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CONTRIBUTIONS TO THE KNOWLEDGE OF SUBMEDITERRANEAN FAUNA IN ROMANIA

BY

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Beiträge zur Kenntnis der Submediterranfauna in Rumänien. Auf Grund von in letzter Zeit unternommenen Forschungen wird versucht, die Idee zu verbreiten, dass es in den südrumänischen Landschaften Rumäniens eine zonale Raumeinheit (die Mediterran- unterzone) gebe, die den Übergang von der Mediterran-zu der steppen-sylvosteppischen Zone mache. Aus einer genauen Analyse der Verteilung von Südtieren in Rumänien geht hervor, dass das Becken der Unteren Donau eine wahre nordische Verbreitungsregion von Mediterrangattungen darstellt. Neben europäischen, eurosibirischen und pontischen Gattungen tragen diese zur Bildung von partikulären Assoziazionen (Cenosen) bei, die eine wirkliche submediterranen Unterzone im Rahmen der großen biogeographischen mediterranen Zone bilden. Die wichtigsten faunistischen Repräsentanten südlichen Ursprungs, die zur Bildung von submediterranen Assoziazionen (Cenosen) mitwirken sind: *Pieris manni, Gortyna moesiaca, Libythea celtis* (Lepidoptera), *Ontholestes haroldi, Carabus gigas* (Coleoptera), *Cicada orni, Tibicina haematodes* (Homoptera), *Isophya speciosa* (Ortoptera), *Camphylaea trizona, Idylla rugicollis* (Gasteropoda), *Vipera ammodytes, Lacerta muralis maculiventris, Testudo hermanni* (Reptilia) *Apus melba, Parus lugubris, Emberiza cia, Carduelis balcanica* (Aves). Der Übergangscharakter der Fauna der submediterranen Unterzone im Becken der Unteren Donau geht auch daraus hervor, dass manche Mediterran-gattungen, die hier leben, von Untergattungen verteten sind, wie: *Pieris manni* ssp. *rossi, Testudo hermanni racovitzai, Oenathe hispanica melanoleuca, Ablepharus kitaibelii stepanecki*. Vom ökologischen Standpunkt sind die Mehrheit der hier erwähnten Gattungen termophile Elemente, die in die wärmere Standorte, auf Kalkstein in geschützten Tälern, Schuchten und auf sonningen Felsabhängen leben. Gebiete auf die viele solcher Tierelemente vorgedrungen sind gibt es in Drobeta Turnu Severin – Sânnicolau Mare, Giurgiu – Zimnicea und die Süddobrudscha.

Detailed research has recently been trying to accredit the idea that southern lanscapes in Romania include a spatial unit transitorynal from the Mediterranean to the sylvo-steppe zones.

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The first to have noticed it were the geographers, eg. Mihăilescu in 1969 who spoke of a Submediterranean sector, and Ghibedea & Isbăşoiu in 1985 who based on the average data of the principal climatic elements distinguished a Dacian-type Submediterranean climate in the south-west of Romania, between Sânnicolaul Mare and Drobeta Turnu Severin. In *Geografia României* (I, 1983) one can read: a sector of climatic province with Submediterranean influences' exists in that some part of the country. Similar climatic features are seen in Dobrogea and Zimnicea-Giurgiu sector, where in winter, the warm, south-west air advections, generated by Mediterranean cyclones, shape a warmer climate, usually associated with rainfalls and sleet. The intensity of specifically winter phenomena is reduced, the snow-layer lasting for a few days (15-25, eg. 23.7 in Constanța City), the frost-free interval being one of the longest in this country (231 days in Constanța, 229 days in Isaccea, 224 days in Turnu Măgurele and Mangalia, and 222 in Drobeta Turnu Severin). There are years in which frost is episodic, the vegetation period being almost continuous.

