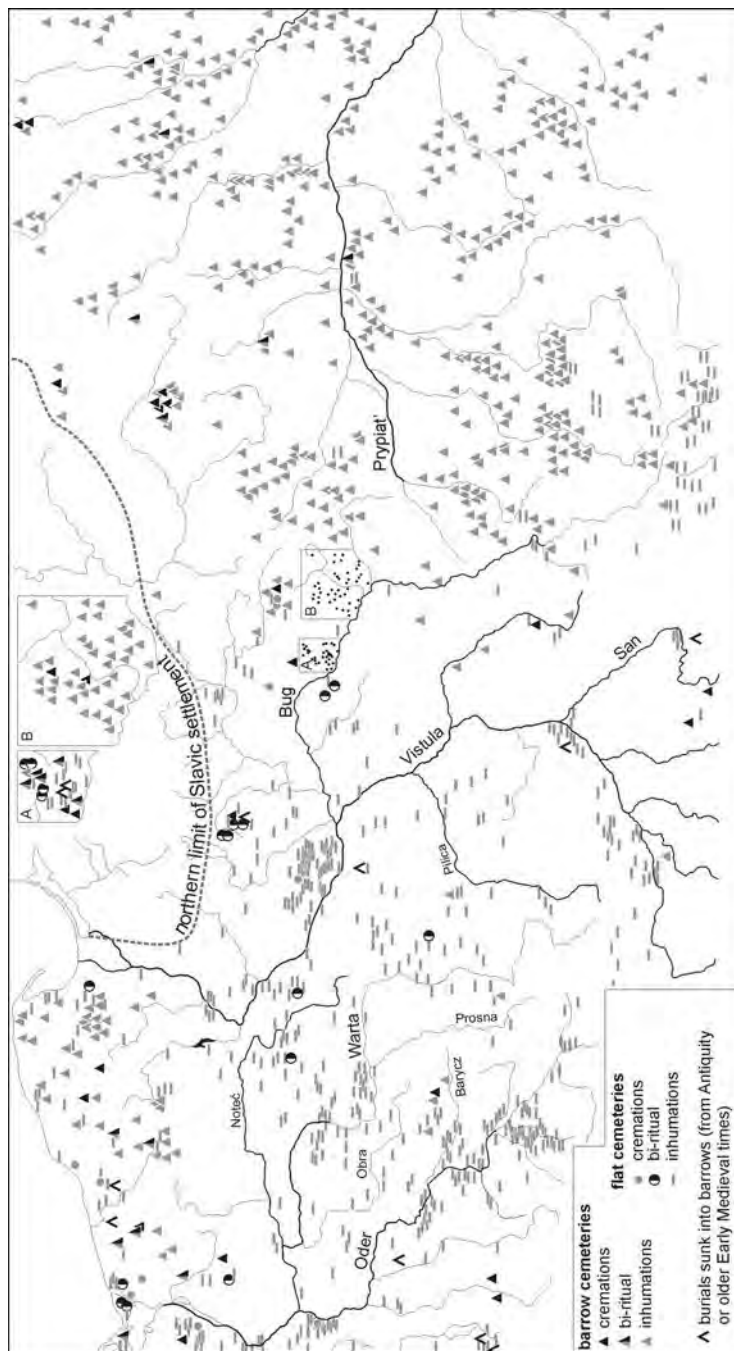


Fig. 20. Slavic sepulchral zones from the middle/end of the 10th to the middle of the 12th century [coll. Zoll-Adamikowa 2000, modified]

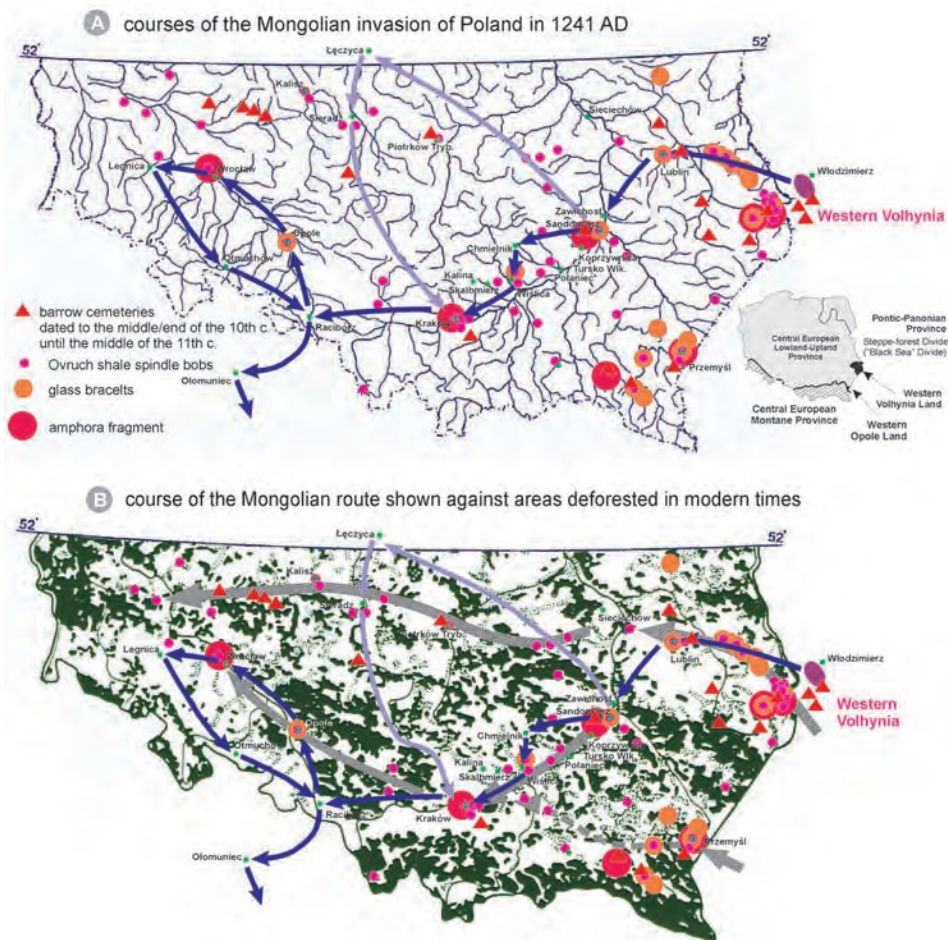


Fig. 21. The route taken by the Mongol army invading Poland in 1241. It ran from Włodzimierz in Volhynia to Legnica in Lower Silesia shown against the distribution of artefacts of Ruthenian provenance (see Fig. 19). (A) Geobotanic areas belonging to the Black Sea environment – regions of Western Volhynia and Western Opole, (B) the course of the Mongolian route shown against areas deforested in modern times (forests are marked in dark colour) [from Breymeyer 1991]

tory, being part of the deciduous and mixed forest zone. The features of the natural environment reminiscent of the eastern steppe (forest-steppe) environment seem to be conducive to the presence here of eastern cultural elements. The distribution of Ovruch shale spindle bobs, glass bracelets and amphorae for storing wine in southern Poland coincides with the location of barrow cemeteries dated to the middle/end of

the 10th century until the middle of the 11th century [foll. Zoll-Adamikowa 2000] (see Fig. 19), which are concentrated east of the Bug river (Fig. 20).

The greatest concentration of artefacts of Ruthenian provenance is found in the vicinity of the Volhynia and Przemyśl gates. From Volhynia, the route taken by the artefacts crosses the Lublin Upland in the direction of Lublin and the Vistula valley where present-day Kazimierz Dolny is situated. The distribution of the finds suggests next two directions of their dissemination. The first runs along the left bank of the Vistula across the Małopolska Upland in the direction of Kraków to cross into the Oder drainage and continue towards Opole and Wrocław in Lower Silesia. The second crosses the upper drainages of the lesser rivers of central Poland (Pilica, Warta, Proсна), passes by present-day Piotrków Trybunalski, Sieradz and Kalisz and continues through the Barycz drainage in the direction of the Oder valley north of Głogów.

The route running from Western Volhynia across the Lublin and Małopolska uplands, along the upper Vistula valley and Oder valley to Lower Silesia was used by Mongols in their invasion of Poland in 1241 (Fig. 21). The Mongols carried out then reconnaissance missions from a camp set up on the right bank of the Bug River, near the town of Włodzimierz. In January 1241, the first reconnaissance party, crossing rivers over ice, passing by Zawichost, reached Sandomierz. Another party, which set out from Włodzimierz in February of 1241, by a similar route moved as far as Skalmierz. After the reconnaissance, the main military operation was carried out by the Mongolian army in March and ended in its victory at Legnica on 9 April 1241. The route taken by the Mongols largely coincides with the southern dissemination route of goods of Ruthenian provenance, and location of major settlement centres in southern Poland.

### 3.3. GEOGRAPHY OF HISTORIC TATAR ROUTES IN WESTERN UKRAINE – LAND RELIEF IMPACT ON NATURAL ROUTES

The study of natural routes between the Baltic and Black seas is greatly helped by the tracing of Tatar routes in Ukraine. An excellent input for the study is supplied by the 17th century map *Ukrainae pars quae Barclavia Palatinatus* (drawn after 1652) (Fig. 22) and descriptions by Z. Gloger in his *Geografia historyczna ziem dawnej Polski* [Historical Geography of Lands of Ancient Poland] [Gloger 1903]. Z. Gloger writes:

*Tatars followed almost immutable routes of their own which they used to send parties of horsemen from 'wild fields' deep into Ukraine. A Tatar route was neither a road nor a merchant's highway, but had a peculiar character of its own. Known to all, it was hardly visible. What was known was its general direction, avoiding crossings*

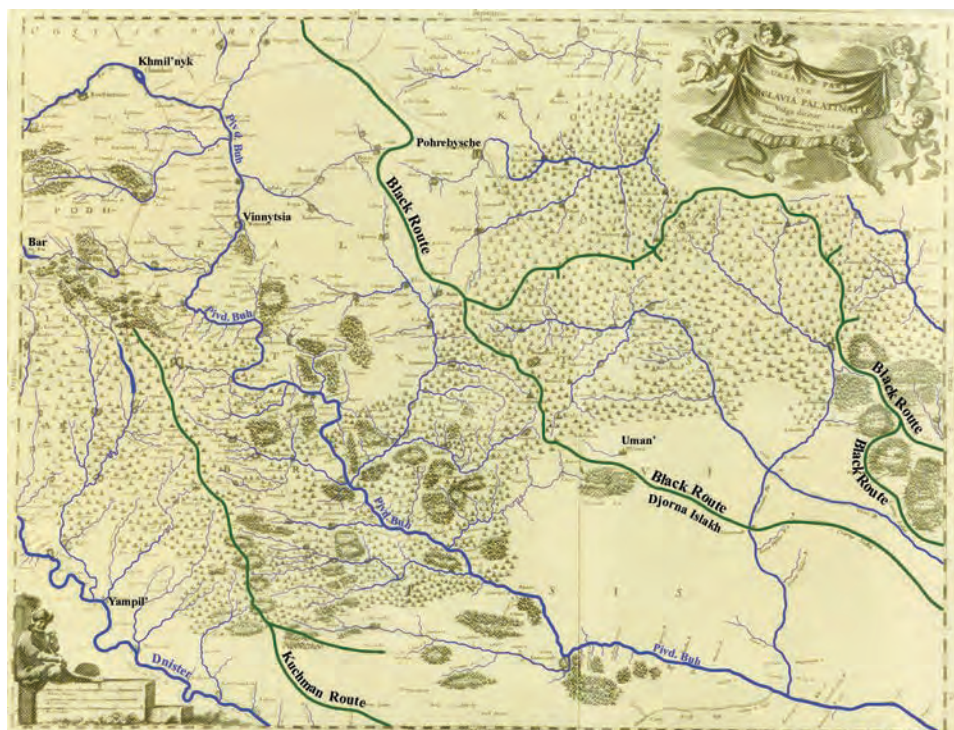


Fig. 22. 17th-century map *Ukrainae pars quae Barclavia Palatinatus* showing tatar routes: Black Route (*Djorna Islakh*) and Kuchman Route [Atlas 2005]

