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The distribution of mosquitoes in Romania (Diptera: Culicidae).Part II: *Culiseta, Coquillettidia, Ochlerotatus, Orthopodomyia* and *Uranotaenia*

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Introduction

The recorded distributions in Romania of species of *Anopheles, Aedes* and *Culex* were presented by Nicolescu *et al.* (2002). This article completes the distributions of the mosquitoes of Romania by describing the species of *Culiseta, Coquillettidia, Ochlerotatus, Orthopodomyia and Uranotaenia.*

Genus *Culiseta*

The genus *Culiseta* is represented in Romania by eight species, six of which have a wide Palaearctic distribution.

Culiseta annulata has been found in seven zones (7 and 9-14) (Thalhammer, 1899; Leon, 1910; Zotta, 1932; Zotta *et al*., 1943; Ungureanu, 1942a, 1956; Sicart *et al*., 1961; Motas *et al*., 1963; Giurca *et al*., 1983; Giurca, 1984; Ciolpan *et al*., 1990; Velehorschi *et al*., 1990; Nicolescu, 1999) having quite abundant populations and found as larvae all year round. The distribution range of this species (Fig. 1) may be wider than currently stated.

Culiseta alaskaensis has been recorded in five zones (5, 7, 10, 12 and 14) (Zotta, 1934; Ungureanu, 1956; Ciolpan *et al*., 1998) but not yet in mountainous areas (Fig. 2).

Culiseta longiareolata has been collected in zones 10-12 (Zotta, 1932; Ungureanu, 1956; Nicolescu, 1999), its larvae being found only in artificial sites (Fig. 3) and *Culiseta morsitans* (Fig. 4) in zones 10, 11 and 14 (Zotta, 1932; Ungureanu, 1942 a, 1956). *Culiseta subochrea* (Fig. 5) has been recorded in zones 11 and 12 of the plain area (Ungureanu, 1956; Nicolescu, 1999) and *Cs. glaphyroptera* (Fig. 6) in the hilly and mountainous zones 1 and 5 (Ungureanu, 1956). The first three species and *Cs. fumipennis* (Fig. 7) have, only rarely, been found in the plain of zone 11 (Zotta, 1932; Zotta *et al*., 1944; Ungureanu, 1956) and *Cs. ochroptera* (Fig. 8) has been recorded only in the mountainous areas of zone 2 (Nicolescu & Velehorschi, 1988).

Genus *Coquillettidia*

Coquillettidia richiardii is quite abundant in the plain and low tableland of zones 10-14 (Fig.9) (Mezincescu, 1908 cited by Seguy, 1923; Leon, 1910; Zotta, 1927, 1932; Martini & Zotta, 1934; Zotta *et al*., 1944; Ungureanu, 1942a; Mezincescu & Cornelson, 1943; Ungureanu & Ilies, 1959; Sicart *et al*., 1961; Motas *et al*., 1963; Giurca, 1984; Ciolpan *et al*., 1990; Velehorschi *et al*., 1990; Nicolescu, 1999) and especially along the Danube and within the Danube Delta where it has sometimes been recorded in very high densities. *Coquillettidia buxtoni* (Fig. 3) has been found in zones 10-12 (Giurca *et al*., 1983; Giurca, 1984; Nicolescu & Velehorschi, 1988; Ciolpan *et al*., 1990; Nicolescu, 1999), but more rarely and as smaller populations.

Genus *Ochlerotatus*

The genus *Ochlerotatus* is represented in Romania by twenty-two species.

Ochlerotatus geniculatus (Fig. 10) develops in tree holes and has a very wide distribution in the forests from the mountains to the Danube Delta, in zones 1-11, 13 and 14 (Thalhammer, 1899; Zotta, 1932, 1938, 1943; Ungureanu, 1940a, 1942a; Mardare, 1943; Motas *et al*., 1963; Dancescu, 1980; Giurca, 1982, 1984; Ciolpan *et al*., 1990, 1998; Velehorschi *et al*., 1990; Nicolescu, 1999).

Ochlerotatus caspius, present in twelve zones (Fig. 11), and *Oc. dorsalis*, present in thirteen zones (Fig. 12), seem to have a very wide distribution, the former being found in zones 1-5, 7, 8 and 10-14 (Edwards, 1921; Zotta, 1932; Martini & Zotta, 1934; Zotta *et al*., 1944; Ungureanu, 1940a, 1942a; Mardare, 1943; Mezincescu & Cornelson, 1943; Ungureanu & Ilies, 1959; Sicart *et al*., 1961; Motas *et al*., 1963; Dancescu, 1980; Giurca, 1982, 1984; Ciolpan *et al*., 1990, 1998; Velehorschi *et al*., 1990; Nicolescu, 1999), and the latter in zones 1-5 and 7-14 (Thalhammer, 1899; Edwards, 1921; Zotta, 1932; Zotta *et al*., 1944; Ungureanu, 1940a, 1942a; Mardare, 1943; Ungureanu & Ilies, 1959; Giurca, 1982, 1984; Ciolpan *et al*., 1998; Velehorschi *et al*., 1990; Nicolescu, 1999). These species are usually found together as larvae, with *Oc. caspius* in higher densities.