Annual temperature averages come close to those of some southern European zones, with intermediary continental and Mediterranean climate values of 11.7^0C at Drobeta Turnu Severin, 11.6^0C at Calafat and Turnu Măgurele, 11.5^0C at Şvinița-Mehedinți, 11.4^0C at Berzasca-Caraş Severin and Giurgiu, 11.3^0C at Orşova, Greaca and Cernavodă, 11.2^0C at Mangalia, Constanța and Călăraşi, 11.1^0C at Isaccea, Corabia, Sulina, Feteşti and Brăila. These are similar to those registered in Toulouse – France (11.3^0C), Nish and Belgrade – Serbia and Montenegro (11.2^0C), Zagreb – Croatia (11.6^0C), Skoplje – Macedonia (11.8^0C), or at some meteo stations in northern Bulgaria (Lom and Veliko Tyrnovo – 11.5^0C, Vidin and Silistra – 11.2^0C, Shumen and Varna – 11.0^0C). Values in the continental regions (8.8^0C in Prague, 7.9^0C in Krakow and 6.8^0C in Kiew) are lower than in the Mediterranean ones (14.1^0C in Marseilles and $15.^0$C in Rome).

Another characteristic element winters are milder and shoter (the Danube Defile, the Cerna Valley and the southern Black Sea littoral), have the shortest and mildest winters with higher air temperature averages: 1.4^0C at Mangalia, 0.7^0C at Sulina, 0.6^0C at Lugoj, 0.5^0C at Drobeta Turnu Severin, 0.3^0C at Timişoara and Cernavodă, and 0.1^0C at Babadag. A similar picture is seen south of the Danube, in Bulgaria: 1.0^0C at Shumen, 0.9^0C at Silistra, 0.5^0C at Vratza and 0.3^0C at Vidin.

In the Mediterranean climate zone the three winter months register higher averages (Athenes 9.9^0C and Marseilles 7.2^0C) than in the continental area: -5.3^0C at Kiew (Ukraine), -3.0^0C at Dorohoi (Romania) and -2.5^0C at Krakow (Poland).

The January mean in the Submediterranean climate zone has intermediary values (0.2^0C at Mangalia, -0.3^0C at Constanța and Şvinița, -0.4^0C at Shumen (Bulgaria), -0.5^0C at Berzasca, -0.6^0C at Sulina, -0.7^0C at Orşova, -0.8^0C at Caransebeş, -1.0^0C at Lugoj and Drobeta Turnu Severin, -1.2^0C at Timişoara and Vidin (Bulgaria), -1.4^0C at Babadag), between those of the Mediterranean climate (6.7^0C in Marseilles, 7.0^0C in Rome and 9.3^0C in Athenes) and the continental one (-3.3^0C in Krakow, -3.5^0C in Warszawa, -4.0^0C in Tecuci and -6.2^0C in Kiew).

The average number of winter days is lower in the Submediterranean zone (20.6 at Drobeta Turnu Severin, 20.9 at Sulina, 21.8 in Constanța and 22.4 in Timişoara) than in the northern regions (39.1 in Cluj and 43.1 in Botoşani).

The average number of frost days is lower in the south (73.2 in Constanța, 80.9 at Drobeta Turnu Severin, 83.5 at Calafat) than in the north and north-east of the country (127.5 at Bistrița and 117.4 at Vaslui).

Spring comes by 7-14 days earlier, the average temperatures of this season are by 2-3^{0}C higher than in the north and north-east of the country.

The first frost sets on one month later (1, Nov. at Giurgiu and Călăraşi, 2, Nov. at Corabia and Brăila, 5, Nov. at Turnu Măgurele, 7, Nov. at Calafat, 9, Nov. at Isaccea, 11, Nov. at Drobeta Turnu Severin, 15, Nov. in Constanța) than in the north (8, Oct. at Cluj and 10, Oct. in Roman).

The last frost occurs at an earlier date in the Submediterranean climate zone (1, Apr. Brăila, 2, Apr. Mangalia, 3, Apr. Drobeta Turnu Severin), than in the north and north-east of Romania (24, Apr. in Bârlad and 29, Apr. in Bistrița).

It follows that the thermal regime in the south of Banat, south of Oltenia and in Dobrogea, makes the transition between the Mediterranean and the continental climate.

A similar character has the *precipitation regime*, as shown by the monthly averages. The continental climate (in Banat, Oltenia and Dobrogea) has one pluviometric maximum, in May-July, and so has the Mediterranean one, but in winter. The Submediterranean climate is an intermediate type, with two pluviometric maxima: a principal one in May and June (like the continental climate) and a secondary one in October-December, brought about by the intensification of Mediterranean cyclones and the south-west advection of moist air masses.