*of large rivers, but individual turns were never known. The width of a route reflected the strength of a detachment of horsemen. Commonly, it extended across 'for two bow-shots' but oftentimes, when the whole horde was moving, it could stretch for a couple of miles. In wilderness, they oriented themselves by observing barrows. The main routes, upon reaching the destination of every expedition by a horde or a smaller detachment, used to break up into smaller units which would overrun a whole country or parts of it singled out earlier. Only along these secondary routes did a hunt go on for residents taken by surprise and their possessions.*

The so-called 'Black Route' (in Tatar *Djorna Islakh*) and the Kuchman Route followed the steppe and forest-steppe zones, along elevated watersheds between the tributaries of the Boh and Dnieper as well as the Boh and Dniester. Another route, known as the Muravsky Route, ran north between the tributaries of the Dnieper and Don rivers to Tula and Moscow. Watershed routes following land elevations and avoiding river crossings were used by steppe societies practising nomadic herding and skilled in horse-riding. The traditions of watershed horse routes used by

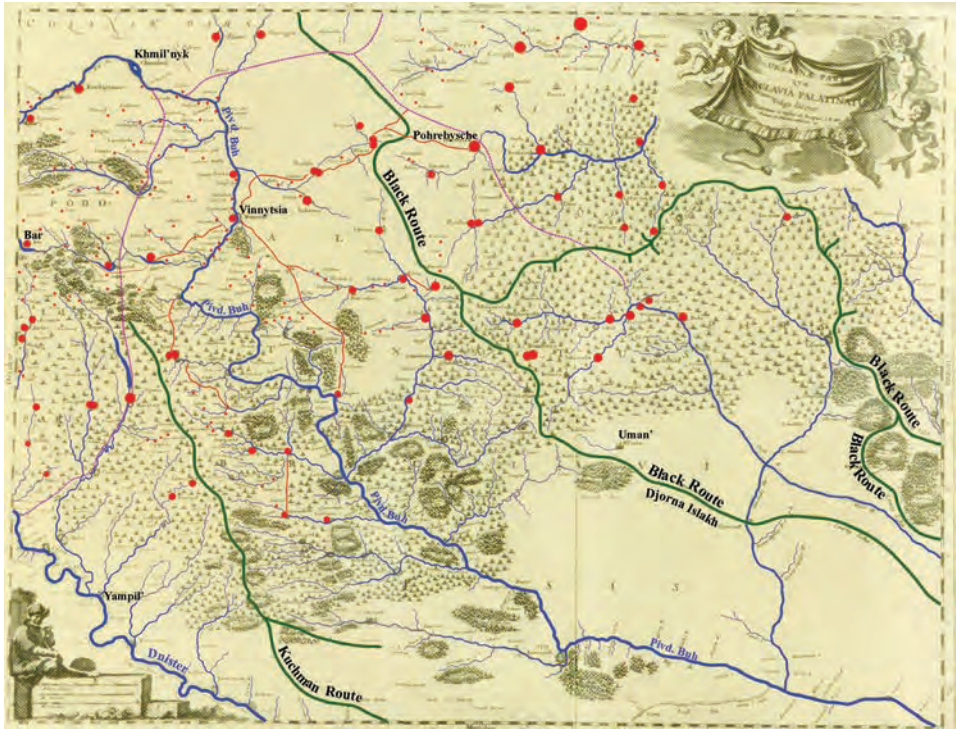


Fig. 23. The 17th century map *Ukrainae pars quae Barclavia Palatinatus* showing Tatar Routes, settlement network of Slavic populations and roads joining individual settlements [Atlas 2005, modified]

nomads in the Baltic-Pontic Area may reach back to a very distant past. Plausibly, long-distance watershed routes had grown in importance since the horse began to play a significant role as a means of transport. The breaking in of the horse was a turning point in the process of controlling the space of Eurasian steppes and the development of nomadic herding [Koško, Klochko 1994]. It is believed that the horse was domesticated in Eurasia, in the distribution range of the wild horse *Equus ferus*, prior to 5000 BC. The beginning of horse-riding is dated to ca. 3500-3000 BC. The oldest documented evidence of the use of the horse bit was found at a site of the Botai culture, occupying areas south-east of the Urals [Anthony, Brown 2000]. This date is also accepted as the time witnessing the rise of typical nomadic pastoral societies with fully developed three attributes of nomadism – breeding large flocks of sheep, use of the horse for riding and a wagon for transport [Anthony 1986; Koško, Klochko 1994; Anthony, Brown 2000].

The historically documented ‘watershed’ routes suited well the way of life and acquired skills of horse-riding nomads, adapted to open steppe areas, affording

broad and unobstructed views, especially from hilltops, accustomed to bypassing water barriers and capable of covering long distances in a relatively short time.

### 3.4. MULTITUDE AND VARIETY OF ROUTES

The 17th-century map of western Ukraine, apart of Tatar routes, shows both settlement and road networks of the then settled agricultural Slavic communities (Fig. 23). What can be seen in the map is their different preferences as to the road system. The Slavic communication routes follow the shortest lines joining neighbouring settlement units. The routes do not avoid river valleys or river crossings, either. Nor do they re-track in any way the watershed routes, taken by Tatars.

The routes of eastern Slavic and Baltic peoples, as can be seen from a comparison of the finds of Arab coins and a reconstructed trade network made by Herrmann, frequently followed waterways and ran along river valleys (Fig. 24). Where watersheds were narrow enough, the water routes could have been connected by portages. The Slavs were known for taking advantage of water transport by using small dugouts (logboats). Mentions of the construction of dugouts by Slavs were made by ancient writers such as Prisci Panitae, Theophylact, Theophanis or Constantinus Porphyrogenitus [Tyszkiewicz 1994]. *Strategikon* by Pseudo-Maurice, written either in the late 6th or early 7th century, informs of the great skill of Slavs to negotiate water barriers and to fight in terrain rich in standing and running waters [after Tyszkiewicz 1994]. With their skills to negotiate water barriers, they helped nomadic Avars in war, of which descriptions have survived in the account of the siege of Constantinople in 626 AD (Easter Chronicle, *Chronicon Paschale* by unknown author).

Another type of known routes in the Baltic-Pontic Area is related to the historic societies of Vlachs (13th-15th century), practising transhumance [Szanter 1997]. Their migrations took place in the mountains and foothills of the Pontic Area along the Carpathian Arch and reaching further north into the Baltic catchment area. The practice of transhumance and seasonal migrations involve regular movement of herds from summer pastures (in the mountains) to winter ones on piedmont plains and in valleys, and keeping a permanent home where crops are grown. Such seasonal migrations are favourable to maintaining contacts with people living on the opposite sides of mountain ranges and establishing trade ties.

The observed differences between several historically identified routes in the Baltic-Pontic Area and the people who used them make me draw two important conclusions. First, the nature and course of a route in a given cultural and natural landscape may depend on the specific society whose needs it serves. The choice

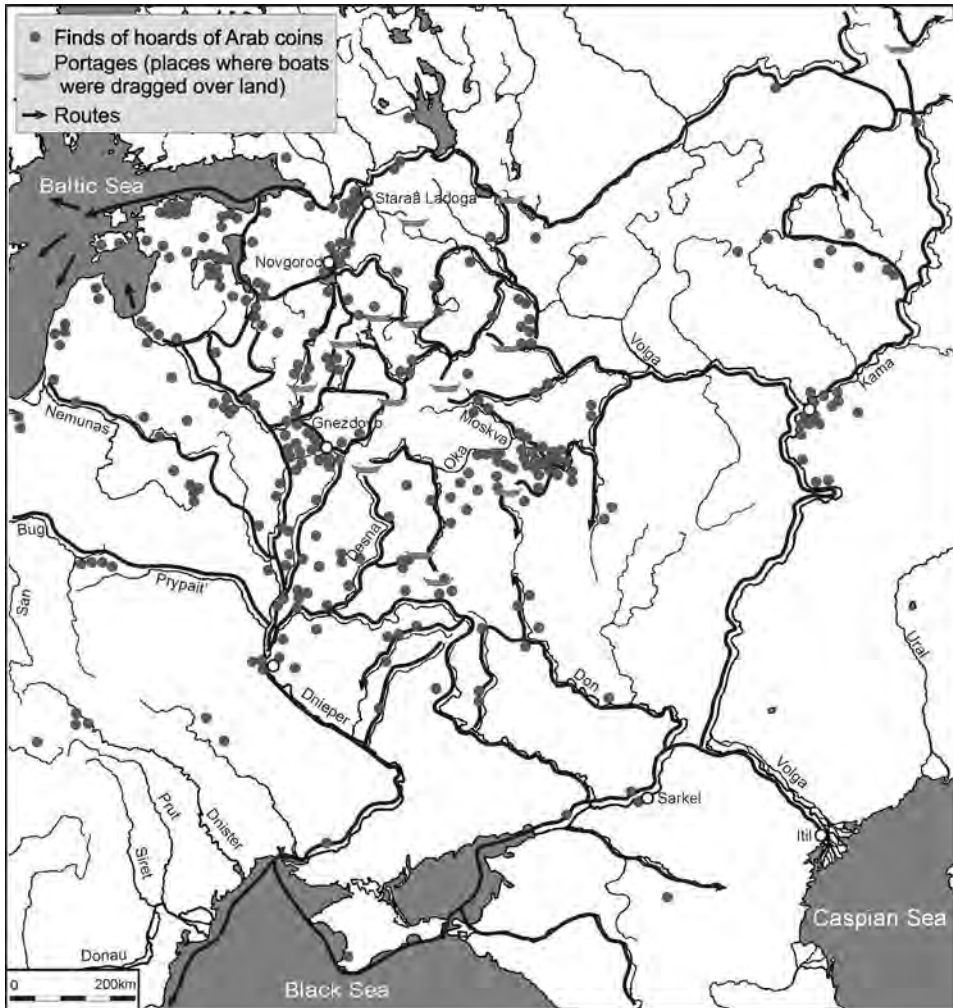


Fig. 24. Finds of hoards of Arab coins against the reconstructed trade routes of eastern Slavic territories [foll. Herrmann 1986]

of migration routes by a given group of people is affected in the cases in hand by the way of life and accumulated experience in the given environment. This, in turn, turns strongly upon the type of economy the group follows. Second, many and varied routes are possible in the diversified natural environments, reflecting different socio-economic preferences and traditions of individual biocultural systems with respect to the adaptation to and the use of given ecological niches. Hence, one has to accept both the possibility of change of route types in time in a given