Ochlerotatus annulipes (Fig. 13) appears in the spring in quite high densities over much of Romania (zones 1, 3, 7, 9-11, 13 and 14) (Thalhammer, 1899; Edwards, 1921; Zotta, 1932; Ungureanu, 1940a, 1942a; Mardare, 1943; Giurca, 1982, 1984; Giurca *et al*., 1983; Ciolpan *et al*., 1990, 1998; Velehorschi *et al*., 1990; Nicolescu, 1999).

Ochlerotatus cantans (Fig. 14), *Oc. leucomelas* (Fig. 15), *Oc. pulcritarsis* (Fig. 16) and *Oc. flavescens* (Fig. 15) each occur in six zones. *Ochlerotatus cantans* has been recorded in zones 2, 7, 9-11 and 14 in all terrains (Thalhammer, 1899; Zotta, 1932; Ungureanu, 1940a, 1942a; Mardare, 1943; Giurca, 1982, 1984; Ciolpan *et al*., 1998; Nicolescu, 1999). *Ochlerotatus flavescens* (Zotta, 1932; Ungureanu, 1940a, 1942a; Mardare, 1943; Giurca, 1982, 1984; Ciolpan *et al*., 1990, 1998; Velehorschi *et al*., 1990; Nicolescu, 1999) and *Oc. leucomelas* (Ungureanu, 1942a; Mardare, 1943; Giurca, 1982, 1984; Ciolpan *et al*., 1998; Velehorschi *et al*., 1990; Nicolescu, 1999) occur only in the hilly and plain zones 7 and 10- 14. *Ochlerotatus pulcritarsis* develops in tree holes in all types of topography and has been recorded in zones 2, 4, 10, 11, 13 and 14 (Thalhammer, 1899; Zotta, 1932, 1938, 1943; Ungureanu, 1942a; Mardare, 1943; Giurca 1982; Nicolescu, 1999).

Ochlerotatus sticticus is present in zones 1, 7, 10, 11 and 14 (Fig. 17) (Edwards, 1921; Zotta, 1932; Ungureanu, 1940a, 1942a; Mardare, 1943; Mihalyi, 1959; Giurca, 1982; Nicolescu, 1999) and is very abundant in some years and areas.

Ten species of *Ochlerotatus*, most of them Holarctic species, have been recorded in only one to four zones, but their ranges may be wider. *Ochlerotatus punctor* (Fig. 18), *Oc. cataphylla* (Fig. 19) and *Oc. communis* (Fig. 20) are present in four zones: *Oc. punctor* in zones 1, 2, 10 and 14 (Ungureanu, 1940a, 1942a; Mardare, 1943; Giurca, 1982, 1984; Nicolescu, 1999), *Oc. cataphylla* in zones 1, 2, 7 and 14 (Ungureanu, 1940a, b, 1942a; Nicolescu & Dancescu, 1979; Giurca, 1982; Ciolpan *et al*., 1998; Nicolescu, 1999), especially in the mountainous and tableland areas, and *Oc. communis* especially in hilly and tableland areas in the northern half of the country in zones 7-9 and 14 (Thalhammer, 1899, 1902; Ungureanu, 1940a, 1942a; Mihalyi, 1959; Nitzulescu & Dancescu, 1979; Giurca, 1982).

Ochlerotatus excrucians (Fig. 21) has been recorded in zones 10, 13 and 14 (Zotta, 1932; Ungureanu, 1942 a; Mardare, 1943; Zotta *et al*., 1944; Giurca, 1982; Velehorschi *et al*., 1990; Nicolescu, 1999), *Oc. intrudens* (Fig. 22) in zones 1 1-13 (Giurca, 1982; Velehorschi *et al*., 1990; Nicolescu, 1999) and *Oc. detritus* (Fig. 23) in saline waters in zones 10, 12 and 13 (Zotta, 1932; Mardare, 1943; Giurca, 1982; Nicolescu, 1999).

Ochlerotatus duplex (Fig. 24) and *Oc. pullatus* (Fig. 25) have each been recorded only twice, *Oc. duplex* in zones 10 and 11 in the Romanian Plain (Nicolescu & Velehorschi, 1988), and *Oc. pullatus* only in the mountainous zones 1 and 2 (Edwards, 1921).

Ochlerotatus riparius (Fig. 7) (Mezincescu & Cornelson, 1943; Zotta *et al*., 1944) and *Oc. refiki* (Fig. 7) (Nicolescu & Velehorschi, 1988) have been recorded only in the plain zone 11.

The records of *Ochlerotatus behningi*, *Oc. zammitii* (Zotta, 1932) and *Oc. nigrinus* (Mihalyi, 1959) await confirmation (Nicolescu, 1995).

Genera *Orthopodomyia* and *Uranotaenia*

Orthopodomyia pulcripalpis and *Uranotaenia unguiculata* are the single representative of their genera in Europe. Orthopodomyia pulcripalpis (Fig. 26) has been found in zones 2 and 10 (Zotta, 1943; Ceianu *et al*., 1995) but may be spread over a larger area. *Uranotaenia unguiculata* (Fig. 9) was recorded in zones 10-14 (Zotta, 1932; Ungureanu, 1942a, b; Zotta *et al*., 1944; Ungureanu & Ilies, 1959; Velehorschi *et al*., 1990; Nicolescu, 1999), never in abundance.

