ENVIRONMENT AND POPULATION PROBLEMS IN ESTONIA

BY

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TARTU 1934

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(SUMMARY)

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Methodological Introduction.

In biology the ecology of individuals is called autecology, but the ecology of communities — syneocology. Thus we can and must divide human ecology into aut- and syn-ecology.

Up to the present time the anthropoecological research has practically developed in these two directions. As to the physiological influence of weather and endemic nutriment (i. e. *„geophysiology"*) also the influence of climate and landscapic character on human spiritual life (i. e. *„geopsychology"*), these have been in some instances, successfully investigated, but so far only by non-geographers [10]). This is comprehensible, as the psychological and physiological resonance of environmental influence in man is a peculiarly subtle and complicated problem, in the solving of which the geographer-specialist has not by far as abundant conditions or means as, for instance, the physiological, medical or experimenting psychological specialist. Such research could be named autecological.

It must be emphasized, however, that so far the chief problem in human geography is the distribution of population — man's dependency on environmental factors, assuming the form of a communal response, appurtains essentially to the domain of human synecology. It must be remembered, however, that the significance of environment and it's influence on man and population changes with the force of collective achievements over nature. This is not so well accomplished by the individual, as by a social being. Even where man seems to act as an individual he is really utilizing spiritual and material social aid. It appears in the fact, that everything man makes or does bears a social seal. The more social life is

developed, the smaller the role of environment, and the greater that of the human spirit.

In investigating the dependency of population and environment, we must neglect neither economic prehistorical nor historical moments, or separate them from the socio-historical [16]), which help to clarify both man's receptive and collective roles in relation to his environment. Different stages of economic development in similar environment, rule man's relations to terrestrial natural supplies, division of labor and possibilities in the organization of labor and there-by different economic and social types.

We can briefly say, that the different stages of economic development of the population in similar or the same kind of environment result in different socio-economical types.

An equal, or more or less equal level of economical evolution, however, brings forth different local forms in different environments.

In investigating the basic lines of distribution, composition, efficiency and occupation of the population and it's ways in utilizing land, social economy can not sufficiently succeed, independent of localism and regionalism, without leaving too many possibilities for speculation and light-handed generalizations. Thus regional research in human synecology changes into an inseparable completion and seconder in the modologic and typologic investigation of economical and social conditions of communities and population.

It is of the greatest importance, therefore, that human synecological research does not decline to geographical determinism, which, we are sorry to say, has hitherto often happened in human geography, but that it should develop along lines of geographical possibilism, i. e. it should take into consideration both economical and social development of the population as well as appreciate the influence of geographical environment.

In the following summarized contribution to regional human ecology it is our problem to point out the influence of various environmental conditions on the population of Estonia, as this influence has for some time transformed and manifests to the present relations of the population and its environment.

Environmental Conditions and Chief Geographical Division of Estonia.

The peninsula of Estonia, between the Gulf of Livonia and Gulf of Finland and the basin of Lake Peipsi with the appurtaining archipelago in the Baltic Sea as outpost, fits very characterizingly into the oval of the northern European area, which Sten De Geer[2]) has summed up under the name of Baltoscandia.

Estonia's physiographical general characteristic, the same as the rest of Baltoscandia, is — beside the above-mentioned peninsular configuration — a widely distributed moraine topography and its appurtenance to the area of surface elevation in connection with former marine boundaries and traces of transgressions. It appears chiefly in the differences of regional originality in the Baltic sea coastal areas above and below the former marine and also ice-dammed-lake boundaries. The geographical effects of the ice-age would, undoubtedly, have been much greater, had they not sunk under the marine and ice-dammed lake level after the ice recession.

The traces left by the highest sea-levels in the form of coast- and surf-lines are often contemporarily represented far inland and are generally called the highest marine or Baltic boundary. This boundary, although genetically metachrone, is of great significance, especially from the viewpoint of the geography of civilization and human ecology, as it encloses in general those areas, where economically man has been occupied with more easily cultivatable, stoneless, fertile and flatter areas. We can say, that in the Baltoscandian lands, the so-called highest marine or Baltic boundary, Swedish, Finnish and Estonian territories are of the greatest significance.

In Sweden the line is very marked, whereas, in Finland it is not to be so distinctly traced. It must be perceived, however, that areas above this boundary in Finland are often comparatively fertile just because the abrasion and denudation of the sea has not reached them[6]).

We very often come across the above-mentioned fact especially in observing and comparing the Estonian territory above and below the marine boundary.

