

12. Biogeographic Position of the Khorassan-Kopetdagh

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Abstract

The biogeographic position of the Khorassan area, which within Turkmenistan includes the Kopetdagh Mountains, is discussed. Khorassan is believed to be a transitional province included in the Irano-Turanian subregion of the Saharo-Gobian biogeographic region of the Palearctic realm. Specificity of fauna and flora of Khorassan-Kopetdagh is expressed in its mixed character: it includes a combination of western (mostly Mediterranean) and eastern (Turanian) elements, as well as local autochthonous endemics, usually at the level of species. Connections of the Khorassan biota with surrounding deserts and a separate controversial question of Hyrcanian connections are discussed.

Introduction

The majority of biogeographers distinguish the Turkmeno-Khorassan Mountains (including their ranges within Turkmenistan called the Kopetdagh Mountains) as a separate biogeographic unit. Its rank, however, is not firmly established and varies from province to subprovince under different names, including Turkmeno-Iranian Mountainous Province (Lavrenko 1965), Khorassan-Kopetdagh Province (Kamelin 1970, 1973), Khorassan Mountainous Province (Yemelyanov 1974), or Khorassan Province (Takhtadzhani 1978). There is no argument among these authors that Khorassan should be viewed as a separate biogeographic area. There are, however, different opinions regarding the affiliation of this unit with a certain region/subregion of the higher level. The reason for this ambiguity most likely lies in the more or less subjective opinions of certain workers as well as in the general lack of biogeographic studies devoted to this southwestern part of the Palearctic biogeographic realm.

Khorassan-Kopetdagh as a Biogeographic Entity

Our discussion attempts to determine which distinctive biogeographic features of the Khorassan are responsible for its separation from both the mountain systems of Middle and Central Asia (which lie to the east from Khorassan) and from the Armenian and Iranian mountain plateaus (which border the Turkmeno-Khorassan Mountains to the west). The most prominent characteristics of Khorassan flora and fauna are the presence of a large number of European, European-Mediterranean, and East Mediterranean species, and the combination of these elements with those of the Turanian region (the desert, or eremic, element of Middle Asian deserts).

This combination occurs within areas which are physiographically distinctly defined (e.g., the well-studied Sumbar River drainage in Southwest Kopetdagh). The documented patterns of distribution of eremic Turanian species in southern Turkmenistan show that these elements penetrate not only to foothills but also to the high altitudinal belt, or steppe zone, of Kopetdagh. We presume that this kind of combination of elements, different in biogeographic origin, is found within the entire system of the Turkmeno-Khorassan Mountains. These lie predominantly within Northeast Iran, and are very poorly studied compared to the Turkmen Kopetdagh.

The geographical ranges of numerous European-Mediterranean, East Mediterranean and Southwest Asian (or Middle Eastern, or Levantine) species of animals and plants include the Kopetdagh Mountains, which comprise the easternmost limit of their distribution. Examples can be found among many plant species (Kamelin 1970; Takhtadzhan 1978), insects (Kryzhanovsky 1965), and mammals (Rossolimo and Pavlinov 1982).

The similar distribution can be traced in the ranges of representatives of freshwater fauna. For example, Livanov (1951) found that free-living planarian flatworms of the genus *Dugesia* discovered in Kopetdagh belong to a small but distinctly separate species group which is close to European species and represents the easternmost distributional limit for this group. The presence of such forms definitely indicates a similarity between Kopetdagh and Mediterranean biotas (especially regarding East Mediterranean and Southwest Asian elements).

At the same time, the South Turanian species inhabiting desert landscapes also are important contributors to the Kopetdagh biota. For many of these species Kopetdagh is also known to be their limit of distribution (western or southern). Also, Kopetdagh is the northern limit of the geographical range for some Iranian endemics, e.g., the plant genus *Cousinia* (Asteraceae), whose center of diversity lies within the Iranian Plateau (Agakhanyants 1978). A similar range is known for the grasshopper genus *Saxitania* (Acrididae) (Shumakov 1963).

Finally, Kopetdagh (and, probably, the rest of the Khorassan) possesses a number of local, autochthonous endemic species. The flora of Kopetdagh is estimated to include an approximate 18% of endemic species (Kamelin 1970). A

list of well-studied darkling beetles (Tenebrionidae) includes 33 endemics to the Khorassan region (Nepesova 1975).