Discussion

Fifty-five species of mosquito have been recorded in Romania, belonging to all eight European genera. This number represents a little over 55% of the mosquito species currently recorded in Europe (Ramsdale & Snow, 1999). This may yet rise to as many as 72 species (Dahl & White, 1978), taking into account the species present in the four zoogeographical European regions extending into Romanian territory. A comparison between the mosquito species currently recorded in Romania and the mosquito species recorded in these four European regions shows a number of new records for these regions, as follows: *Ae. cinereus* and *Ae. geminus* for the Carpathians; *Ae. cinereus* for the Sarmatian Province; *Cx. laticinctus* for the East European Plain; and *An. maculipennis s.s., Ae. cinereus, Ae. geminus, Oc. duplex, Oc. zammitii, Cx. impudicus, Cx. martinii, Cs. fumipennis, Cs. alaskaensis, Cs. subochrea and Cq. buxtoni* for the Pontic Province.

The existence of such a high number of mosquito species in Romania, with only 2.6% of the land area of Europe is due to the variety of topographical and ecological conditions, which range widely between coastal and alpine situations. This aspect becomes more significant taking into consideration that the mosquito species recorded in Europe represent less than 4% from the mosquito species in the world.

Analysis of the ranges of distribution of the 55 mosquito species identified in Romania shows the presence of many species having wide interregional distributions. With 15 Holarctic and 30 Palaearctic species, there are only 10 species peculiar to Europe, including two Mediterranean species (*Oc. zammitii* and *Cq. buxtoni*). Moreover, some Holarctic and Palaearctic species (*Ae. vexans, Cx. pipiens, Cx. laticinctus, Cx. theileri, Cx. mimeticus, Cs. longiareolata* and *Ur. unguiculata*) are also present in large areas of other zoogeographical regions. It is obvious that the Romanian territory offers a large range of habitats to these very adaptive and widely distributed species.

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Zotta, G., Radacovici, E., Teodorescu, A.M., Georgescu, M., Mardare, I., Duport, M., Atanasiu, M. & Trifon, A. (1946) Evolutia endemiei palustre in judetul Teleorman [Malaria endemic in Teleorman county]. *Revista Stiintelor Medicale* **XXXV**, 781-815.

Figures 1-26. The distribution of mosquitoes in the different ecological zones in Romania.

The zones are:

1.Oriental Carpathians, 2. South Carpathians, 3. Occidental Carpathians, 4. Banat Mountains, 5. Oriental Subcarpathians, 6. South Subcarpathians, 7. Subcarpathians of Transylvania, 8. Western Transylvania, 9. Western Plain, 10. North-western Romanian Plain, 11. South-eastern Romanian Plain, 12. Dobrudja, 13. The Danube Delta and the lagoon complex, 14. Moldavian Tableland.

Maps are not provided for *Ochlerotatus behningi*, *Oc. zammitii* and *Oc. nigrinus* as the records are uncertain.

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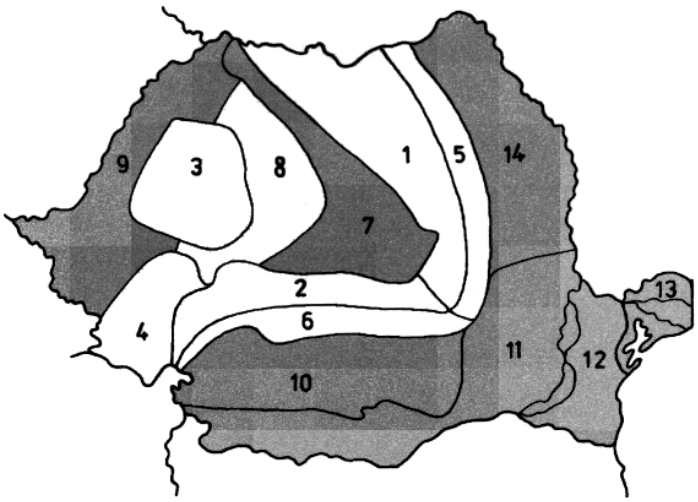
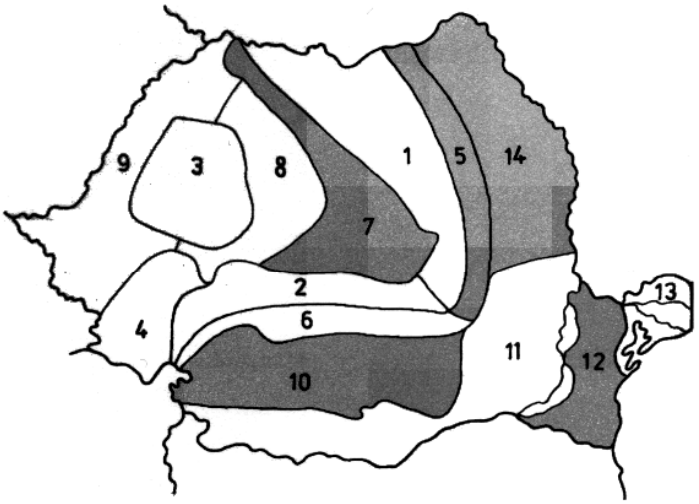