The most important differenciating fact is, of course, that

while in Fennoscandia the supramarine areas appurtain to the glacial erosion-territory, in Estonia the highest region, i. e. above the marine boundary, is prevalently just glacial accumulation-territory. Only partly touched by ice-dammed lakes, but not marine abrasion are here preserved in alternating thicknesses a relief glacial moraine-sheet, which is composed of boulder-clayey and boulder-marlaceous untouched surface-covering with here and there fluvio-glacial deposits. Therefore, in Estonia there is represented a supramarine or rather superaquatic region (by which we mean all areas, that have been above the marine boundaries and also above the level of ice-dammed lakes) a chief store for more conveniently cultivatable surfaces. The subaquatic region, however, takes up the areas below the marine boundary and also those covered by ice-dammed lakes.

Thus we perceive, that after the continental ice-recession large parts of present Estonian territory have been covered with water, and partly even repeatedly.

Beside the surface and surface-forming material of ice-age origin all this is of standard significance in the formation of the Estonian existence sphere of ecological conditions, of much greater influence than has hitherto been brought forth.

Undoubtedly, the two regions brought forth, differing in genetical, morphological and ecological background, are Estonia's most essential and chief natural geographical divisional foundation, in the limits of which a more detailed geographical resp. environmental subdivision can be performed.

Granö [4]), who more than a decade ago divided Estonia into geographic (landscapic) units, discerns the so-called landscapes of four-, three- and two categories of matter. Of these the landscapes of four categories of matters represent the most perfect geographical harmony, but their utilization in human ecology and economic geography is difficult because between them, in places the transition zones are too wide. On the other hand the landscapes of two categories of matter, however, express too little geographical harmony and are too indefinite. Therefore, in the natural subdivision and especially in the research of the economic geography of Estonia the landscapes

of three categories of matter should be considered as the most acceptable and productive; moreover, as they are easily congruable with the communes, which, as administrative units are the foundation of various statistical summaries.

As we have already indicated [8]), the geographical detailed division of Estonia into landscapic units by Granö, can be summarized according to sub- and superaquatic regions. It is also essential, that the landscapes of the three categories of matter fit well into the limits of ecologico-geographical division (see map I). This is also later supported by Tammekann's map[25]) of the distribution of landscapic types, where the so-called hilly-, striated and table-landscapes are reliefly situated in the superaquatic region, and the flat landscapes rule the subaquatic region. We must, however, omit the coastal landscapes of northern Estonia from the superaquatic region (see map I, landscapes 15—17 incl.), which, although tablelandscapes, essentially appurtain to the subaquatic region. The statistical inventory, which we have accomplished by congruing with the communes concerning the landscapes of three categories of matter according to data from the population and agricultural census, ministry of agriculture, valuation lists, and the administration of taxes gives us support, once more, from the economico-geographical and human ecological standpoint.

Depending on the kind of formation, composition and the entire territory of late- and postglacial evolution, the above-explained basic lines reflect in the character, density and repartition of natural vegetation, cultivated areas, settling and network of roads and with this also the map of distribution of statics and dynamics of population. This means, that by the above used division we have to deal with the fundamental and chief ecological division of Estonia.

Historical Aspect of Environment and Population Relations in Estonia.

The settling of the above-mentioned two chief ecological regions of Estonia differs in its age, whereas, the superaquatic region shows older vegetation, while the subaquatic region shows older human colonization.

In the maximum extension of the Baltic ice-dammed lake, the

Estonian archipelago and the present coastal areas were expansively flooded by water, while at the same time in the areas north and northwest of the ice-margin great masses of ice were still represented. Also, the Estonian peninsula — the present superaquatic region — was covered with artic vegetation. After the Baltic ice-dammed lake had found an outlet into the North Sea, the water-level lowered conceivably and larger and larger areas became more accessible to the immigrating vegetation from the south and southeast. But this expansion of terrestrial vegetation was followed by regression of vegetation owing to the transgressions of the sea.

Therefore, the age of natural vegetation in the present Estonian territory varies, while in the superaquatic regions it was able to develop to some extent untouched, in the subaquatic areas it was more perturbed and younger. As Lippmaa [13]) has explained, these differences do not reflect in the present natural vegetation, whereas the long period of time following the transgression has brought with it a certain balance. In the stabilization of natural vegetation the character of the superficial deposits and its composition was of conclusive significance. The differences in the latter circumstances cause the chief differences of vegetational evolution between the super- and subaquatic regions. According to Thomson's [26]) research of forest history the conceivable differences in the quantitative composition of forests, which are above and below the so-called marine boundary vary at all times during the postglacial period.