The distribution of the two-maxima pluviometric type is the strongest argument in favour of a Submediterranean climate. *The principal maximum* occurs in May (Anina – 125.9 mm, Denta – 74.2 mm) and June (Orşova – 81.8 mm, Vânju Mare – 67.4 mm, Ciupercenii Vechi – 67.3 mm, Isaccea – 52.5 mm, Constanța – 43.5 mm, Jimbolia – 67.8 mm, Banloc – 79.4 mm, Turnu Măgurele – 67.5 mm) and *the secondary maximum* in October (Anina – 91.9 mm, Vânju Mare – 56 mm, Ciupercenii Vechi – 53.2 mm, Isaccea – 42 mm, Jimbolia – 52.8 mm, Denta – 52 mm, Turnu Măgurele – 46.8 mm), November (Orşova – 76 mm, Constanța – 36.2 mm) and December (Banloc – 49.6 mm). In Drobeta Turnu Severin, the secondary maximum (80.9 mm in November) has even higher values than the principal one (76.6 mm in May). The situation is similar south of the Danube, in Bulgaria, where the principal maximum occurs in June (Silistra – 66 mm, Shumen – 78 mm, Veliko Tyrnovo – 88 mm) and the secondary one in November (Silistra – 47 mm and Veliko Tyrnovo – 53 mm) and December (Shumen – 57 mm).

The biogeographical formations follow this distribution. Thus, only part of the Mediterranean species occur over larger arees, not simply around the Mediterranean Sea, but also in the north of the Balkan Mts., the Prebalkan Platform and the basin of the Lower Danube, some forming continuous associations, others stopping on the line of the Balkan Mts, presumably because beyond it the climate no longer suits them.

Mediterranean plants and animals that do advance northwards, up to the Lower Danube Basin (and even farther into the Southern Subcarpathians) – which actually represents a northern region of wide and uninterrupted spread of Mediterranean species, especially in the south of the Romanian Plain, take part beside European, Euro-Siberian and Pontic elements, in the formation of some particular coenoses, making up a truly Mediterranean zone, intermediary between the Mediterranean and the steppe and sylvo-steppe zones from the southern part of Romania.

As regards the vegetation of the Romanian Plain, Doniță (1967) emphasised the presence of gladed Submediterranean forests. They represent a distinct zonal unit, namely, the sub-zone of the southern sylvo-steppe and, together with the Submediterranean fauna, form the sub-zone of Submediterranean ecosystems belonging to the Mediterranean zone (Popova et al., 1976). Some of the Submediterranean plant species contributing to the formation of common Submediterranean complexes, are *Quercus pubescens, Q. cerris, Q. frainetto, Fraxinus ornus, Carpinus orientalis, Cotinus coggygria, Cornus mas, Viburnum lantana, Pinus nigra, var. banatica, Ruscus aculeatus, R. hypoglossum, Corylus colurna,* etc.

The main representatives of the southern fauna are the reptiles: *Vipera ammodytes, Lacerta muralis maculiventris, Testudo hermanni hermanni, T. hermanni montandoni*, lepidopterans *Pieris manni ssp. rossi, Gortyna moesiaca, Libythea celtis, Cenonympha leander, Eriopus latreilii*, coleopterans *Ontholestes haroldi, Carabus gigas*, homopterans *Cicada orni, Tibicina haematodes, Lyristes plebejus*, orthopteran *Isophya speciosa*, hymenopteran *Eucera clypeata*, gasteropodans *Campylaea trizona, Idyla rugicollis, Speliodiscus triasica*, scorpion *Euscorpius carpathicus*, birds *Oenathe hispanica melanoleuca, Alectoris graeca saxatilis, Streptopelia decaocto, Apus melba, Parus lugubris, Embriza cia, E. circus, Carduelis balcanica, Eremophylla alpestris balcanica* etc.