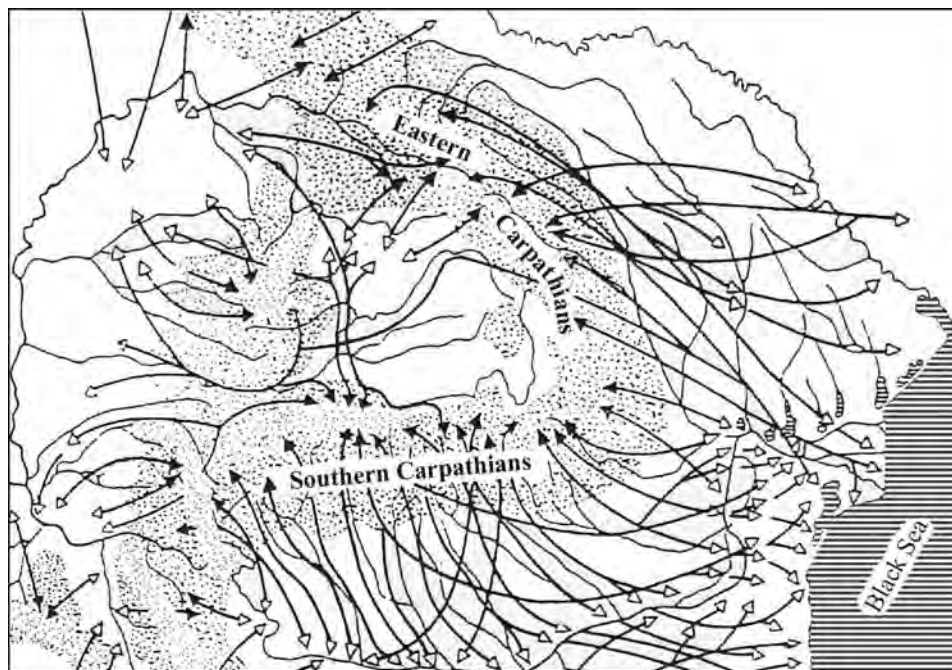


Fig. 25. Routes of herder seasonal migrations in the Carpathians [from Szanter 1997; developed by E. Petrovici, original publication: Koczyńska-Jaworska 1960]

area (owing to a replacement of one population group by another or a change of the socio-economic system) and co-existence of different route types in the same area, for instance, different routes of long-distance migrations preferred by nomadic steppe societies, and others chosen by settled societies, relying on crop cultivation for subsistence.

The course of routes was certainly strongly affected by the environment conditions. Long-distance migrations across the forest landscape of the Central and East European Plain, with the possibility of penetrating dense forests or panoramically observing the landscape being limited, were facilitated by water routes – travelling on rivers or chains of lakes. The use of boats, known already to Mesolithic societies in this area, was very convenient for the transport of goods. In an open steppe landscape, free from any forest barriers, with a panoramic field of observation, long-distance migrations were naturally helped by routes running along watersheds – elevated tracts of land – which admittedly could be more roundabout than others, but allowed migrants to orient themselves more easily and avoid water barriers. The routes must have been even more popular owing to the use of the horse for transport and riding.

From the point of view of landscape ecology, the development of routes in Europe's forest zone was certainly marked by the changes resulting from the spreading of agricultural economy, referred to as the 'Neolithic revolution'. What they brought about was the gradual development of an open anthropogenic landscape. Open spaces and a relatively permanent settlement network helped overland migrations. Initially, open landscape areas were limited to small 'islands' on specific habitats determined by the range of Linear Band Pottery culture settlement. With time, the areas were expanded and joined together. In Central Europe, assuming that no human activity takes place, the share of forests by area would be clearly predominant. Taking Poland as an example (excluding raised bogs), only a fraction of a percent of the country's territory would be covered by open plant communities and for that limited only to high-mountain habitats and seacoast ones along beaches and dunes in the early stages of their formation [Matuszkiewicz 1991].

Another milestone in the development of overland routes must have been the invention of the wheel and introduction of vehicular transport. In Central Europe, this happened already in the phase of a partial opening of landscape in the Middle Neolithic, among the Funnel Beaker culture populations. The rise of vehicular transport associated with southern Mesopotamia is dated, relying on radiocarbon measurements, to ca. 3600-3400 BC. The spread of this invention of momentous significance across Eurasia was rapid as the oldest representation of a wagon on Central European pottery – Bronocice site on the Małopolska Upland – is dated to the period from 3640 to 3370 BC [see Bakker *et al.* 1999; Kruk 2008b]. The wagon became an inseparable attribute of nomads on the Eurasian steppes.

### 3.5. ANALOGOUS PENETRATIONS IN OLDER PERIODS OF PREHISTORY

The communication routes joining Pontic steppes to the forest zone of the Baltic catchment area and crossing Volhynia, and Lublin and Małopolska uplands in historic times find analogies as far back as the Neolithic. This is seen in the distribution of flint and stone artefacts originating in Volhynia, in the Dniester drainage, as well as of Świeciechów flint, the outcrops of which are found in the Vistula drainage, close to where the San empties into the Vistula. Both artefact categories are similarly distributed in Poland: the sites where they are found form a belt crossing loess uplands – the Lublin and Małopolska uplands – continuing along the upper Vistula to reach the Oder drainage. A branch of the belt stretches down the Vistula towards Kujawy. Hence, the sites form a great loop covering in the south an area on the Vistula and Oder rivers and in the north moving from Kujawy across the middle Warta drainage to reach Lower Silesia on the middle

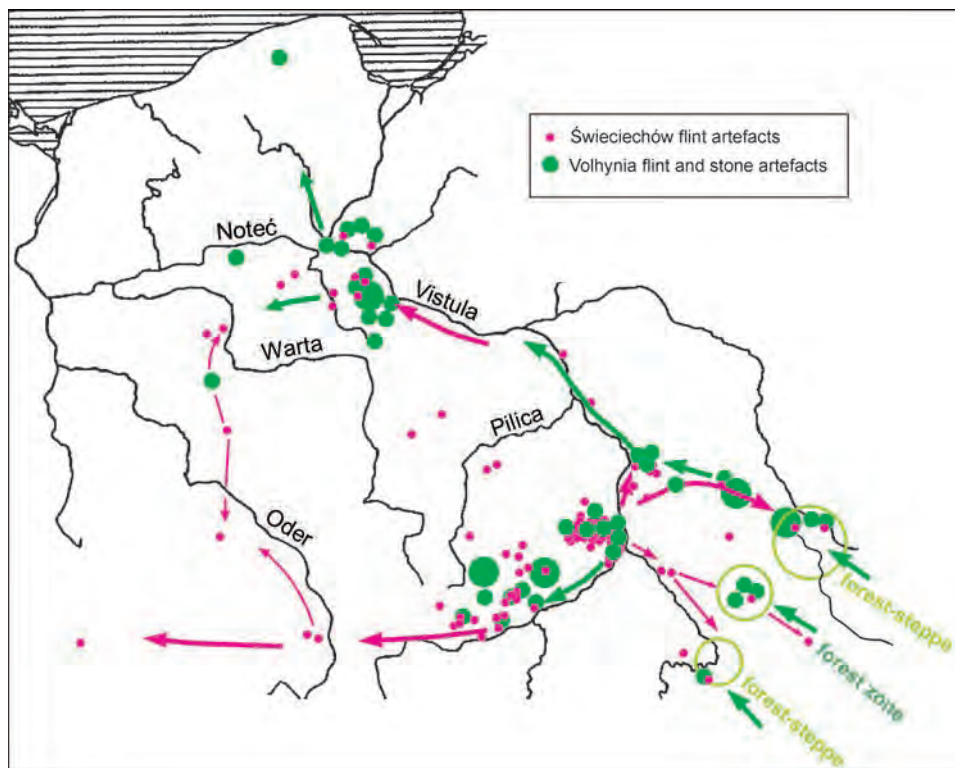


Fig. 26. Distribution of Świeciechów flint artefacts and Volhynia flint and stone [from Cofta-Broniewska, Koško 2002, modified; foll. Balcer 1975; Chachlikowski 1997] in the Vistula and Oder drainages, showing three corridors along which cultural stimuli moved between the Baltic and Pontic areas

Oder. The chorology of the finds in south-eastern Poland coincides with the distribution route mentioned earlier along which eastern patterns moved in the Middle Ages – via Volhynia and the Przemysł Gate along a forest-steppe corridor. In both regions, we encounter both Świeciechów flint finds, coming in from the west, and Volhynia flint ones of eastern provenance. The distribution of the flint artefacts in this special area forms yet another corridor running across the forest zone (see Fig. 26).

The distribution of flint artefacts in the zones of old uplands and lowlands corresponds roughly to the geography of settlements of Linear Band Pottery culture communities in the Oder and Vistula drainages (see Fig. 27). The distribution of Early Neolithic settlements in southern Poland was connected with loess areas: the Małopolska Upland on the left bank of the Vistula, the Lublin Upland located between the Bug and Vistula, Western Volhynia and, in the Oder drainage, especially

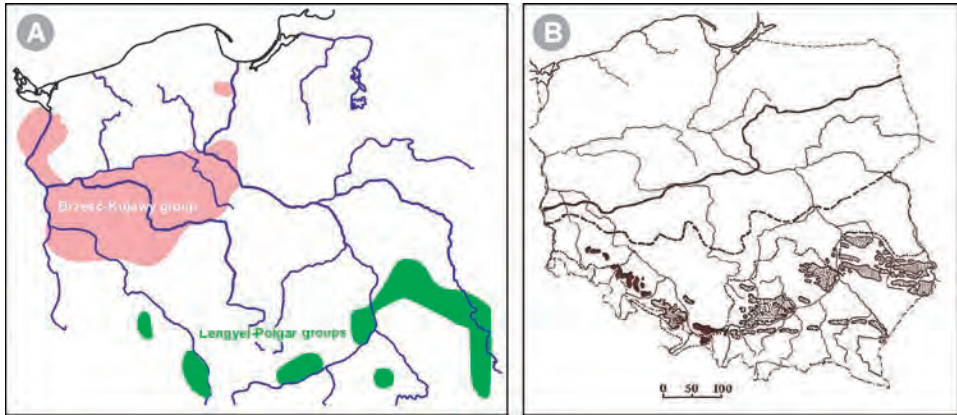


Fig. 27. (A) Distribution of communities from the cultural circle of the Late Linear Band Pottery in the drainages of the Oder and Vistula in the classic and late phases [from Cofta-Broniewska, Koško 2002, modified; foll. Kamińska, Kozłowski 1990] against (B) the range of loess covers in Poland

the Głubczyce Plateau. On the lowlands, the settlements concentrated in Kujawy, on fertile black soils, and on the lower Oder, on fertile black soils in the region of Pyrzyce. Dispersed Neolithic settlements are found in Wielkopolska. The major centres of Early Neolithic agricultural economy form a kind of a circle, surrounding the lands of central Poland, between the Warta and Pilica rivers, which were free of this kind of settlement (Fig. 27).

#### 4. ECOLOGICAL BORDER AND CULTURAL FRONTIER

As regards the development of routes, attention should be paid to the emerging relationship between the ecological and cultural patterns in the Baltic-Pontic area. The transitional area between the forest environment of the Baltic zone and the steppe (forest-steppe) one of the Black Sea area, between the drainages of the upper San and Bug rivers, and the upper Dniester drainage appears to be a crucial transitional area between cultural units as well. According to archaeological findings, it was there that a frontier was, separating two great cultural units of the Neolithic – the Funnel Beaker and Tripolye cultures; the latter reached there its north-westernmost limit (Fig. 28).