The temporal and spatial distribution of the fir is especially interesting. In observing the whole territory of Estonia we notice, that the predomination of the fir belongs to the subatlantic period.

On the other side is the regression of the fir, which expresses itself in the diminishing quantity of pollen in the upper strata. This appears especially abruptly above the marine boundary i. e. firstly in the supra-marine region, and seemingly depending on man's agricultural activity, especially, as the result of burning for cropping. The pollen analysis also gives certain indications concerning the conceivable commencement of advance and distribution in human settlement.

The influence of human intervention has obtained prevailing significance in the contemporary map of Estonian vegetation. In

course of time man has, in various ways modified natural vegetation to a greater extent than could be imagined, for instance, according to the population map. Commencing, in reality, in the boreal period, the increasing influence of human activity on vegetation has expressed itself chiefly during the subatlantic period, in the course of which the climate has changed to a damper and cooler — the present climate, which in the cross-section of the last 60—70 years, as Frisch [3]) has explained, shows a marked maritime change.

Firstly, during the subatlantic period the influence of human activity is represented on the one hand, as a destructive factor, which expresses itself in the destruction and transformation of vegetation and natural plant communities, while, on the other hand, as a creative factor, which appears in the form of derivated or artificial plant communities.

Human activity as a creative factor in the formation of vegetation appears in the form of cultivated plant communities. The history of cultivated plants and arable lands is, at the same time, also the story of the sedentary colonization and fixed settlement of land, and the same natural conditions are effective in extension of cultivated surfaces as well as in the distribution of settled population.

We can perceive again, that the difference in the living value between the sub- and superaquatic regions is quite obvious. As we have previously [8]) indicated by the relative method and by the help of Laasi's [12]) absolute method, it has been still more explicitly shown that arable land is both sparsely and densely repartitioned throughout all of the Estonian territory, still there appears, in strong lines, a well marked difference in the regional survey of the density in the distribution of arable land. The causes of such regional distribution of arable land can bring forth the following factors, all of which, in this or that degree originate from the glacial and postglacial evolution of Estonian territory: the general relief together with height proportions, its composition of soils, and their depending draining conditions of both. The regional coincidence of these causes has chiefly concentrated the larger and denser parts of cultivated land into the superaquatic region. The primitive woodlands of this triangle have, in the course of time, been transformed into predominating arable land areas.

The lower or higher living value of the Estonian territory is well indicated in Tammekann's[24]) map of the distribution of population, which is drawn by the dot-method. In the human ecological and economico-geographical aspect we are interested in the relative distribution, which we have explained in the chartographic appendix map measuring 1 : 1 500 000 (see map II). This map plainly demonstrates the great differences in the relative density of rural population, where the compact land settlement is expecially characteristic of the superaquatic region.

These great differences in the distribution of population are not only contemporary, but originate from the settling and populating process begun in remote times. Being ancient woodland to almost its full extent, these virgin forests have, in the course of time, been obliged to give up more and more room, with the spreading of settlements, to plunder-, utilizable and culture-lands. Herewith the nature of soils and drainage conditions have, all the time shown their selective influence in directing and concentrating human settlement.

In connection with this, we are interested in determining to what time to ascribe the origin of the great increasing influence of pedological factors, and also the remarkably greater attractive force of the superaquatic region on the process of settling and the density of population. It is, undoubtedly, a convenient introduction to the ecological conception of the relations of contemporary circumstances in population and environment.

As shown by archeological research[15]) the most remote finds, which testify, that man existed on Estonian territory, appurtains to the boreal period, i. e. the interval of 7000—5000 B. C. The greater part of the Estonian stone-age finds originate in the neolithic period, i. e. the 30th and the first half of the 20th centuries B. C. All these finds, as the distribution map on neolithic finds (see fig. 1) indicates, exist regularly near the water — near rivers, lakes and sheltered bays. This confirms to us the fact, that the Estonian inhabitants of the stone-age were firstly fishermen and hunters. The difference between the sub- and superaquatic regions does not appear in any way in the survey of stone-age settlement.

The more fertile areas of the superquatic regions must surely have attracted the half-nomadic, primitive fishing and hunting tribes at a very early time, because, as we know, the more fertile

areas are richer in fish and animals. The surface and soil factors, however, must have become of standard importance later, when land cultivation and cattle-breeding became the chief branches of economical activity. Although the beginnings of land-cultivation reach back to the end of the stone-age they were not of great significance at that time. In general the same can be said of the bronze age (1300—500 B. C.).