Figure 1



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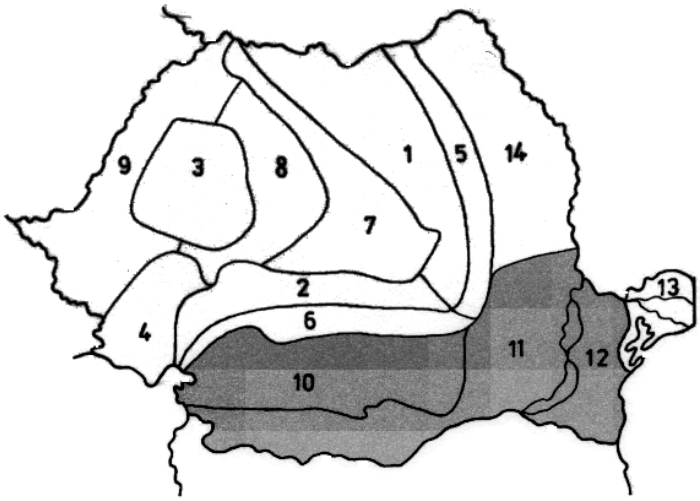

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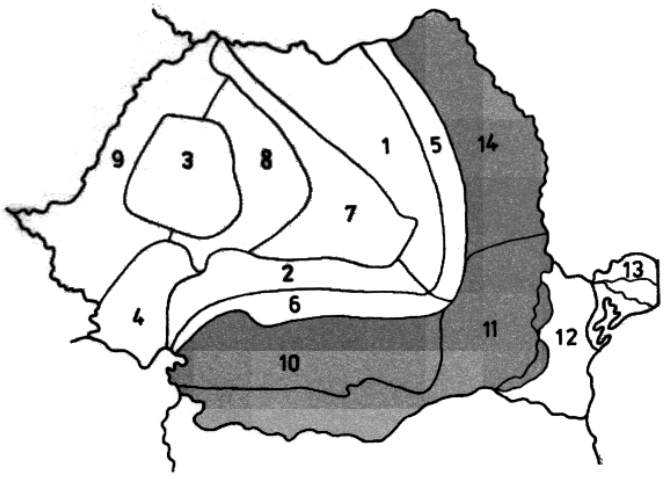

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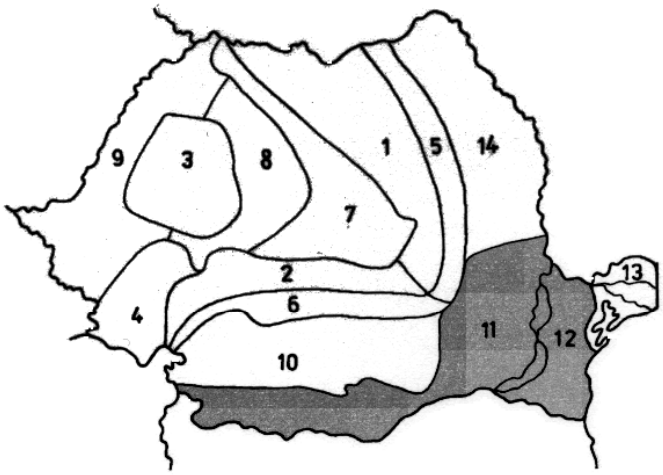

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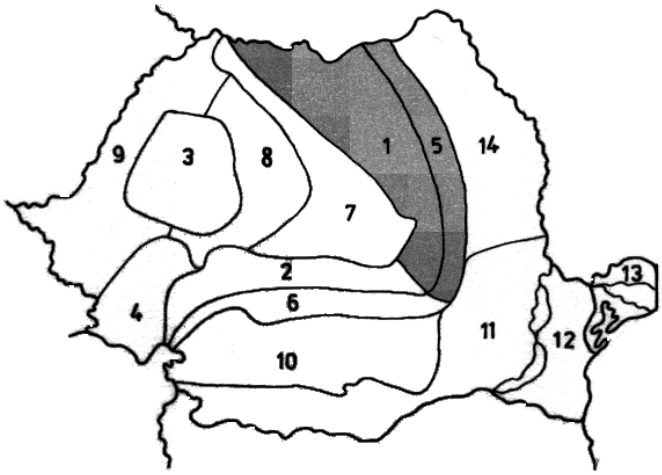