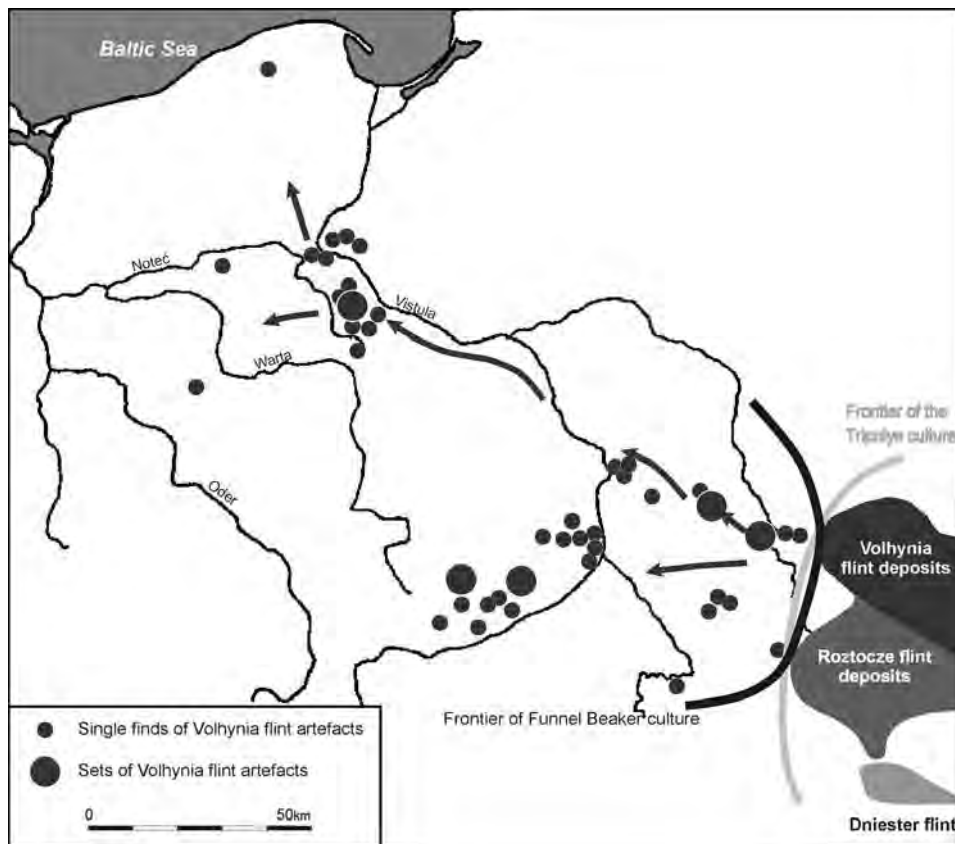


Fig. 28. The cultural frontier between the Neolithic Funnel Beaker (south-eastern limit) and Tripolye cultures against the distribution of Volhynia flint artefacts in the Vistula and Oder drainages, and areas where flint raw materials were found (see Fig. 26) [from Cofta-Broniewska, Koško 2002, modified; foll. Balcer 1983; Chachlikowski 1997]

The frontier renews itself in a later cultural pattern represented by the communities of the Globular Amphora culture. It marks a transition zone between its central ('Polish') group and the eastern one [Wiślański 1979, Szmyt 2001] (Fig. 29).

Cultural frontiers in this area are marked also in later times, e.g. in the Middle Ages, a line divided there areas of flat cemeteries and those of barrow ones. A list of the latter made by H. Zoll-Adamikowa [Zoll-Adamikowa 2000] links them primarily with the lands in the Pripet drainage (see Fig. 20). It was in this region, only slightly to the west, that the Polish-Ruthenian frontier ran in the 12th century, marking the division into West and East Slavic lands [Parczewski 1991]. The division has survived, only with minor corrections, to this day.

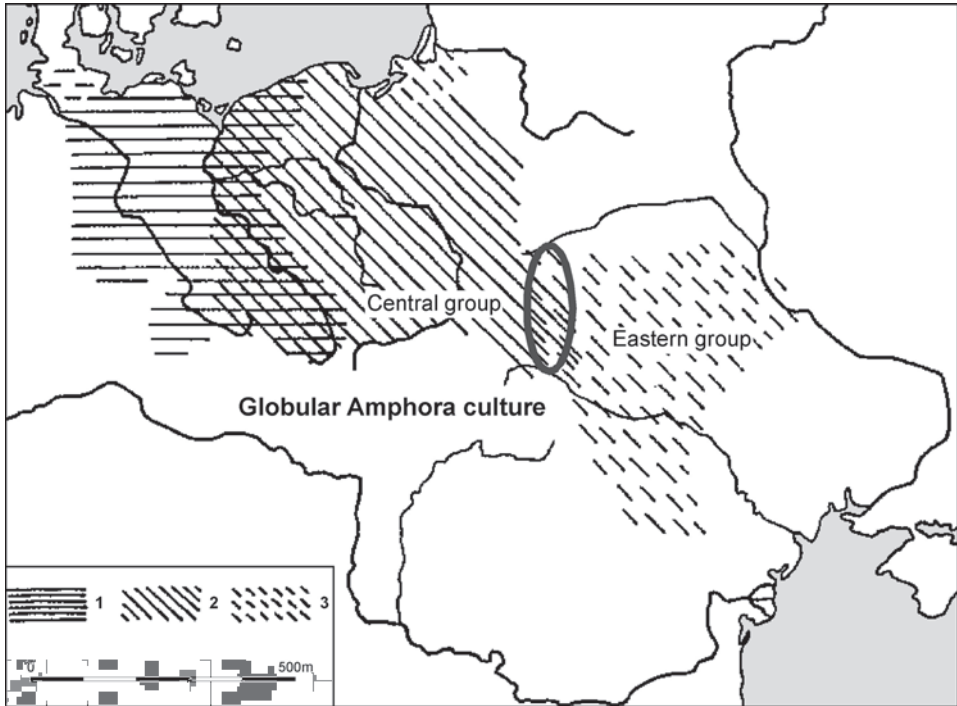


Fig. 29. Ecological border vs. cultural frontier (Globular Amphora culture) in the upper Bug drainage – frontier between the central ('Polish') group and the eastern one [from Cofta-Broniewska, Koško 2002; foll. Wiślański 1979; Szmyt 2001]

## 5. MIGRATION ELEMENTS IN POLISH FLORA AND NATURAL ROUTES

Some plant species growing in Poland have migrated from other regions. In some cases, their distribution offers clues as to the region they migrated from and the routes they took. Plant species that have arrived from a single specific region along a specific migration route are grouped together and called flora migration elements (components) in geobotany [see Pawłowska 1977; Matuszkiewicz 1991]. To trace migration routes, the use of palaeobotanic data is highly recommended, but due to their limited availability, plant migration routes are mostly charted by analyzing their present geographic distribution. Migration routes traced in this way can be clearly marked when plant sites are distributed in a manner close to linear or insular. Migration routes become more easily traceable if they are related to the land relief. Natural flora migration routes often run along river valleys, elevations, mountain ridges and ranges, forming bridges enabling migrations.

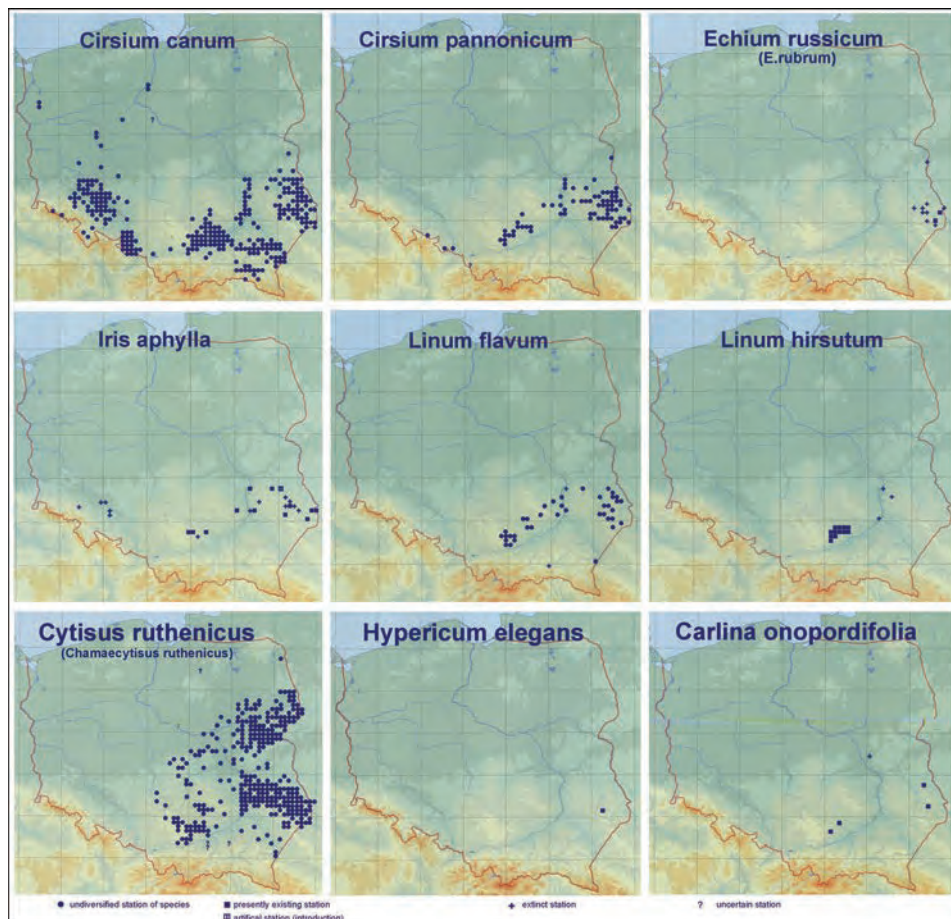


Fig. 30. Insular distribution of some Pontic species in Poland illustrating well the migration routes of steppe elements from the Pontic zone via the Western Volhynia and Lublin uplands towards the Małopolska Upland and further on towards Lower Silesia [foll. Zajac, Zajac 2001; modified]

For the discussion of natural routes in the Baltic-Pontic Area, of particular interest are species of eastern and south-eastern origin in the flora of the Central European Plain (Fig. 30). Such species are referred to as a Pontic (steppe) element. The Pontic Province ('Sarmatian Domain') encompasses the areas of eastern Europe (see Fig. 18) west and north of the Black Sea, Podolia, the Hungarian Plain, southern Moravia, and the eastern portion of Lower Austria. The Pontic species include plants growing in the continental climate, requiring much light but little water. They thrive on dry, sunny and warm slopes and walls, often among xerothermic grass. Some of them survive on balks, roadsides or plough lands. They are particu-