A perceptible transformation in the distribution of settlement takes place in the iron-age, viz. in the so-called Roman iron-age (0—400 A. D.). The principal features of settlement distribution (see fig. 2.) have fundamentally transformed in comparison with the neolithic period. The soil factor became of standard importance and accordingly, settlement of the higher and more fertile areas of the superaquatic region appears with remarkable distinctness. This transformation in settlement distribution and conditions evidently took place during the early iron-age with the transition to the cultivation of land, which up to the Roman iron-age had already become the standard of livelihood.

We perceive, quite plainly therefore, that the influence of natural environment on the population is not, in itself, determinizing, but depends to a very great extent on the economical and cultural stages of evolution of the population itself. Thus it is testified by concrete example the standpoint expressed in the methodological preface, that man's relation to natural environment is regulated by various stages of economic development.

The distribution of settlement continues in the middle iron-age (400—800 A. D.). It is in particular perceptive, that, beginning with the 5 th century A. D. in the so far uninhabited or very sparsely settled Western Estonia and the Estonian Archipelago tombs and finds commence to appear. The growth and expansion of the population increases even more markedly in the late iron-age (800—1200 A. D.). The way in which the march of settling was performed in the historical period (i. e. after 1200 A. D.). is, in the chief features, clear, but insufficiently documented in detail. Settlement distribution covers wider and wider areas, wherwith the difference between the super- and subaquatic regions is all the time preserved developing into the

features of contemporary settlement. In order to illustrate the character and course of this process the author of the present work has compiled relative maps (see fig. 3. and 4.) on the same area, viz. the Virumaa district, concerning which there is comparative utilizable material. These maps should be especially instructive, as the area under observation pertains to the characteristic transition zone from the superaquatic to the subaquatic region.

In historical times, i. e. beginning in the XIII century the evolution of eeonomical forms has gone through no perceptible fundamental transformation during all these centuries. The chief basis of existence was, as formerly, agriculture and cattle-breeding, only with the difference, that in the XIII century the two-field crop system prevailed, while later the three-field system was in use, which continues until the middle of the XIX century. The fundamental change takes place only about the middle and in the second half of the XIX century, which commenced progressively to express itself also in concentrations and the transformation of population density. In a longer historical aspect these changes can be compared only with the settling and economic revolution, which took place in the Roman iron-age. These transformations depend chiefly on the abrupt changes of social and economical circumstances, and the economical modes and stages of advance into the new epoch.

In the middle of the XIX century the Estonian rural population lived in a period of almost secluded economiy. The economical circumstances of the rural population was entirely derived from the middle ages, with all its rural communism. Then entirely new conditions took their place. As a result of social reforms the communal lands were divided and money-rent and landed property were set in. This, in a way increased the wealth of the population, destroyed rent-service and the secluded form of household economy and created free exchange-economy with developing monetary and market-economy. On the other hand it helped to increase the class of landless proletariat, their migration to cities, urbanization and emmigration.

At the same time, and this is very important, a great change took place in the towns, where, up to this time a very small part of the population dwelt. Now the urban population began to rapidly increase. In one way the town laws took away the corporative arrangement (guilds) from the citizens and in so doing developed free profession. On the other hand urban trade and

developing industry increased together with the increasing wealthiness of the rural population. This was especially facilitated with the improvement of communication, by artificially built roads — railroads, which opened distances. In these new possibilities of expansion the market must have greatly influenced farm economy. Thus Estonian economical development, beginning in the second half of the XIX century enters an enteriely new epoch — the stage of accelerated commuuication, machinery, also lively inland traffic, market and monetary-economy. In short: the period of machinery and capitalism commences.

In connection with this, the most important environmental conditions are positional factors and spatial and temporal distantial relations, which, as we have seen do not depend only on natural environment, but man's intervention in environment through artificial roads and means of communication. At the same time the crowding of population into cities begins to progress. A perceptibly new aspect appears in the distribution of population: urban agglomeration (see fig. 6). Owing to distantial relations and the attraction of marketing-centers the country is divided between the urban centers into more definite hinterlands (see map III).

Still, even in this stage of development the background influence of natural fundamental conditions makes itself valid in many ways. The most essential and interesting of the circumstances that appear herewith, is, no doubt, the fact that the depopulation of the countryside in the superaquatic region develops more rapidly.

The short survey of these questions, however, is the task of our next chapter.

Contemporary Relations between Population and Environment of Estonia.