The wide spread of these species in the Lower Danube Basin was facilitated not only by favourable ecological conditions, but also by the proximity of the Pontic-Mediterranean glacial refuge, a later centre of genesis and diffusion of the Pontic-Mediterranean fauna. This situation enabled the massive penetration of many southern elements during the Atlantic (a post-glacial climatic optimum): *Lacerta muralis maculiventris, L. viridis, L. taurica, Testudo hermanni, Vipera ammodytes, Reticulitermes lucifugus, Scolopendra cingulata, Carabus affinis* and *Ablepharus kitaibelii*, representing the East-Mediterranean faunistic wave. Subsequently, in the Upper Holocene (Subatlantic), when the weather was slightly cooling, the area of southern species (Mediterranean and Submediterranean) would shrink, some remaining in isolated stations or enclaves, the above ones (see map) constituting the glacial relicts of today.

As a result, the continuity of these southern species north of the Danube represents a historical process that unfolded in the Quaternary.

The transitorial character of the Submediterranean fauna in the Lower Basin of the Danube is obvious also because some Mediterranean animal species of the region are

represented by sub-species, eg. *Pieris manni ssp. rossi, Testudo hermanni racovitzai, Oenathe hispanica melanoleuca, Ablepharus kitaibelii stepanecki*, etc.

The presence of the Submedierranean sub-zone, a biogeographical unit that makes the passage from the Mediterranean to the sylvo-steppe and steppe zones, is conformable to the laws of nature, because the passage from a biogeographical unit to the adjoining one is not so very well delimited. Between them there is a transitional unit with common biogeographical elements interwoining there. In most cases, therefore, the boundary between the two units is often festooned, looking like continental sea sides where land ends up in peninsulas, islands and gulfs (Fig. 1).

This remark is true of the Submediterranean sub-zone, too, it displaying large outposts, and a few island-like enclaves of Submediterranean and Mediterranean elements, eg. near Iaşi (I) - *Helix lucorum* (gastropodan) and *Dinarchus dasyppus* (orthopteran), in the Buzău Subcarpathians (II) – *Euscorpius carpathicus, Reticulitermes lucifugus*; in the Olt Valley (III) north and south of Râmnicu Vâlcea town – *Euscorpius carpathicus, Calliptamus italicus, Carabus gigas*; in the Mureş Valley (IV) near Deva town – *Isophya speciosa, Euscorpius carpathicus, Carabus gigas*.

There are three territorial outposts in which several southern elements can be detected (see fig. 2).

The first outpost, which is the richest and covers the largest area, is the Danube Defile and the adjouining zone, with lots of Mediterranean animals: *Reticulitermes lucifugus* (isopterans), *Phyllomorpha laciniata, Coriomeris spinolai, Melanocoryphus altomaculatus, Apophimus pectoralis* (heteropterans), *Pezotettix giornai* (orthopterans), *Agrilus sinuatus* (coleopterans), *Coniopterix arcuata* (neuropterans), *Meria fasciculata* (hymenopterans), *Mantis religiosa* (mantoidans), *Scolopendra cingulata* (chilopodans), *Oedipoda germanica, Tibicina haematodes* (homopterans), *Elachiptera megaspris* (dipterans), *Coscinia cribaria, Pieris manni, Dryobotodes cerris* (lepidopterans), *Euscorpius carpathicus* (arahnides), the northernmost representative of the scorpions, *Scutigera coleoptrata* (myriapod rather a house dweller), *Vipera ammodytes, Testudo hermanni* (reptiles) and birds: *Passer hispaniolensis, Hirundo daurica rufula, Emberiza cirlus, Oenathe hispanica, Dendrocopos syriacus.*

Many of these species are southern thermophilous elements, therefore they are concentrated mostly on calcareous terrain with warmer topoclimates. Here on the limestone of the Danube Defile, some particular coenoses have come into being, eg. the gasteropodans *Herilla zieglesi dacica-Xerocampylaea zelebori* or *Campylaea trizona, Idylla rugicollis, Speliodiscus triaria* and the ornithocoenosis of *Oenathe hispanica melanoleuca-Neophron percnopterus-Hirundo rupestris*, all with a marked southern character.

A second area of the southern associations is the eastern Burnaz Plain, the forests of which host southern insects like: *Tettigia orni, Cicada plebeja, Carabus gigas, Callimenus montandoni* and *C. oniscus*.

Going eastwards, in Dobrogea, one finds a southern outpost with a faunistic complex containing *Ablepharus kitaibelii fitzingeri* (Reptilia), *Dinarchus dasypus,*

Calliptamus italicus, *Callimenus affinis* (Coleoptera), *Tibicina haematodes* (Homoptera), etc.