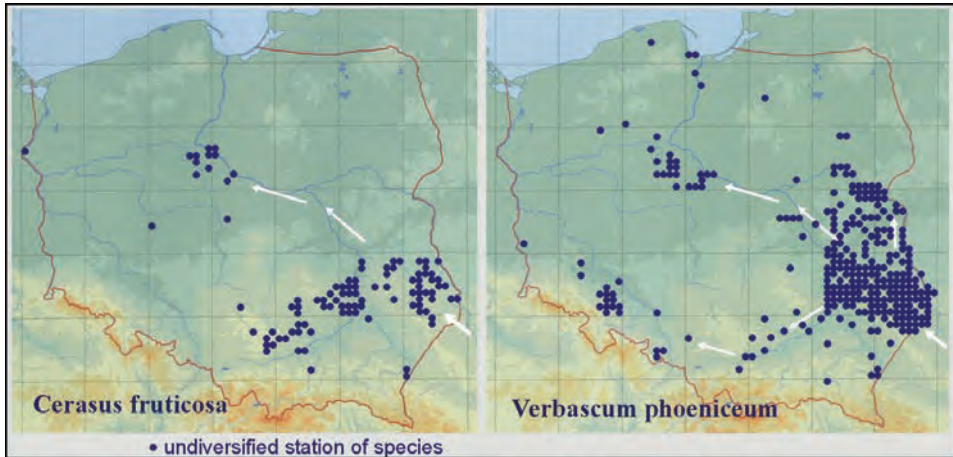


Fig. 31. Pontic species that migrated north from southern Poland along the Vistula Valley [Pawłowska 1977] [species distribution foll. Zajac, Zajac 2001; modified]

larly frequent on loess and limestone soils. In Central Europe, they are distributed insularly. In Poland, these are above all the Nida Basin, the Western Volhynia, Lublin and Sandomierz uplands, and parts of the Silesian Lowland. The Pontic species are also encountered in the Kujawy Lake District and on the Inowrocław Plain, particularly on the slopes of the Toruń-Eberswald Ice Marginal Valley (Spillway) exposed to the south and lower Vistula and lower Oder valleys [Pawłowska 1977].

It is believed that the natural migrations of Pontic elements took place on a larger scale in the Glacial and Late Glacial periods and in the Early Holocene, prior to the formation of dense forest communities in Central Europe. At that time, the area was covered by open-type vegetation, referred to as steppe-tundra or mammoth steppe. The vegetation was characteristic of the then cold and relatively dry climate with continental features. In W. Szafer's opinion [Szafer 1950] such plants included grasses of the genus *Stipa*, tussock-grass (*Poa*), fescue (*Festuca*), plants of the genus *Artemisia*, or garlic (*Allium*). The greatest number of steppe plants has arrived from the east, most probably from the Podolia refuge via the Lublin and Małopolska uplands (their route followed loess areas, and limestone and gypsum hills).

Later migrations by Pontic species could be helped by human activity, particularly by deforestation, resulting in the rise of open, synanthropic habitats favourable to photophilous steppe plants. The evolution from the mammoth to cultural steppe is well illustrated by the history of the genus *Artemisia*, discussed earlier in the light of isopollen maps (Fig. 18). The cultural landscape is conducive to the growth of steppe plants such as the genus *Artemisia* or steppe grasses as well as some species of steppe fauna (of open habitats) such as brown European hare (*Lepus europaeus*),

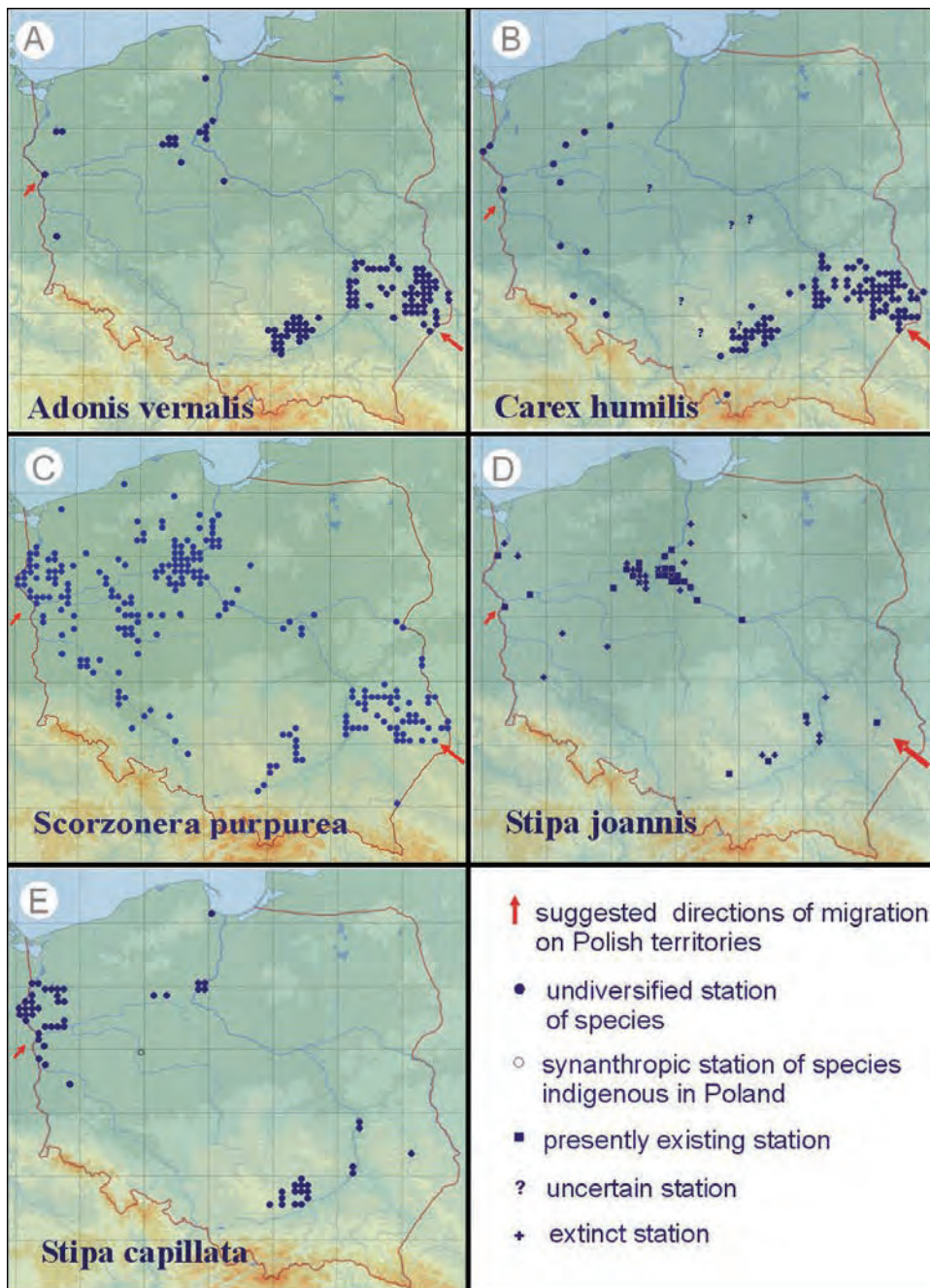


Fig. 32. Pontic species that [foll. Czubiński 1950] arrived at the Małopolska Upland along the south-eastern or southern route and reached Pomerania from the west, from the central German refuge in Thuringia, taking the Brandenburg-Noteć route [species distribution foll. Zajac, Zajac 2001; modified]

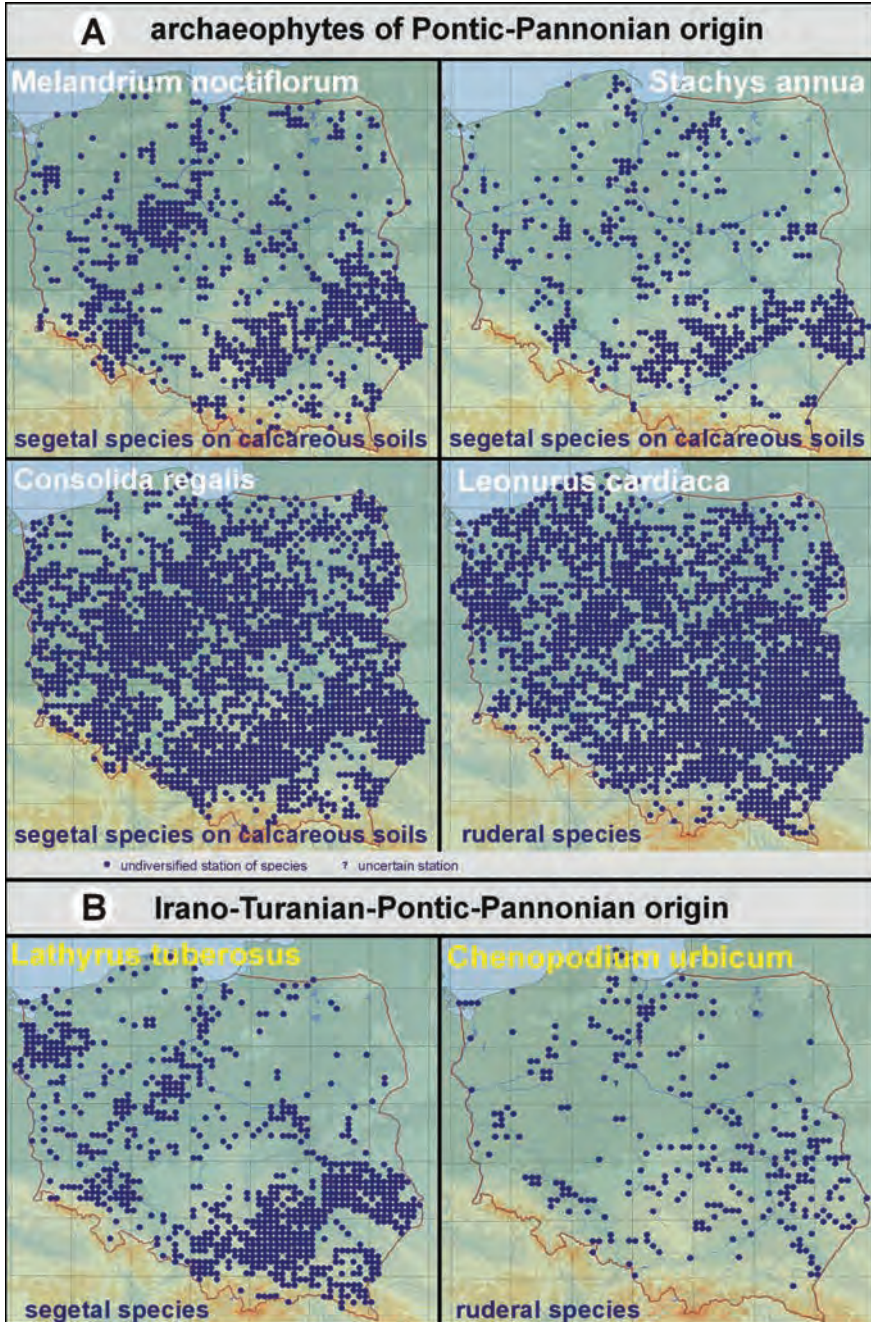


Fig. 33. Distribution of archaeophytes in Poland of (A) Pontic-Pannonian and (B) Irano-Turanian-Pontic-Pannonian origin [identification of the archaeophytes foll. Zajac 1988] [distribution foll. Zajac, Zajac 2001; modified]

common hamster (*Cricetus cricetus*), spotted souslik (*Spermophilus suslicus*), European souslik (*Spermophilus citellus*), or birds: grey partridge (*Perdix perdix*), skylark (*Alauda arvensis*), or great bustard (*Otis tarda*) [Tryjanowski, Winięcki 2003].