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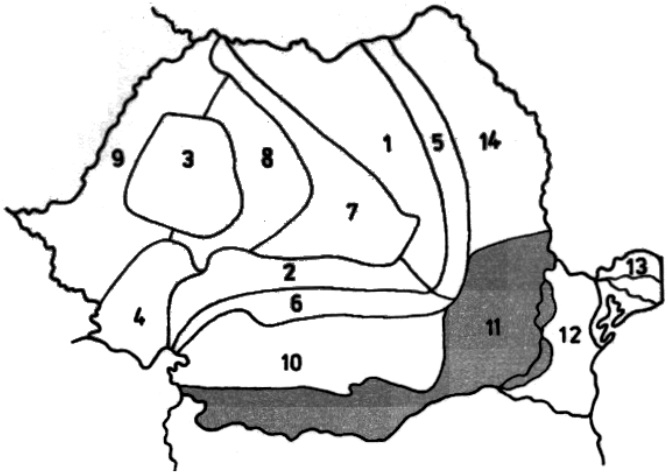

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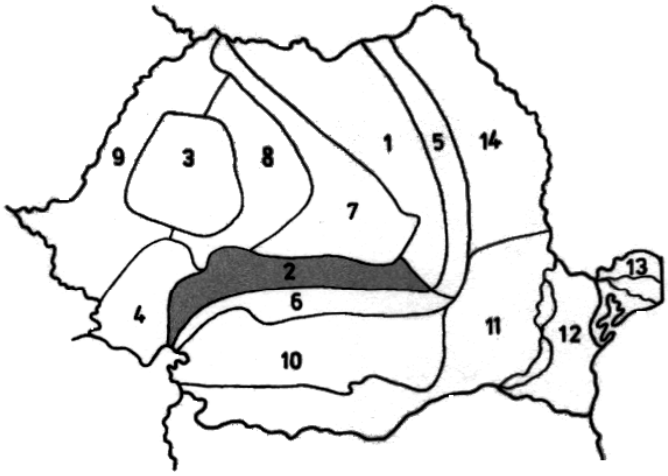

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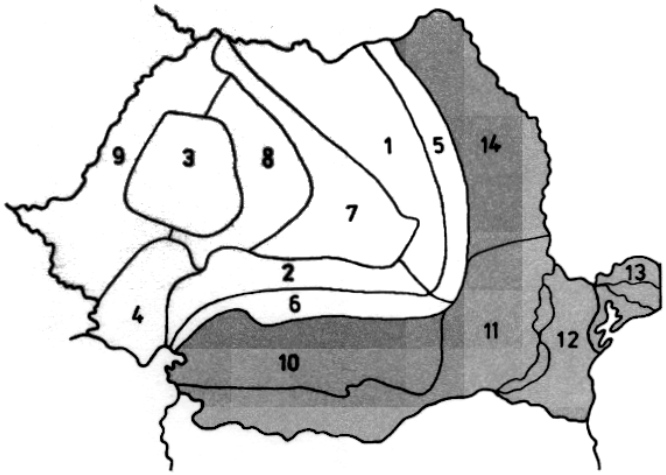

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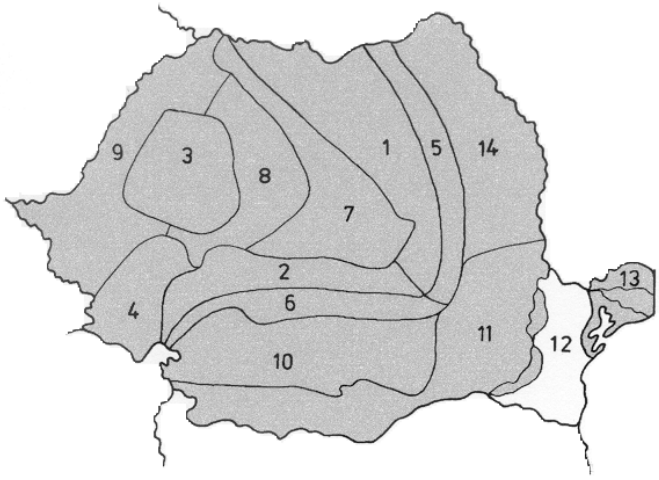

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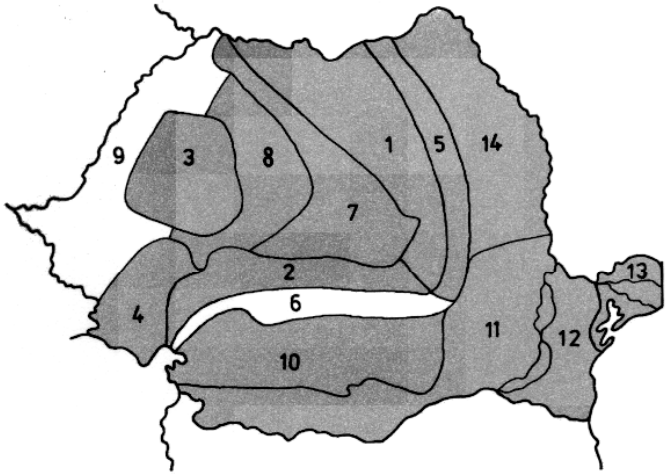