The demographic conditions in the increase of the Estonian population are not very opportune, firstly on account of the results of the World War and Independence War following it.

The picture that we get of the augmentation and mobility of the Estonian population, according to the census of the interval of 1922—1934 is indicated in the following table:

Population of Estonian Towns, Boroughs and Communes.

Census of	Towns	Boroughs	Communes
	number of inhabitants in thousands.		
28. XII. 1922	263.4	35.4 [2]	791.9
1. III. 1934 [1]	331.1	26.7	764.5

As we see from this synopsis, the population of Estonia has, in general, grown slowly. At the same time the proportions of the urban and rural population have changed quite conceivably. Thus, in contemporary Estonia we have a marked process of urbanization. The growth of the urban population does not proceed through natural increase (in towns mortality exceeds birth-rate), but mechanically, by migration of rurals to cities and through depopulation of the countryside.

Out of the Estonian demographic problems we shall try, by the following, to bring forth, on human ecological background, chiefly, the migration of rurals into the cities and urbanization, which is closely connected with many other problems.

On surveying more closely the growth of the Estonian urban population resp. the migration of rurals into cities and seeking the causes, we must do this, firstly on a regional basis, as the increase of town population is not uniform, but just the opposite — regionally exceedingly heterogeneous. The above-mentioned circumstance appears most definitely on the chartogram (see fig. 7), where we have indicated the „purified" increase or decrease of population in towns during the decade of 1922—1931.

As this figure testifies, the most rapid growth is in those towns of Estonia which belong completely or prevalently, with their hinterlands, into the superaquatic region. On the contrary, the coastal towns, or generally speaking, the towns, together with their hinterlands, belonging in the subaquatic region are either decreasing or increasing slowly.

1) Preliminary Summary. — 2) Including former boroughs, which, in the mean time have received the rights of towns.

The especially perceptible increase in the towns appurtaining to the superaquatic region causes, firstly the questions:

1) from which rural areas do the urban immigrants originate? and

2) why have they migrated into towns?

It is comparatively easy to answer the first question. The circumstance is quite evident, that those communes, which depopulate more rapidly belong, in the first place, to the hinterlands or the marginal areas of the fastly growing towns. In connection to its „immigrants", only Greater Tallinna (i. e. Tallinna including its suburban sattelite Nõmme) is quite an exception, meaning the capital, which envelopes the whole country with its commercial and administrative significance. It is evident from the preliminary data of the census of 1934 that the urban immigrants originate chiefly from the hinterlands of the same towns. Lastly, it mentions, in relief, the greater horizontal mobility of the rural population of the superaquatic region — also fig. 8, which we have compiled from data of the census of 1922.

The second question given, — why do the rurals migrate to towns in such an extent, and why this takes place just in the superaquatic region, is more difficult to answer. The opinion, that the stagnation of the population or its slow growth in the coastal towns and the more rapid growth, *in extenso*, of the interior towns is due to the cutting off of Estonia from Russia is not correct. The separation of Estonia from Russia has, of course, influenced the more lively mutual relations of the towns and their hinterlands in a way, but the marked exodes of the rural population have begun long before Estonia became independent. Thus, even at that time the towns of the superaquatic region grew comparatively more rapidly [9]).

We must, therefore, look here for the most essential causes.

The causes of the crowding of population into cities can be generally divided into three categories:

1) The possibilities of employment in towns, which lifts general welfare and enables a better standard of living than in the country.

2) Development in the opening of new roads, the improvement of all roads and evolution in means of communication,

which is, at the same time both as the prime condition and the result of the growth of towns, and facilitates the frequency of going to the city, — the "*rurbanization*"[23]) of the country population.

Furthermore it is necessary

3) to have forcible circumstancss in the country itself, that could thrust out the inhabitants, who have grown together with their own "sphere of life". This could be named r u r a l - r e p u l s i o n.

The repulsive-power of the exode of rural population before Estonia's independence — was, undoubtedly, the shortage of land. 58 % of the whole land was in the hands of a small number of landlords of estates, — principally German nobles in the Baltic region, — while only 42 % belonged to the smaller landowners — the Estonians.

As we have previously explained, the exodes of the rural population of Estonia has not ceased in the interval of 1922—1934, not withstanding land-reform (which apportioned *Latifundia* among the landless rurals under legislative action) and the small increase in the population of the country generally. Therefore, we are still more interested in the migratory element of the country population.