The chief migration route of Pontic floral elements seems to have followed north the middle course of the Vistula as far as the Kujawy Lake region and Inowrocław Plain (Fig. 31). The region stands out in terms of the incidence of Pontic steppe elements on the Central European Plain (Fig. 31, see also Fig. 32). Some steppe species such as, for instance, the spring Adonis (*Adonis vernalis*) spread across the Plain along two routes: onto the Małopolska Upland along a route from the south-east or the south; further north, onto Pomerania, it must have spread from the west, from the central German refuge in Thuringia, taking the Brandenburg-Noteć route [Czubiński 1950, after Pawłowska 1977]. Other species that point to this direction of migration routes are low sedge (*Carex humilis*), scorzonera (*Scorzonera purpurea*) and feather grasses (*Stipa joannis* and *Stipa capillata*) (see Fig. 32).

An important group of plants for making conclusions as to human migration routes consists of species whose occurrence is related to human activity, mainly anthropophytes – i.e. species alien to a given area but accidentally introduced onto it by man. A classification of anthropophytes distinguishes further so-called old-comers (archaeophytes) – species that migrated prior to the turn of the 15th century (prior to the discovery of America) – from newcomers (cenophytes) – species that arrived later. Among archaeophytes, there is a group of species of eastern origin that can be traced back to the Pontic-Pannonian Province or even to a still broader territory encompassing the Irano-Turanian area. The group is made up mainly of segetal species (field weeds), growing especially on limestone soils, or ruderal ones accompanying human settlements or growing on roadsides. Archaeophytes growing in Poland were identified and classified by A. Zając in a series of works [Zając 1981; 1984; 1987; 1988]. Among the archaeophytes of Pontic-Pannonian origin, some, for instance, *Melandrium album* or *Stachys annua* show insular distribution whereas others, such as *Consolida regalis* or *Leonurus cardiaca* have now a very broad range covering almost the whole country (Fig. 33). The occurrence of these species, originally brought by man and growing in synanthropic habitats, points to the migration routes, running from Volhynia, across the Lublin Upland, towards the Sandomierz and Małopolska uplands and further on in the direction of the upper and middle Oder in Lower Silesia. On the lowland, their insular presence is marked especially in Kujawy and on the lower Vistula. Another cluster is found on the lower Oder. The distribution of these species forms the same kind of a loop as mentioned earlier, crossing in the south the Vistula and Oder valleys, while in the north it runs along the middle Vistula towards Kujawy, Wielkopolska and Lower Silesia. Few positions of the species are found in central Poland, in the drainages of the upper Warta and Pilica rivers. The causes of this ‘vacuum’ are probably connected with both natural environment conditions and the nature of human activities. A similar distribution is shared by two directional

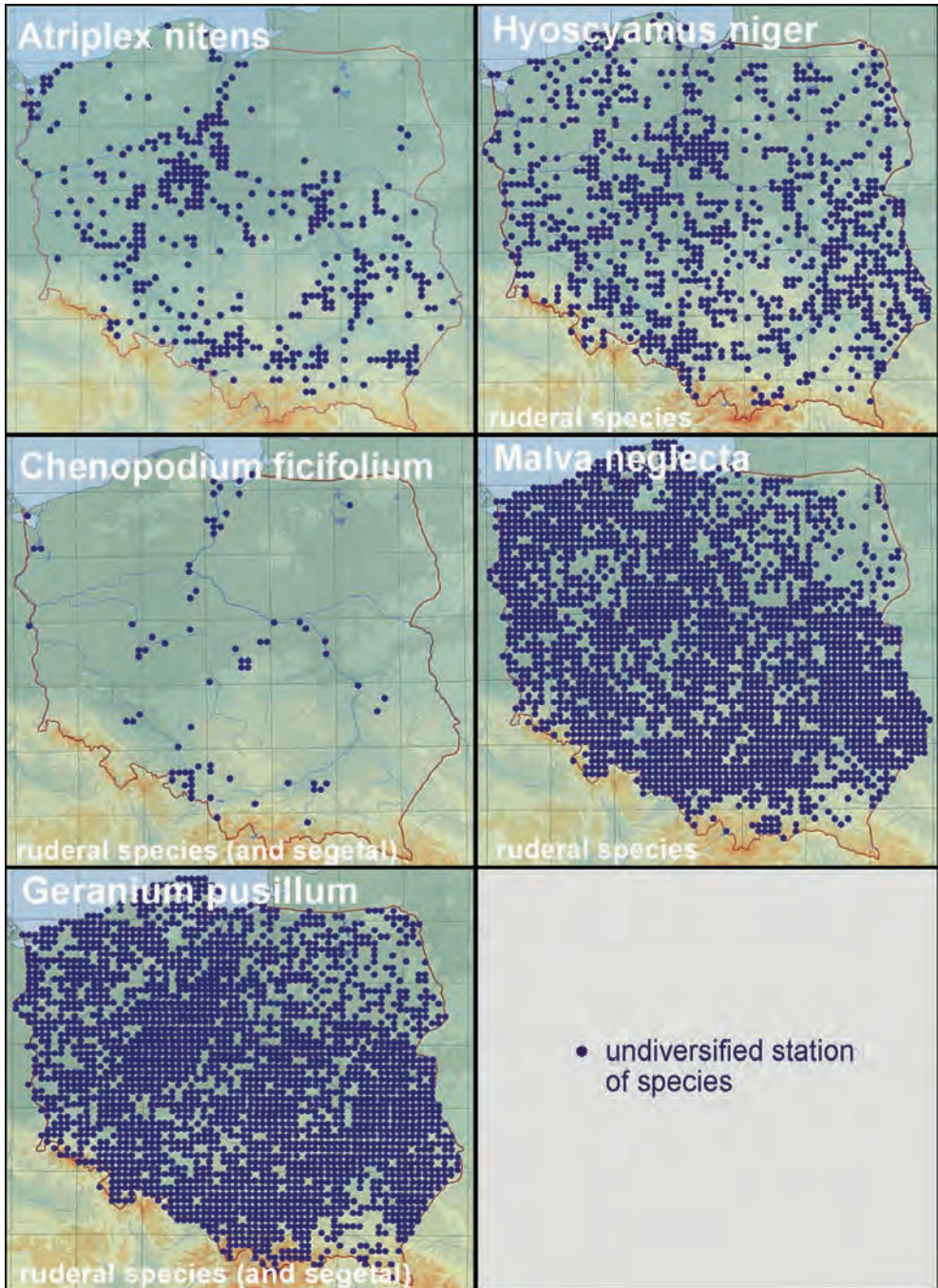


Fig. 34. Geographic distribution in Poland of archaeophytes of Irano-Turanian origin, Irano-Anatolian subgroup [foll. Zając, Zając (Ed.) 2001] [identification of archaeophytes foll. Zając 1987]

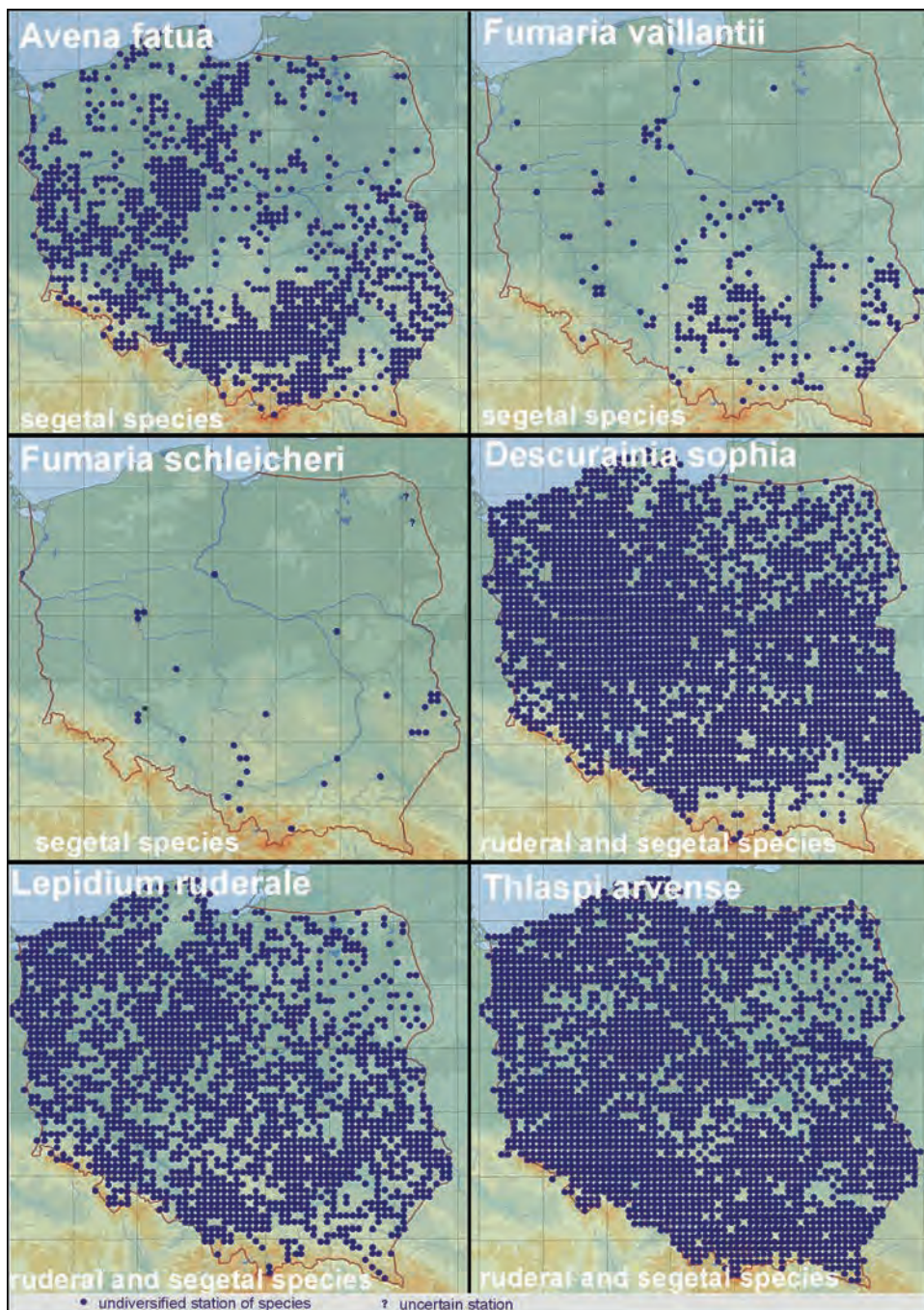


Fig. 35. Geographic distribution in Poland of archaeophytes of Irano-Turanian origin, Central-Asian subgroup [foll. Zając, Zając (Ed.) 2001] [identification of archaeophytes foll. Zając 1987]

elements, having a broader Irano-Turanian-Pontic-Pannonian background, namely tuberous pea (*Lathyrus tuberosus*) and upright goosefoot (*Chenopodium urbicum*) (Fig. 33).