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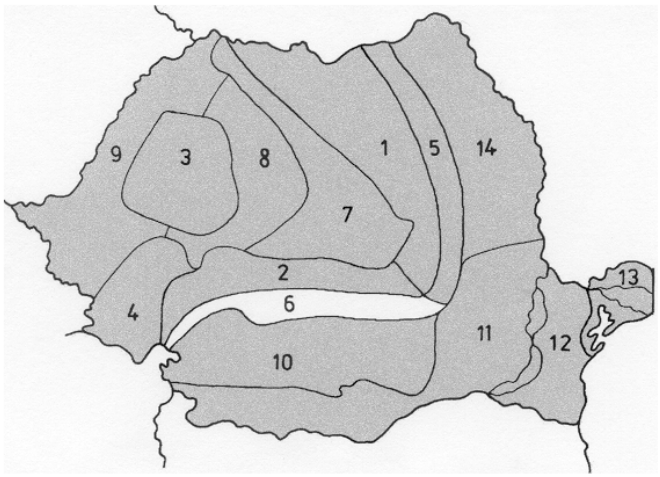

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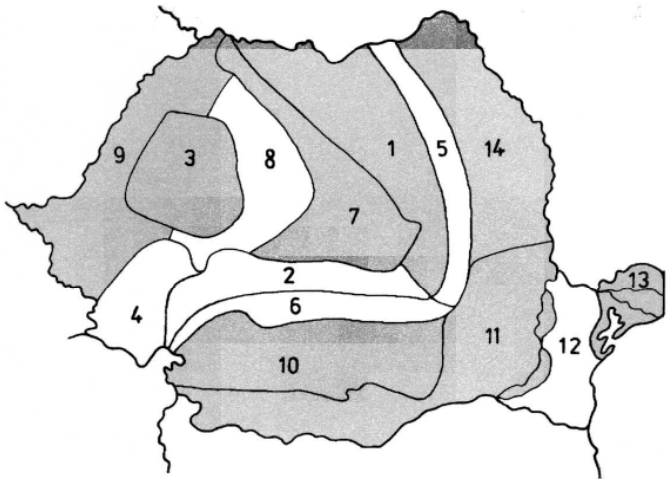

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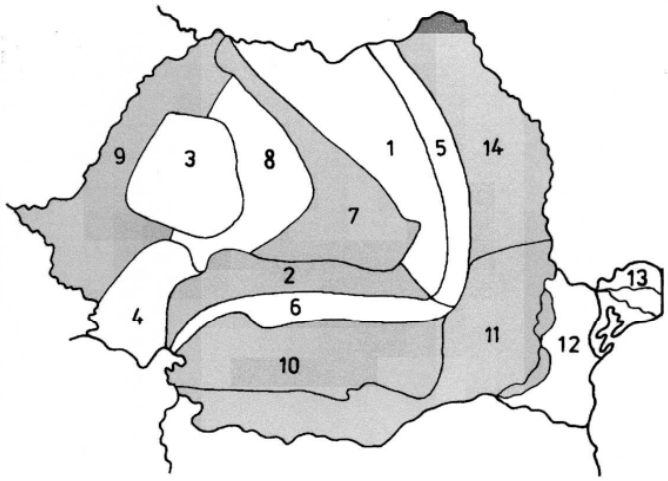

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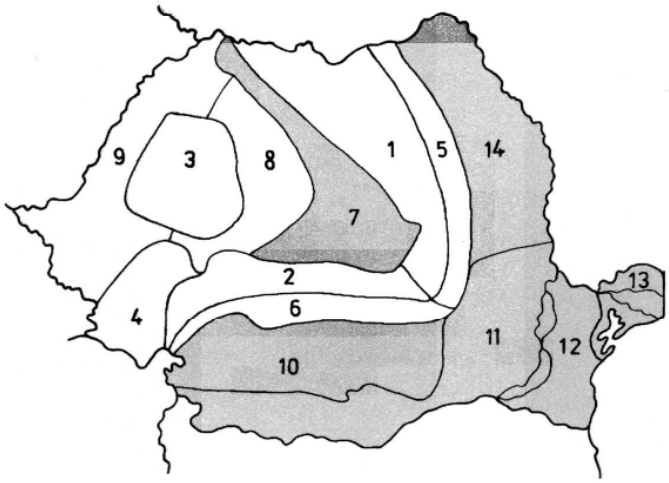

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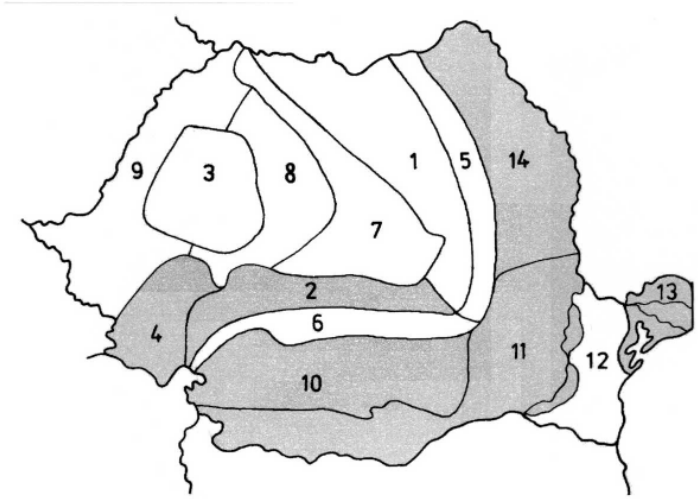