As the depopulation of the countryside appears mostly in the superaquatic region we could say, as has been done, that these areas are o v e r p o p u l a t e d relating to the natural carrying-power of the existence sphere. This conjecture is confirmed, for instance, by greater density of rural population in the superaquatic region in connection with the general surface (see fig. 5). But in the following we see that this surmise is superficial and incorrect.

In the first place the density of population computated relating to the whole area does not give sufficient criterion in deciding the question of overpopulation.

In order to appraise the density of the agricultural population of Estonia from this standpoint, we must do this in connection with the distribution of the level of p r o d u c t i v e a n d c o n s u m p t i v e f a c t o r s. But, we are sorry to say, there is very little data concerning the regional distribution of consumption.

As to productive factors, the graphs (see fig. 9, and 10.) show the density of farm population relating to arable land and

„yield-land“*), that the agricultural population, in connection with the productive areas lives the most sparsely just in the wealthier and depopulating superaquatic region.

The density of population in relation to arable land and the distribution of the average-sized farm land show, in the cartographic comparison (compare fig. 9. and 11.) an almost contrary reciprocal tendency. We must, therefore, look for the causes of the repulsive power of migration of rurals into cities elsewhere than in simple overpopulation.

Fig. 15. on the correlation chart summarily characterizes the relations between the density of farm population in connection with farm land and the average size of farm arable land. We see from this, that the average size of farm arable land regulates the relation of the density of rural population to arable land. This average size of arable land is, as we see in connection to the pecentage of distribution of arable land which in turn expresses the previously explained differences in the character and superficial deposits and their composition between the sub- and superaquatic region.

As the partial signifcance of arable land is so weighty in importance in the distribution of the density of agricultural population, so, for better future explicity, we shall observe the means of utilization of arable land, as on this depends the relation and rotation of the different crops as as well as the general result of agriculture. Fig. 14. indicates, as we perceive, that here also appears the characteristic difference between the sub- and superaquatic regions.

With a few exceptions the subaquatic region is the most in arrear, whereas the superaquatic region is the most advanced in the agricultural stage. In the first — self-support economics predominates, with the raising of food-cereals (rye, barley) also and potatoes, in the other — economy of exchange with dairy-economics and fodder-raising.

*) According to the data from the Bureau of Statistics of the Estonian Government the following proportions in the „yield-land“ units form themselves:

1 ha arable land	=	1.00	yield-land unit.
1 ha meadow land	=	0.25	„ „
1 ha pasture land	=	0.15	„ „

The regions varying in the stage of development of farm-economy differ also in that of agricultural mechanization (see fig. 12 and 13).

Thus the sub- and superaquatic regions differ conceivably in the level of economical development. This should be of fundamental importance in explaining our mainproblem.

The arrear system of farm economy with its food economy, poorer connections with the market, lower level of consumption and the satisfaction of a simpler life, — these seem to be the reasons which keep the rural population in the subaquatic region. Less developed mechanization and the low productivity of the labor of each, i. e. lower rationalization, have the same influence.

On the contrary, the rationalization and emphatical productivity of the more developed mode of economy, better connections with the market, greater dependence from the fluctuations of this conjuncture, higher level of consumption and higher demands in relation to welfare, i. e. *rurbanization* of country seem to be the causes of rural repulsiveness in the superaquatic region.

As the more rapid growth of towns in the superaquatic region, naturally, the more the hinterlands are characterized in relation to the developement of the economy of exchange, the greater the possibilities of existence, growth and attractive force, as the economy of exchange, in itself means the products manufactured in towns and the greater consumption of commercially mediated produces by the population of the hinterlands.

If we, as previously explained in several instances, take the greater density of population relating to arable land as an exponent of food-economical structure, we can say, that with the increasing population density in regard to arable land area the repulsive force of the hinterland decreases.

On the other hand we must also appraise the quantitative relation of hinterland and town population. The higher this is, the more possibilities of development the town economy has and the urban population can also increase.

Summarily, we can say, that

1) the growth of towns is directly proportionate in relation to the number of inhabitants of towns and hinterlands and

2) contrarily proportionate to the density of population of hinterlands in relation to arable land, i. e. the less so the lower the stage of development of agricultural economy. — The following graphic summary (see fig. 16) demonstrates this concerning Estonia.

In relation to this rule only Petseri has conceivable divergency — a town which shows the highest relative increase in Estonia. The cause of such relative crowding in population can be said to be the high quantitative relation (1 : 28) between the population of the town and its hinterland, on the other hand — the circumstance that Petseri became a new administrative district-center during the independency of Estonia.