A similar distribution pattern is observable in respect of species migrating from the Irano-Turanian area and belonging to the so-called Irano-Anatolian subgroup, namely *Atriplex nitens*, *Hyosyamus niger* or *Chenopodium ficifolium* (Fig. 34) and other species from the Irano-Turanian area, representing the Central Asian subgroup such as *Avena fatua*, *Fumaria schleicheri* and *Fumaria vaillantii* (Fig. 35).

Discussing the geography of archaeophytes, we usually face difficulties in determining the time of the beginning of migration of a given species and periods when it intensified. The time perspective of a migration may be established, relying on palaeobotanical data. The migrations of many segetal and ruderal species of southern and south-eastern provenance to areas lying north of the Carpathians took place in the Neolithic and accompanied the introduction of cereal, leguminous, fibre and oil-bearing crop plants.

It is reasonable to believe that the development of an open cultural landscape was a watershed in the dissemination of species from the steppe zone. Their distribution coincides significantly with the geography of Early Neolithic settlement, represented by the Linear Band Pottery cultures. The populations of these cultures opted for areas of special environment features; specifically, they settled on fertile lands with chernozems developed on loess in the old uplands or on fertile black soils on the lowlands. Started ca. 5500-5400 BC, the anthropogenic transformations of these areas, involving the deforestations and consequent hydrological changes brought about by increased direct runoff, which, in turn, caused the drying of habitats, may have helped the migrations of steppe species. In such general terms, the concentrations of steppe elements in the southern Baltic catchment area are in a way ecological indicators of habitats reminiscent of the Black Sea zone known for a fertile substratum and predominance of open-type vegetation. Expanses of open landscape may have also influenced, as it has been observed earlier, the choice of migration routes by specific population groups adapted to or preferring an open-type environment (e.g. communities of farmers or nomads) to the forest one, which was more favourable to populations leading a trapper's life. It seems that the presence of settlements, especially important settlement centres, was by itself one of the crucial factors in determining the course of routes.

Going back to the distribution of steppe elements in the environment prevailing on the southern shores of the Baltic, it is worth taking notice of the geography of continental-type plant communities. Their distribution presented by W. Matuszkiewicz [Matuszkiewicz 1991], expressed as a number of plant communities, concentrates to form a belt stretching from the Western Volhynia Upland and crossing the Lublin, Sandomierz and Małopolska uplands (Fig. 36), and shows a clear relationship to the distribution of loess areas intensively settled from the Neolithic.

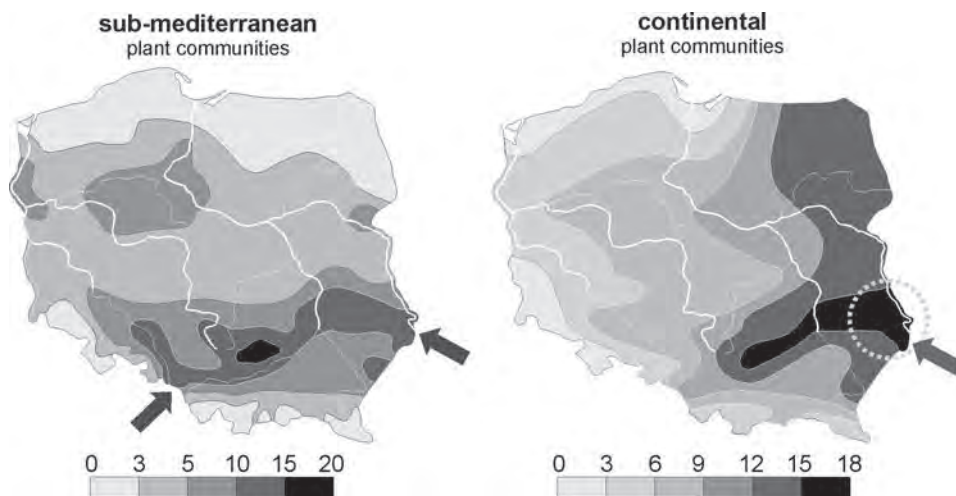


Fig. 36. Distribution of thermophilous sub-Mediterranean and continental plant communities in Poland [coll. Matuszkiewicz 1991]

The distribution of this type of vegetation is strongly reminiscent of the distribution of plant communities characteristic of thermophilous environments of the southern type, known as sub-Mediterranean (Fig. 36). They are most numerous on the Małopolska Upland but they are also frequent in the belt mentioned earlier, reaching further west into the drainage of the upper and middle Oder. The sub-Mediterranean communities have a higher representation, albeit an insular one, on the Lowland as well. One of such areas is Kujawy with the adjacent Chełmno Land and eastern Wielkopolska. Another one is located on the lower Oder in the vicinity of the town of Pyrzyce. The concentration of sub-Mediterranean communities on the Lowland seems to correlate well with areas covered by the intensive Early Neolithic settlement by the Linear Band pottery communities.

## 6. THE MAIN COMMUNICATION LOOP OF THE UPLAND-LOWLAND ZONE BETWEEN THE BALTIC AND THE CARPATHIANS

On several occasions already references have been made to a marked belt formed in the drainages of the Vistula and Oder rivers by the distribution of flint artefacts, Early Neolithic settlements and steppe (continental) floral elements of Pontic-Pannonian and Irano-Turanian provenance, related to the steppe and anthropogenic environments. The belt describes a kind of a circle, crossing the old

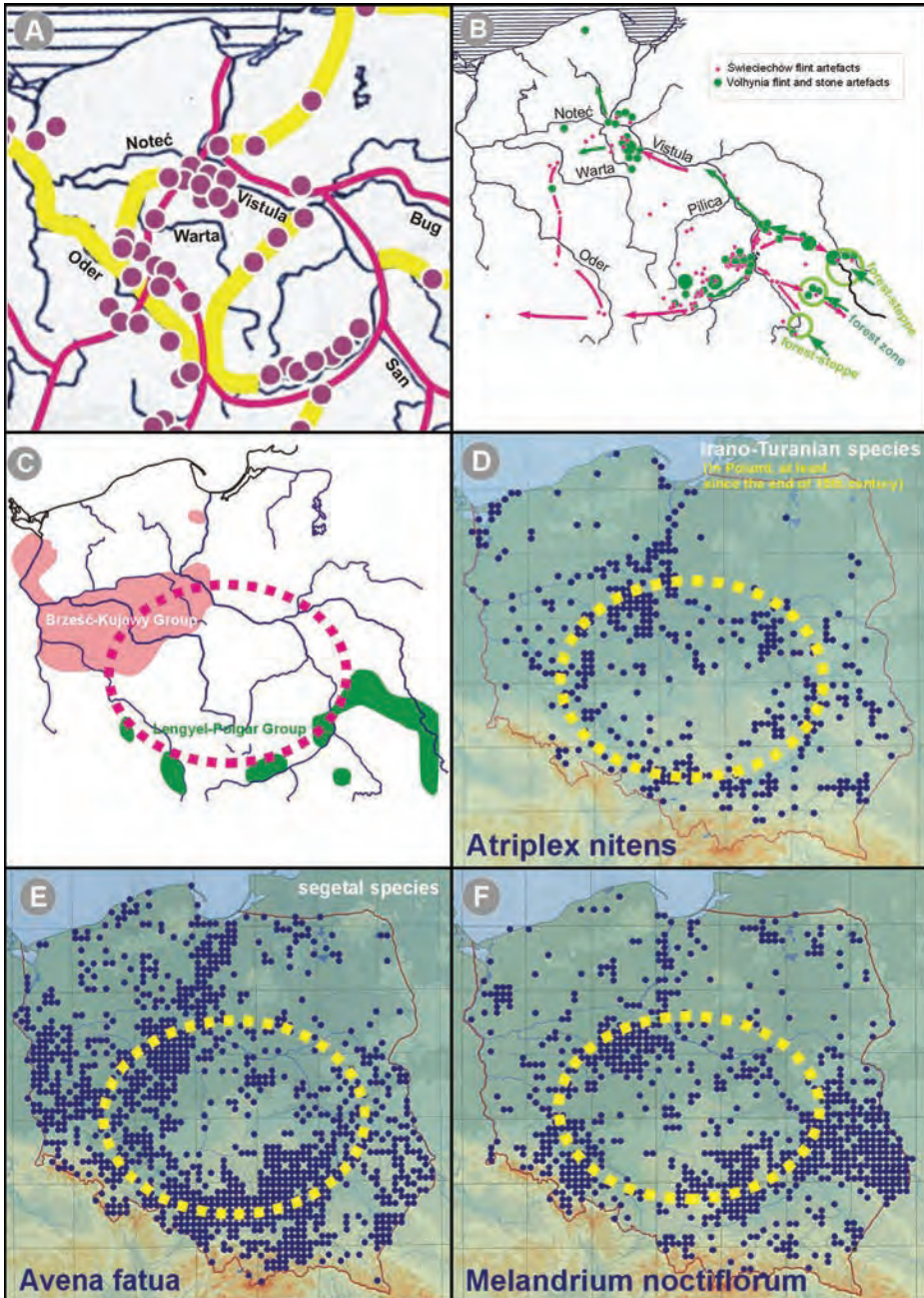


Fig. 37. Great communication loop between the Baltic and Carpathians seen in the archaeological picture (tracing of Bronze Age inter-regional routes, distribution of Świeciechów and Volhynia flint, and Early Neolithic settlements of Linear Band Pottery populations) (see Figs. 1, 26, 27) and in the natural scientific picture (selected archaeophytes of Pontic origin) (see Figs. 33, 34, 35)

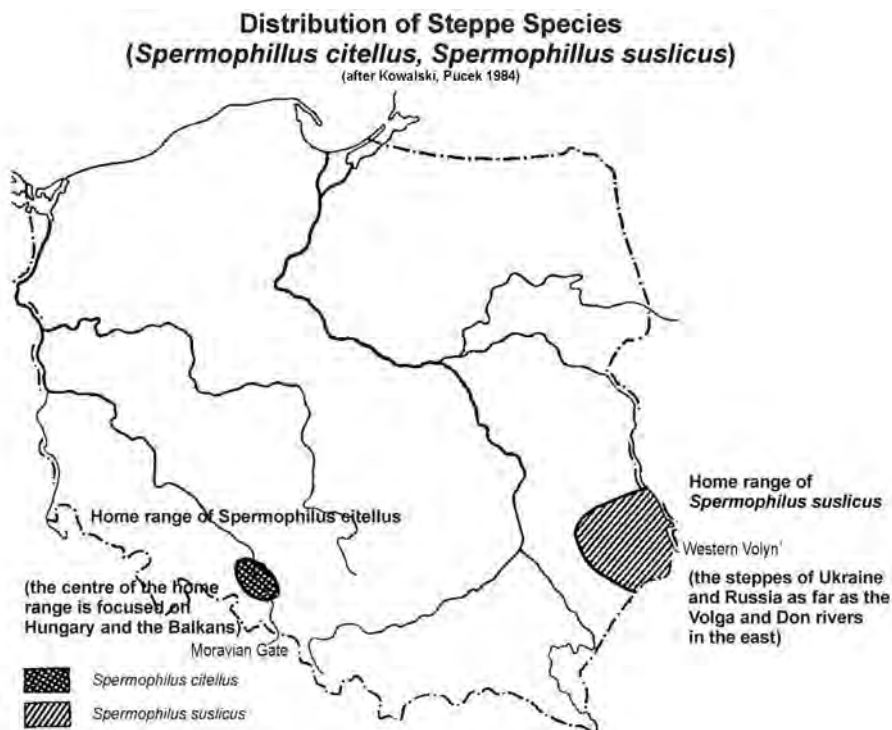


Fig. 38. Distribution of steppe species of the spotted souslik (*Spermophilus suslicus*) and the European souslik (*Spermophilus citellus*) in Poland, Volhynia and in front of the Moravian Gate [foll. Kowalski, Pucek 1984] illustrates the migrations of the elements of steppe fauna from the Pontic-Pannonian area

upland and lowland areas adjacent to the valley of the middle and upper Vistula, middle Oder in Lower Silesia, areas located between the Oder and Warta rivers, and Kujawy. The circle surrounds the areas of central Poland which stand out in terms of both cultural and floral patterns. No or few and wide apart communities of Pontic species, characteristic of the steppes of south-eastern Europe, are noted there. This major belt, conveying Early Neolithic material goods and settlement (whose economic-settlement preferences can be called stenotopic – tied to areas of highly fertile soils) as well as selected floral elements, highly coincides with the course of major transit routes of the Vistula and Oder drainages in the Early Bronze Age traced by M. Gimbutas and A. Koško (see Fig. 37). Reflected in some data, both archaeological and natural scientific, the loop seems to point to the chief communication pattern observed on the Polish lands between the Baltic and Carpathians since the Early Neolithic. In the south, the communication pattern joined the main thoroughfare crossing the Carpathians through the upper Oder valley and across