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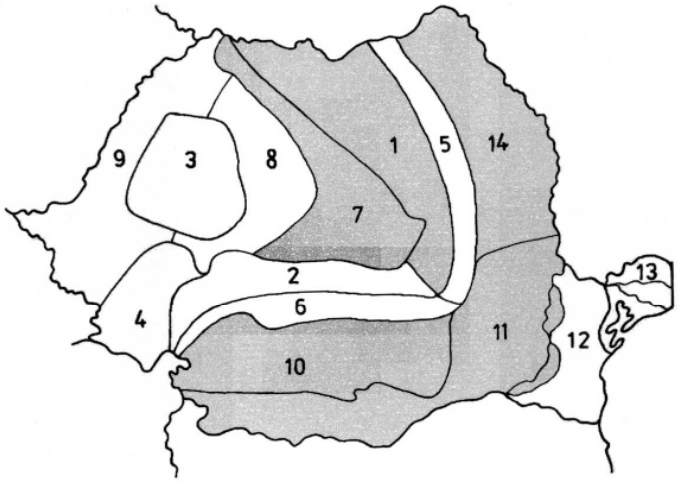

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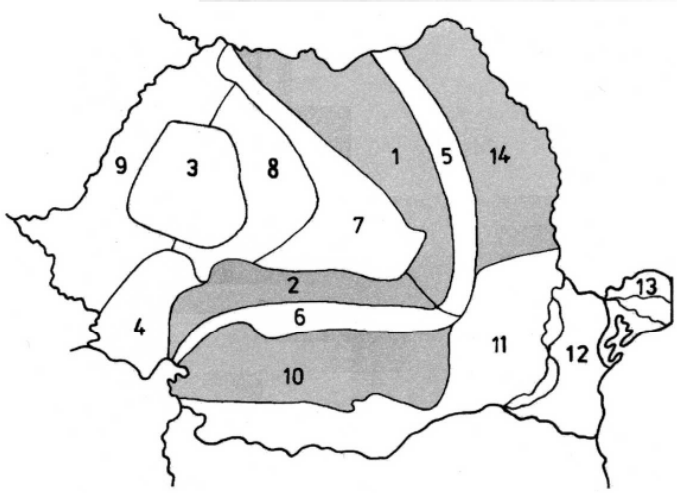

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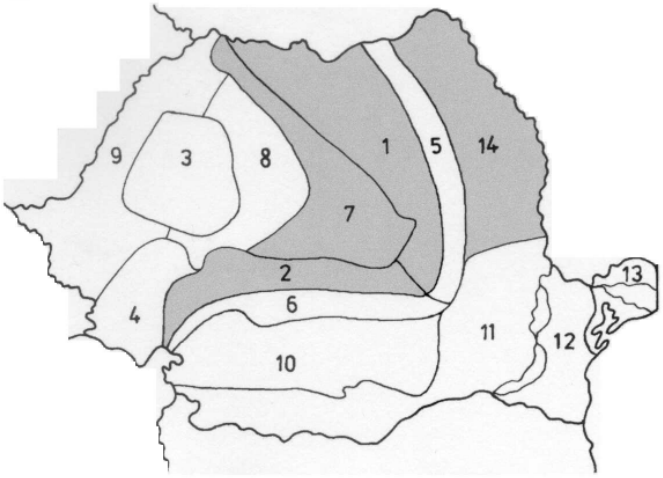

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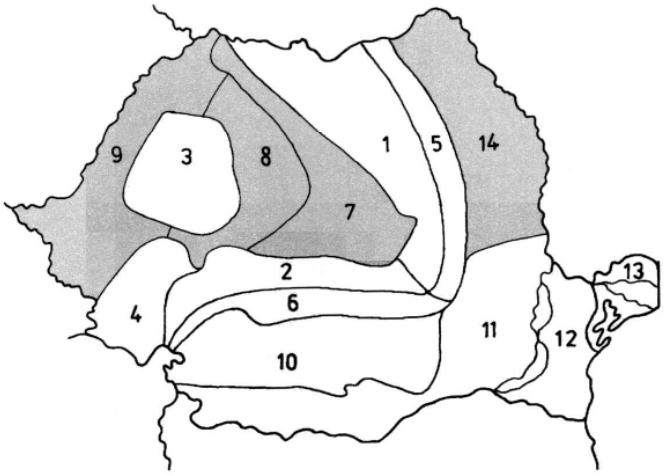

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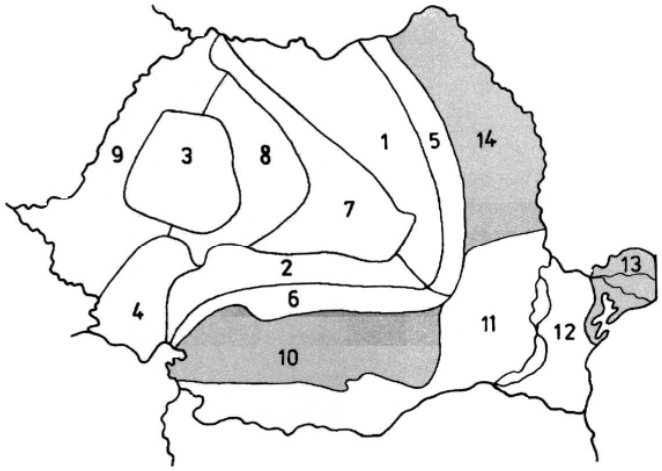