All these features of Khorassan (of which Kopetdagh is the best-studied portion) form a unique combination of floral and faunal elements which includes species of western, eastern, northern, southern, and endemic origin. One can argue for separation of Khorassan into a special biogeographic unit only if the existence of this unique mixture of elements is recognized, and thus, the transitional nature of this combination is fully acknowledged. Defined in this way, Khorassan can be considered a biogeographic province of the same rank as all other provinces included in the Irano-Turanian subregion of the Saharo-Gobian region of the Ancient Mediterranean (Kryzhanovsky 1965). This last unit is considered a subrealm, or subdominion, of the Palearctic Realm (dominion), with some reservations regarding its transitional nature. Another biogeographic classification proposed by Yemelyanov (1974) includes, among others, the following provinces: the Khorassan Mountainous, Southwest Asian, Hyrcanian, Iranian, Afghan, Turkestan, and South Turanian.

Yemelyanov (1974) discerned the transitional character of some of these provinces (e.g., the Southwest Asian and Hyrcanian); he thus includes both in the Irano-Turanian subregion of the Saharo-Gobian ("Sethian" sensu Yemelyanov 1974) region *and* the Mediterranean subregion of the Mediterranean ("Hesperic" sensu Yemelyanov 1974) region. The innovative concept of "transitional" areas proposed by this author eliminates the excessive rigidity of the conventional schemes. This approach as well as Yemelyanov's regionalization of the Irano-Turanian subregion appear to be reasonable. One could only argue against the unnecessary introduction of new names (such as "Sethian" or "Hesperic") for those regions which already have traditional common names.

Turan versus the Mediterranean?

The most prominent of those Russian researchers who considered the problem of biogeographic division of Middle Asia and adjacent areas was O. L. Kryzhanovsky (1965, 1980). He worked out zoogeographical division of the Irano-Turanian subregion using data on Coleoptera and several other animal groups. Kryzhanovsky distinguished a so-called "Irano-Azerbaijdzhanian province"; here, the rank of "province" was undoubtedly higher than the corresponding rank used by the majority of other authors (Lavrenko 1965; Kamelin 1970, 1973; Yemelyanov 1974; Takhtadzhan 1978). This is due to the fact that the entire Irano-Turanian area was treated by Kryzhanovsky (1965) as a "superprovince," which included the Irano-Azerbaijdzhanian Province as well as the Turanian, Central Iranian, Afghano-Turkestanian, and other provinces. Khorassan was included by Kryzhanovsky (1965) into the limits of the Irano-Azerbaijdzhanian province; therefore, its biogeographic rank appeared to be lower than that of other areas of the Irano-Turanian superprovince (or subregion, according to other authors).

Another Russian biogeographer, V.M. Neronov (1976), published the biogeographic division of Iran, using data on the distribution of rodents. His division differs by distinguishing the Southeast Asian ("Peredneaziatskaya") superprovince, which is similar to Kryzhanovsky's Irano-Azerbaijani province. However, this superprovince is included by Neronov (1976) not within the Saharo-Gobian region but within the Mediterranean region. This treatment reflects the traditional understanding of the Mediterranean in the broadest sense which was, in the past, used by many schools of biogeographers, especially plant geographers (Wulff 1944), and which remained popular until recent years (Tolmachev 1974). Such tradition takes its roots in the views of the famous plant geographer, Engler, who included all Southwest Asia, the Caucasus, and part of Iran in the Mediterranean region. The latter, under such treatment, necessarily receives a very vague eastern boundary (Gratsiansky 1971). Most modern plant geographers treat the Mediterranean area according to the tradition of Alfonse De Candolle and Boissier, in a much more narrow sense, within the range of evergreen tree species (such as laurel, oleander, and evergreen oaks). In Asia, the Mediterranean region in this strict sense occupies only narrow coastal zone in Anatolia and the Levant (Lavrenko 1965; Takhtadzhian 1978). We agree with the last delineation of the Mediterranean region. It eliminates the certain ambiguity in definition of this unit, which often triggered criticism from different viewpoints, or – even – proposals to abolish the term "Mediterranean" (Kucheruk 1972).