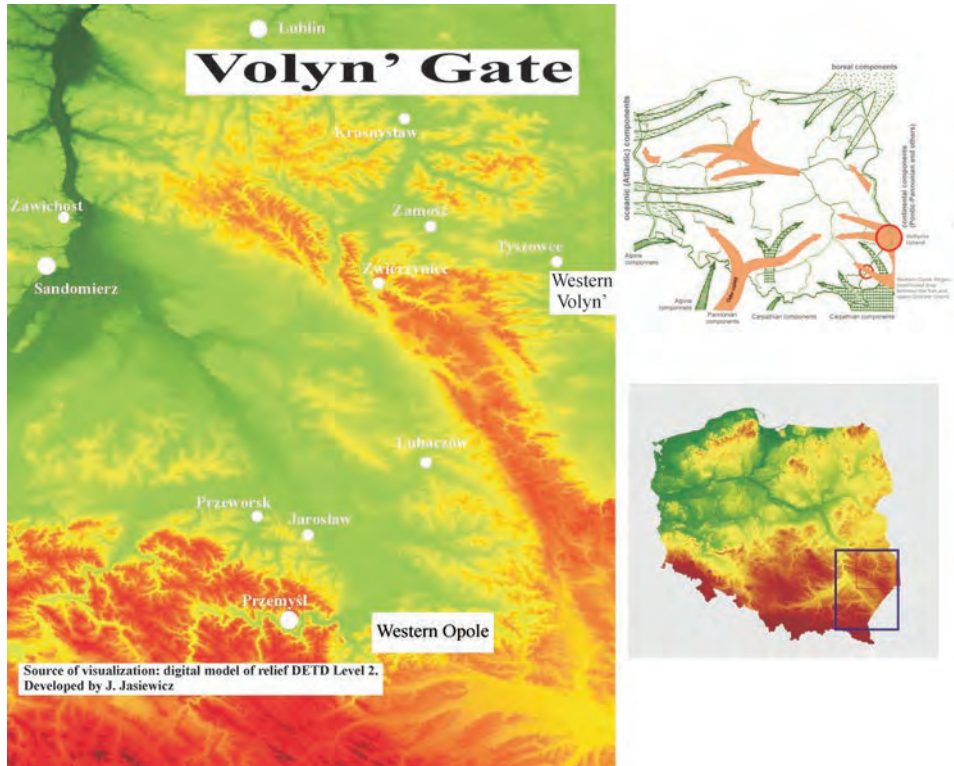


Fig. 39. Land relief of Western Opole (Przemyśl Gate) and Western Volhynia (Volhynia Gate) being the major migration routes of steppe elements from the east, from the Pontic Area, to the forest zone of Central Europe. Digital models of land relief (dett level 2) developed by J. Jasiewicz

the Moravian Gate while in the east it joined the Black Sea biocultural area mainly through the Lublin Upland and Western Volhynia. In the north, its two major branches stretched towards the lower Vistula and lower Oder rivers.

## 7. WESTERN VOLHYNIA AND PRZEMYŚL (WESTERN OPOLE) GATES – EXCHANGE ROUTES OF CULTURAL AND NATURAL STIMULI WITH THE EAST

Western Volhynia, as suggested by the collected data, was crucial in terms of both cultural and natural indicators. Crossing the region, the route of the 13th-century Mongol raid against Poland correlates well with, on the one hand, the specified

Ruthenian artefacts and, on the other, the distribution of continental species of the Pontic-Pannonian origin, migrating into Poland from the Black Sea Province. In the light of migrations of floral steppe elements as well as cultural stimuli from the east, Western Volhynia and Western Opole were important stopovers on the route from the east. Their role, it may be claimed, was similar to that played by the Moravian Gate on the migration route from the south, from the Pannonian area and, taking a longer perspective, from the Balkans and the Mediterranean, followed by cultural patterns and natural elements. Western Volhynia, as the north-westernmost bridgehead of the great Eurasian steppe expanse north of the Carpathians, was a refuge for the eastern flora and fauna (see the distribution of the souslik in Poland and other steppe species occurring in both the Moravian Gate and in Volhynia, Fig. 38).

An extension of the ecological corridor was formed by a belt of loess uplands in southern Poland, offering habitats preferred by thermophilous vegetation having Mediterranean characteristics (sub-Mediterranean vegetation) and continental vegetation displaying Black Sea characteristics. Understood thus, Western Volhynia ('Volhynia Gate') and the Przemyśl Gate within Western Opole were important points in interregional communication – a kind of a 'pass' between the two major geographic zones of the Baltic-Pontic Area. The nature of the 'pass' seems to be illustrated best by the history of Grzęda Sokalska, settled by Corded Ware culture societies. It comes out as a place of passage and stopover for all corded populations migrating west from the East European steppe zone [see Machnik, in this volume].

A further discussion of routes in the Baltic-Pontic Area, in the context of natural sources, shall analyze the Late Holocene changes in the environment and their potential impact on the shaping of communication patterns. Another issue calling for an analysis is the identification of possible route markers in palaeobotanic and archaeozoological sources.

*Translated by Piotr T. Żebrowski*

## ABBREVIATIONS

- AA – Archäologischer Anzeiger. Berlin  
ActaArch – Acta Archaeologica. Copenhagen  
ActaArchHung – Acta Archeologica Academiae Scientiarum Hungaricae. Budapest
- AAS – Anatolian Archaeological Studies. Tokio  
AJA – American Journal of Archaeology. New York  
AoF – Altorientalische Forschungen. Berlin  
AnSt – Anatolian Studies. London  
APŚ – Archeologia Polski Środkowoschodniej. Lublin  
ARM 4 – Dossin G., Lettres. Textes cunéiformes, vol XXV. Musée du Louvre, Département des Antiquités Orientales, 1951. Paris
- AVL – Arkheologia Vostochno-Evropeiskoi Lesostepi. Voronezh  
BAR IS – British Archeological Raports. International Series. Oxford  
BICS – Bulletin of the Institute of Classical Studies of the University of London. London
- BPS – Baltic-Pontic Studies. Poznań  
BSA – The Annual of the British School at Athens. London  
CAD – Assyrian Dictionary of the Oriental Institute of the University of Chicago, I.J. Gelb, B. Landsberger, A.L. Oppenheim, E. Reiner (Eds), 1964 - . Chicago
- JBS – Journal of Baltic Studies. Abingdon  
JCH – Journal of Cultural Heritage. Amsterdam  
JCS – Journal of Cuneiform Studies. Chicago  
JESHO – Journal of the Economic and Social History of the Orient. Leiden
- JIES – The Journal of Indo-European Studies. Waschington D.C.  
JRAI – Journal of the Royal Anthropological Institute. London  
JRGZM – Jahrbuch der Römisch-Germanischen Zentralmuseums Mainz. Mayence
- KSIA – Kratkiye soobscheniya Instituta Arkheologii. Moskva  
KSIIMK – Kratkiye soobscheniya Instituta Materialnoy Kultury. Moskva  
MDP 22 – Scheil V., Actes juridiques susiens. Mémoires de la mission archéologique de Perse, Vol XXII, 1930. Paris
- MIA – Materialy i issledovaniya po Arkheologii SSSR. Moskva-Leningrad
- NA IA NANU – Nauchniy Arkhiv Instytutu Arkheologii Natsionalnoy Akademii Nauk Ukrainy. Kiev

- NHMU – National History Museum of Ukraine. Kiev  
 OJA – Oxford Journal of Archaeology. Oxford  
 PBS 8/2 – E. Chiera, *Old Babylonian Contracts*, 1922. Philadelphia  
 Posiedzenia P.I.G. – Posiedzenia Państwowego Instytutu Geologii. Warszawa  
 PPS – Proceedings of the Prehistoric Society. London  
 PZ – *Prähistorische Zeitschrift*. Berlin  
 RA – *Rossiyska Arkheologiya*. Moskva  
 RA 36 – *Revue d'Assyriologie et d'Archeologie orientale*, 1938. Paris  
 Riftin – A.P. Riftin, *Staro-vavilonskie iuridicheskie i administrativnye dokumenty v sobraniakh SSSR*, 1937. Moskva  
 SA – *Sovetska (Sovetskaja) Arkheologiya*. Moskva  
 UET V – H.H. Figulla, Martin W.J., *Letters and Documents of the Old Babylonian Period. Ur Excavation Texts*, 1953. London  
 VDI – *Viestnik Drevney Istorii*. Moskva  
 WA – *Wiadomości Archeologiczne*. Warszawa  
 ZA – *Zeitschrift für Assyriologie*. München

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12	Fig. 3. 'The router of the Argonauts' journey according to S. Czarnowski [Czarnowski 1937/1956 – visualization by the present authors]	Fig. 3. 'The Route of the Argonauts' Journey According to S. Czarnowski [Czarnowski 1937/1956 – visualization by the present authors]. Legend: 1 – routes, 2 – routes?
153	Koško, Szmyt 2007	Marciniak 2004
526	Koško A., Szmyt M.  2004a <i>Nomadyzm a pastoralizm w międzyrzeczu Wisły i Dniepru</i> . Archeologia Bimaris 3. Poznań.	Koško A., Szmyt M.  2004a (Eds) <i>Nomadyzm a pastoralizm w międzyrzeczu Wisły i Dniepru</i> . Archeologia Bimaris 3. Poznań.
526	Koško A. Szmyt M. (Eds.)  2007 <i>Nomadyzm a pastoralizm w międzyrzeczu Wisły i Dniepru w IV – III tys.</i> Archaeologia Bimaris 3: 35-42.	Marciniak A.  2004 Mikrospołeczny wymiar pasterstwa i nomadyzmu i tafonomiczne podstawy ich identyfikacji w materiałach faunistycznych. In: A. Koško, M. Szmyt (Eds) <i>Nomadyzm a pastoralizm w międzyrzeczu Wisły i Dniepru</i> . Archaeologia Bimaris 3: 35-43.