Otherwise the Petseri hinterland (formerly a part of the Russian Pskoff government), as all Russian frontier areas, was for historical reasons the most in arrear in its social and economical development. Although situated in the superaquatic region relating to natural environmental conditions, the Petseri district (see map I, landscapic units 31—33) economically shows the greatest resemblance to the most arrear areas of the Estonian subaquatic region, which appears markedly in relation to the overdensity of agricultural population in regard to arable land (see fig. 9).

This again confirms the standpoint in the our introduction, that in the same or similar environmental conditions various socio-economical types depend on different stages of economic development.

Appendix I

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Appendix II: Figures and Maps.

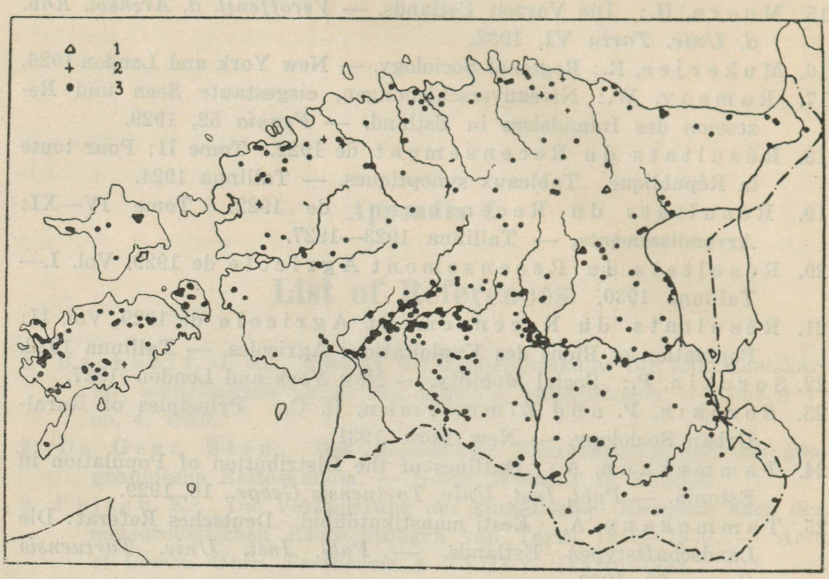


Figure 1. Distribution of neolithic finds in Estonia according to R. Indreko.
1. Neolithic settlements. — 2. Burial places. — 3. Occasional finds.

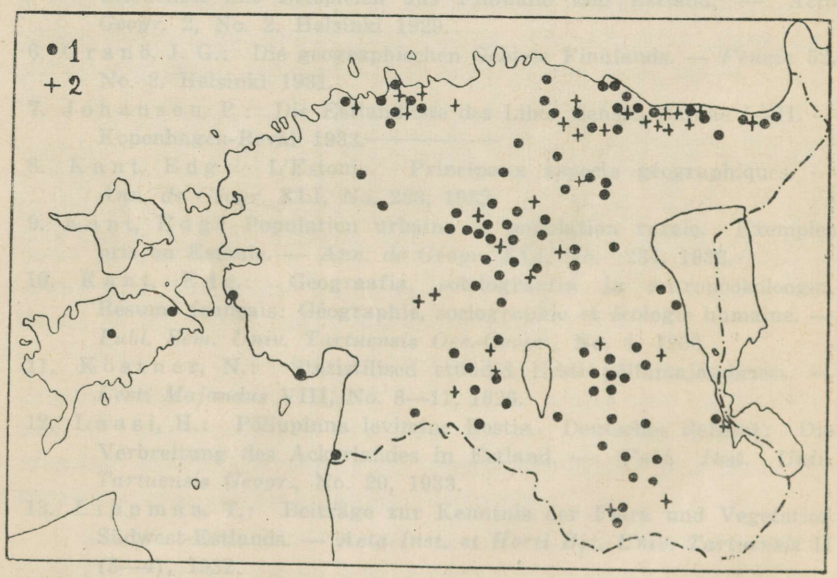


Figure 2. Distribution of Roman iron-age finds in Estonia according to H. Moora[15]).
1. After 200 A. D. — 2. Up to 200 A. D.