From an ecological viewpoint, the majority of these Submediterranean animal species are thermophilous, occupyng warmer, limestone-based areas, sheltered valleys, gorges and defiles, as well as the sunlit rocky slopes. As previsionly mentioned, they have a higher incidence in the south-west and south-east of Romania, where the climate shows obvious Mediterranean influences, with two thermal-hydric maxima.

As a conclusion, the presence of many southern elements in the south of Romania is ever better evidenced, and the idea of a Submediterranean biogeographic space unit in this part of the country is gaiming ground.

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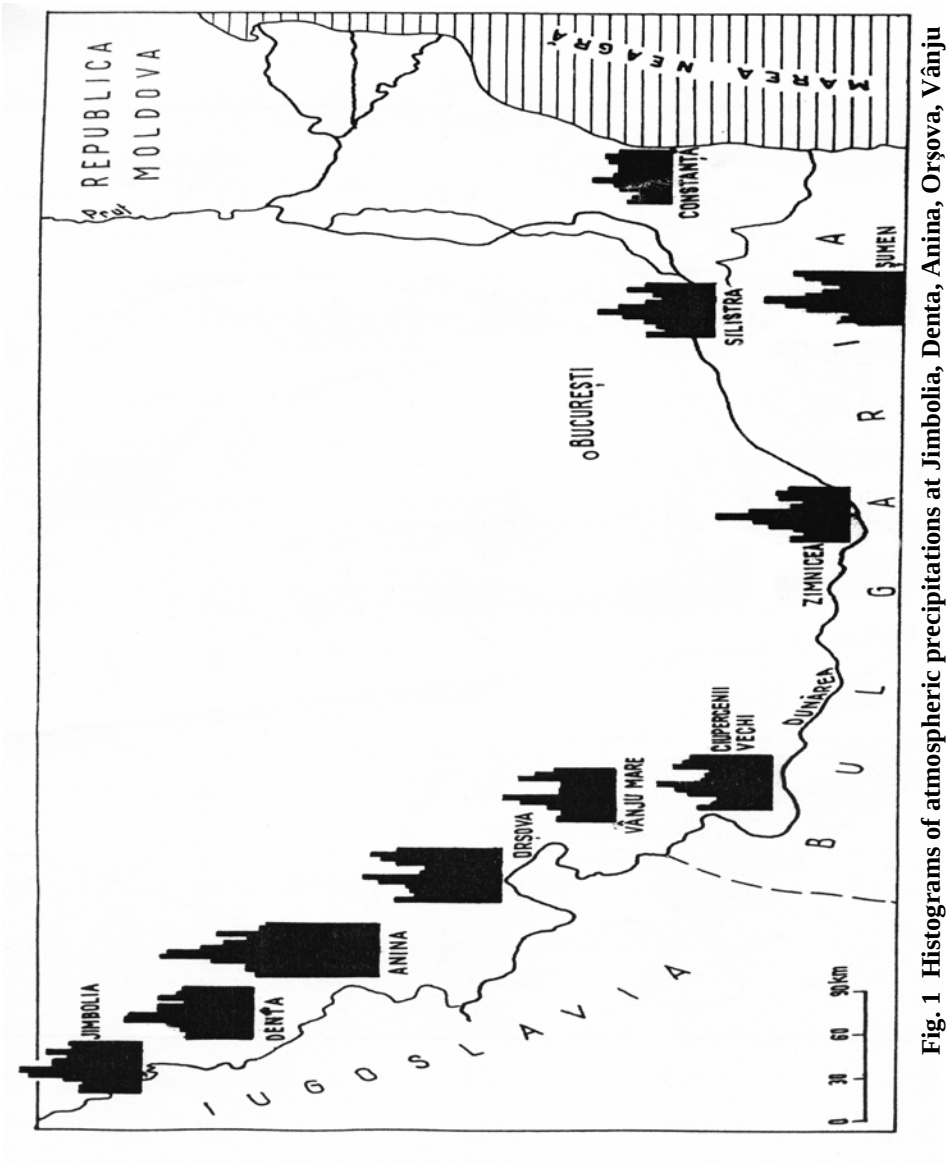

Fig. 1 Histograms of atmospheric precipitations at Jimbolia, Denta, Anina, Orşova, Vânju Mare, Ciupercenii Vechi, Zimnicea, Constanţa (Romania), Silistra and Sumen (Bulgaria).