Taking into account these arguments, we cannot agree with Neronov (1976) in separation of the Southeast Asian superprovince from the Irano-Turanian subregion and its affiliation with the Mediterranean region. We also cannot accept the very rigid boundary between the Mediterranean and Irano-Turanian area (i.e., between the Mediterranean and Saharo-Gobian biogeographic regions) which Neronov (1976) and Neronov and Arsenyeva (1980) draw along the eastern promontory of Kopetdagh, around the central Iranian deserts, and toward the southwest to the southern Zagros Mountains. Such rigid boundaries are not completely supported by the biogeographic situation in transitional areas.

Transitional Position of Khorassan

The acknowledgment of the essentially transitional character of certain biogeographic areas led Yemelyanov (1974) to the separation of special transitional areas, e.g., his Southwest Asian and Hyrcanian provinces. This approach seems to reflect real situation adequately. It does not require grouping together transitional and non-transitional provinces; therefore, the intermediate category of superprovince is not necessary and can be omitted. One considers only the categories of the region (e.g., Saharo-Gobian), subregion (e.g., Irano-Turanian), and province (e.g., Khorassan). Each province is characterized by a specific set of species and description of its biota, as well as by the combination of abiotic conditions in the history of its development and in present time.

The chorological relationship of the Khorassan with all surrounding provinces, therefore, can be characterized in the following way. The Khorassan province is bordered to the north and east by the South Turanian province; to the southeast, by the Afghan (or Afghano-Turkestan) province; to the south, by the Central Iranian province; to the west, by the Southwest Asian province; and to the northwest, by the Hyrcanian province. The Southwest Asian province is diverse and includes several subprovinces, of which the one directly bordering the Khorassan province is correspondent to the Armenian subprovince of Yemelyanov (1974), or to the Atropatenian subprovince of Takhtadzhian (1978).

This peculiar biogeographic position, combined with the specific historical development (prolonged island isolation in late Paleogene – early Neogene, which led to the formation of numerous endemic species), is the reason why the Khorassan area is separated as a distinct unit by most biogeographers. The fauna and flora of Khorassan (including Kopetdagh within Turkmenistan) present a very characteristic mix of narrow-range species (the endemics of Khorassan, Southwest Asia, South Turan, mountainous Middle Asia, and Iran) and wide-ranging ones (European-Mediterranean, Ancient Mediterranean, and Palearctic). The character of this mixture in Khorassan differs from the combinations of faunas or floras found at the transition between larger biogeographic categories. It should be noted that, where the Mediterranean and Saharo-Gobian regions meet in Asia and in Africa, the boundaries of these two Palearctic regions lie very close to the Paleotropical realm. Moreover, the territories which lie in southern Iran and Pakistan (the Mekran Mountains, Baluchistan, and Sind) were recently affiliated with the Paleotropical, but not the Palearctic realm (Kryzhanovsky 1980). This proximity of Paleotropical desert biotas again emphasizes the transitional character of Khorassan, which effectively separates the southern and northern deserts of Asia.

Nevertheless, regarding its transitional status, the Khorassan province cannot be classified as transitional area between two realms (as, for example, Baluchistan province is between Palearctic and Paleotropical realms), nor between two regions of the same realm (as are the Southwest Asian or Hyrcanian provinces which separate the Mediterranean and Saharo-Gobian regions), nor even between two subregions of the same region (as the Mesopotamian province is between the Saharan and Irano-Turanian subregions). The mixed character of Khorassan fauna and flora is more local, and it is defined by its location on the crossroad between five different provinces of the Irano-Turanian subregion. This mixture, combined with substantial autochthonous endemism, determines the unmistakable image of the Khorassan province, including the Kopetdagh Mountains within the republic of Turkmenistan.

Contacts Between Mountain and Desert Biotas

Although a mountainous area, the Khorassan province still experiences contact with the surrounding lowland biotas. Since Khorassan is surrounded by a number of vast Asian deserts (which lie within South Turanian, Central Iranian, and, partly, Afghan provinces), it is occupied by xerophile desert species of animals and plants of various origin. These elements often penetrate to the middle and even high (mountain steppe) altitudinal belts, up to 1,800 or 2,000 m. Such penetration may have been enhanced since the last aridization cycle (Agakhanyants 1978). Disjunct ranges of xerophile elements might have been formed in the past by pluvial, humid climatic periods. An example of a species with a disjunct range from a well-studied fauna of reptiles is a lizard species *Chalcides ocellatus* (Scincidae), which recently was found in Kopetdagh; its main range lies in the Mediterranean region and in the south of the Central Iranian province (Darevsky 1981).