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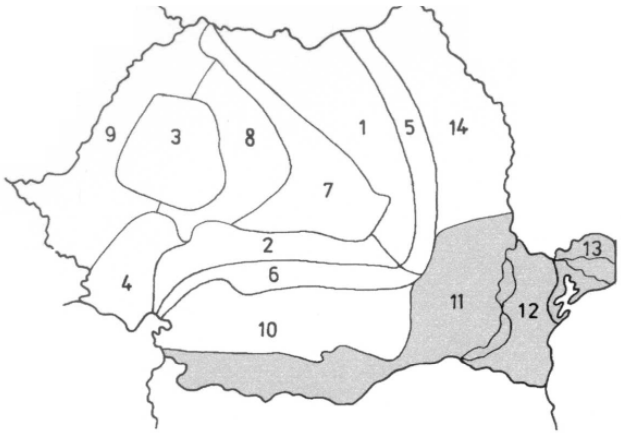

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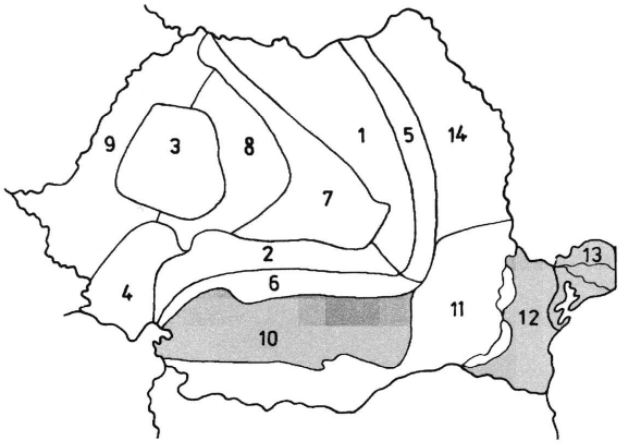

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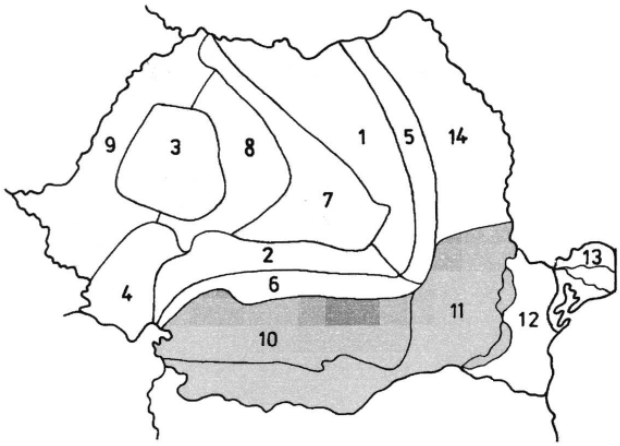

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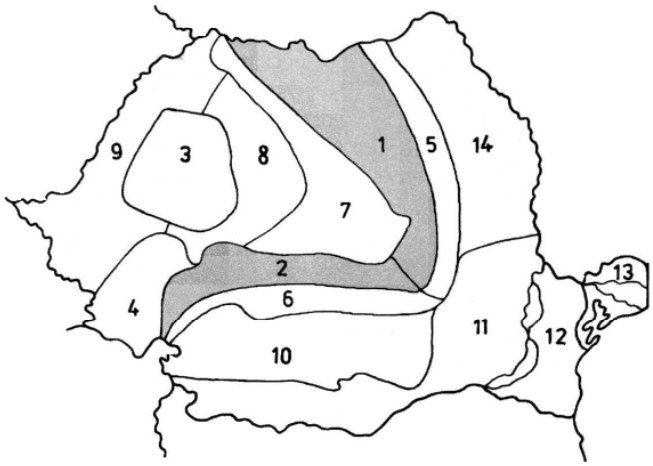

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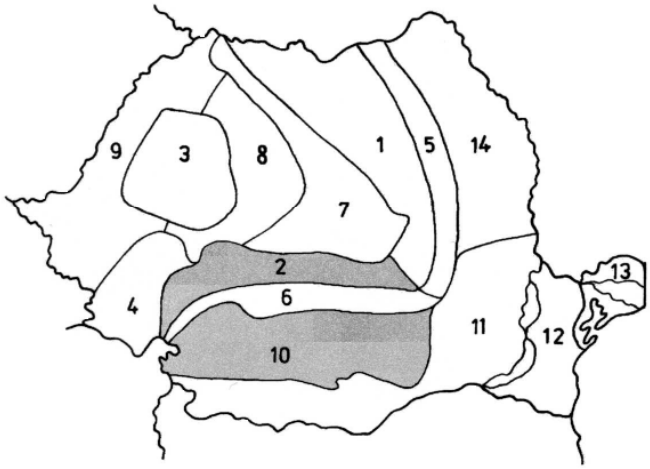

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