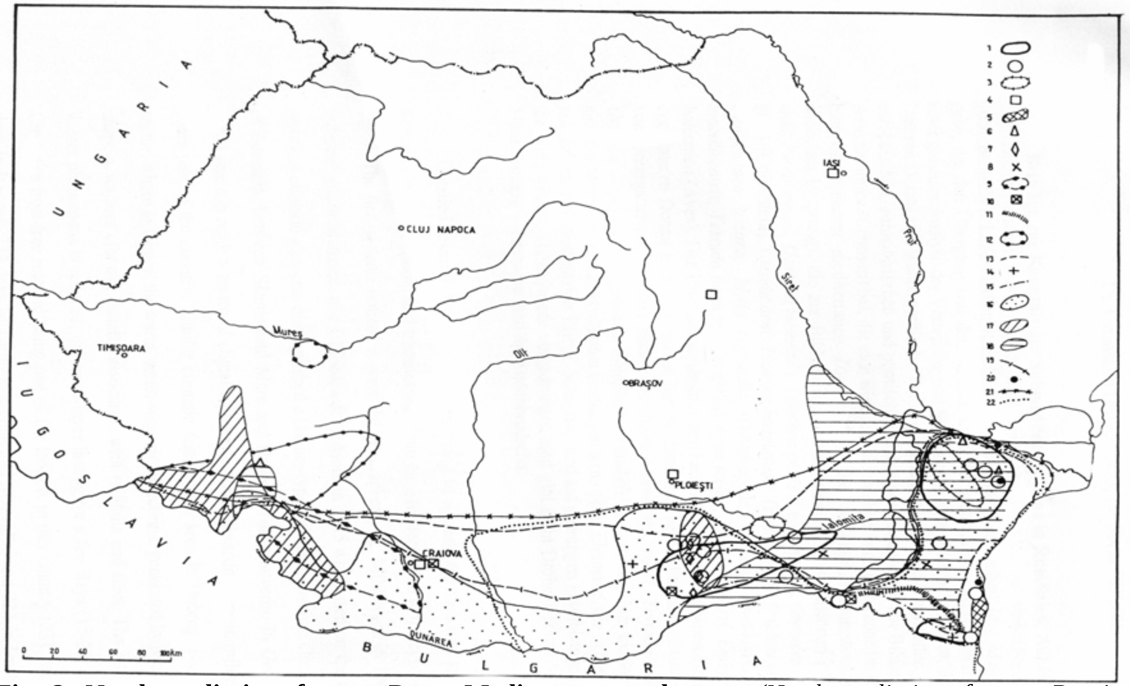

Fig. 2. Northern limits of some Ponto-Mediterranean elemente *(Northern limits of some Pontic – Mediterranean elements): 1. Milax cristatus (Gasteropoda) ; 2. Lindholmiola corcyrensis (Gasteropoda) ; 3. Deroceras melanocephalus (Gasteropoda) ; 4. Helix lucorum (Gasteropoda) ; 5. Zebrina varnensis (Gasteropoda) ; 6. Lithobius bulgaricus (Chilopoda) ; 7. Nematostoma bidentatus (Opilionida) ; 8. Chortippus loratus (Orthoptera); 9. Isophya speciosa (Orthoptera) ; 10. Modicogrillus chopardi (Orthoptera) ; 11. Zerynthya cerisyi (Lepidoptera) ; 12. Gortyna moesiaca (Lepidoptera) ; 13. Perisomana caecigena (Lepidoptera) ; Rhyncomyia peusi (Diptera) ; 15. Pelobates syriacus (Amphibia) ; 16. Ablepharus kitaibelii (Reptilia) ; 17. Lacerta praticola (Reptilia) ; 18. Coluber jugularis (Reptilia) ; 19. Lacerta taurica (Reptilia) ; 20. Mesocricetus newtoni (Mammalia) ; 21. Isophya rectipennis (Orthoptera) ; 22. Conocephalus hastatus (Orthoptera). I.-IV. Enclave de elemente sudice (Southern enclaves).*