The Hyrcanian Connection

Biogeographical analysis of the Khorassan-Kopetdagh necessitates consideration of the often discussed and misunderstood connection between the Khorassan and Hyrcanian provinces. A unique relict biogeographic area, Hyrcania is well defined as the southwestern and southern shores of the Caspian Sea (within the Talysh or Lenkoran areas in Azerbaidzhan, administrative provinces of Ghilan and Mazandaran in Iran, and, possibly, also the far southwestern portion of Turkmenistan in the delta of the Atrek River). This area has distinctive climate and soils; many authors have ascribed to it an even higher rank than province. Takhtadzhian (1978) mentions that Hyrcania is one of the most clearly defined and delineated provinces in the Irano-Turanian region. Kryzhanovsky (1965) classifies Hyrcania within the Mediterranean region; other authors (V.B. Sochava) include it into the European forest province of the Circumboreal subregion of the Palearctic (Physical-Geographical Atlas of the World 1964). These different viewpoints depend on recognition of the relict nature of Hyrcania; nevertheless, in the modern geological epoch, Hyrcania is sharply isolated from adjacent mountain and desert areas. It occupies relict forests of Talysh, northern slopes and foothills of the Elburz Mountains (its southern slope belongs to the Southwest Asian province), and the lower portion of the Atrek River. The relict Hyrcanian forests are located at altitudes from sea level to 500–800 m (Takhtadzhian 1978). In Kopetdagh, this belt is occupied by a completely different landscape of climatically defined semidesert foothills (adyrs). However, the proximity of the Hyrcania and Khorassan, as well as the presence of mesophilic mountain valleys with riparian forests in Southwest Kopetdagh, motivated some authors in the past (Petrov 1945; Rustamov 1945) to characterize certain elements of the fauna and flora of Kopetdagh as “Hyrcanian” ones. This view seems to be based on an

misunderstanding. All animals and plants mentioned by these authors as "Hyrcanian" are actually mesophilic species common not only to Hyrcania and Khorassan but distributed much more widely, with European-Mediterranean, Ancient Mediterranean, or European-Caucasian-Khorassan geographic ranges. The relict character of certain species in Southwest Kopetdagh valleys (such as walnut *Juglans regia* or Eastern sycamore tree *Platanus orientalis*) has no connection with the Hyrcanian flora since such Tertiary relicts are present throughout most of the Ancient Mediterranean area, often with a disjunct range. Of the Kopetdagh flora, which is very well studied and includes more than 1,800 species of vascular plants (Kamelin 1970), only very few species are specific Hyrcanian elements. Such characteristic dominants of the Hyrcanian forest as *Quercus castaneifolia* and *Parrotia persica* (the relict genus), are absent from Kopetdagh. There are also very few animal species with the Hyrcanian-Khorassan distribution; these include a ground beetle *Brosicus karelini* (Carabidae) and darkling beetle *Metaclisa viridis* (Tenebrionidae), which penetrate from Hyrcania to the humid valleys of Southwest Kopetdagh (Kryzhanovsky 1965). Many genera have vicariant species in Hyrcania and Khorassan; for example, spiders *Dysdera concinna* (Dysderidae) in Hyrcania and *D. pococki* in Kopetdagh (Dunin 1982, 1985).

Hyrcania and Khorassan, therefore, do not have much in common, and there are almost no "Hyrcanian" biogeographic elements in Southwest Kopetdagh. One can only talk about means of penetration of the mesophilic European, Mediterranean, or Caucasian animals and plants to Kopetdagh and further eastward. These ways, naturally, led through the Hyrcanian province because they were limited by the Caspian Sea to the north and the Iranian deserts to the south.

An additional confusion concerning this question probably originated from historical-cultural traditions: ancient Hyrcania included, among other territories, Southwest Kopetdagh, whereas Parthia, adjacent to the east and southeast, included the rest of Turkmeno-Khorassan Mountains and the northern submontane plain (Yefremov 1955).



Walnut (*Juglans regia*) forest along the Aidere River Valley, Southwest Kopetdagh (1,200 m).
Photo by K.P. Popov.