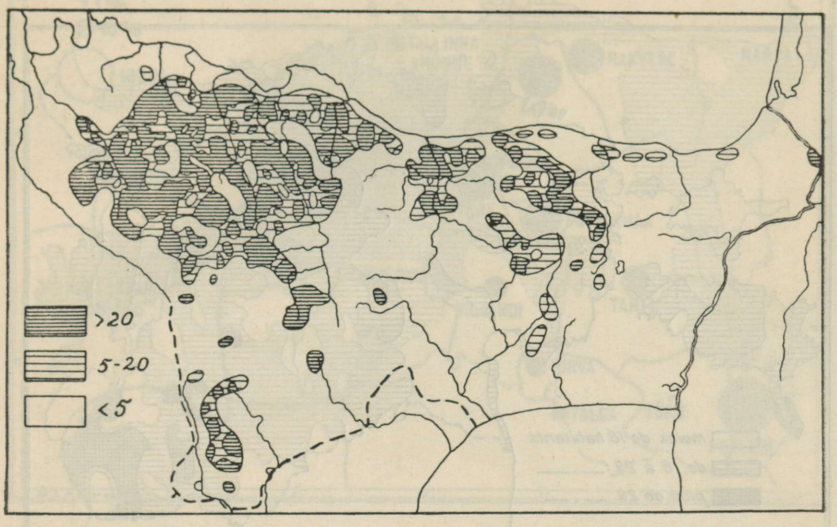


Figure 3. Density of population (per sq.-km.) in district of Virumaa, 1220.
Compiled by the help of Backhoff [1]) method according to data of *Liber Census Daniae* [P. Johansen [7])].

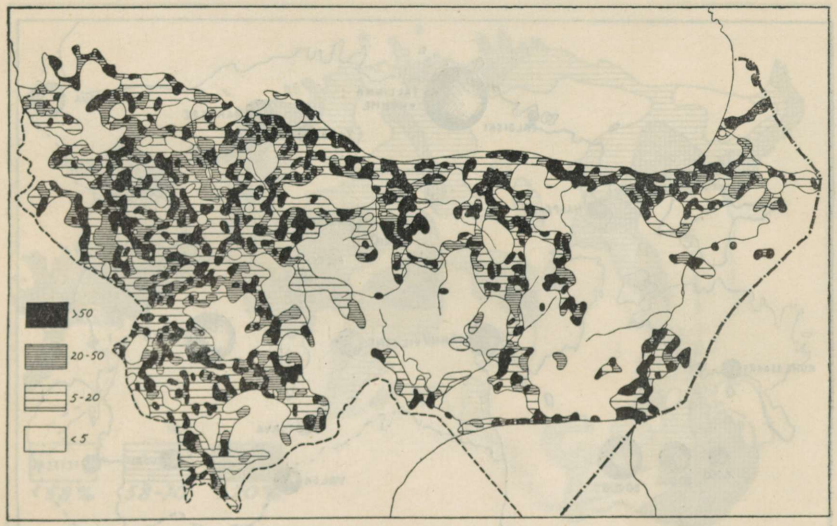


Figure 4. Density of population (per sq.-km.) in district of Virumaa, 1922.
Compiled by the help of Backhoff [1]) method according to the map of Tammekann [24]).

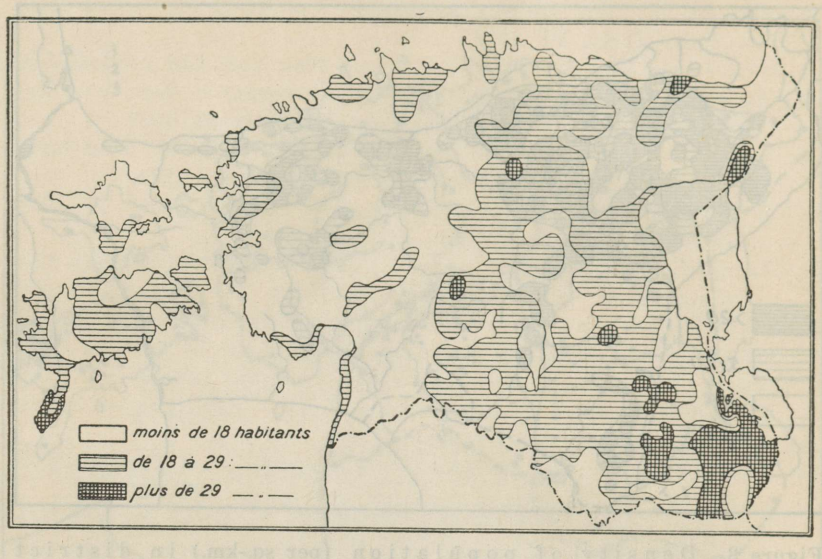


Figure 5. Density of rural population in Estonia, 1922. Distribution of density of country population (outside of towns) per sq.-km. by the help of interpolation method according to census.

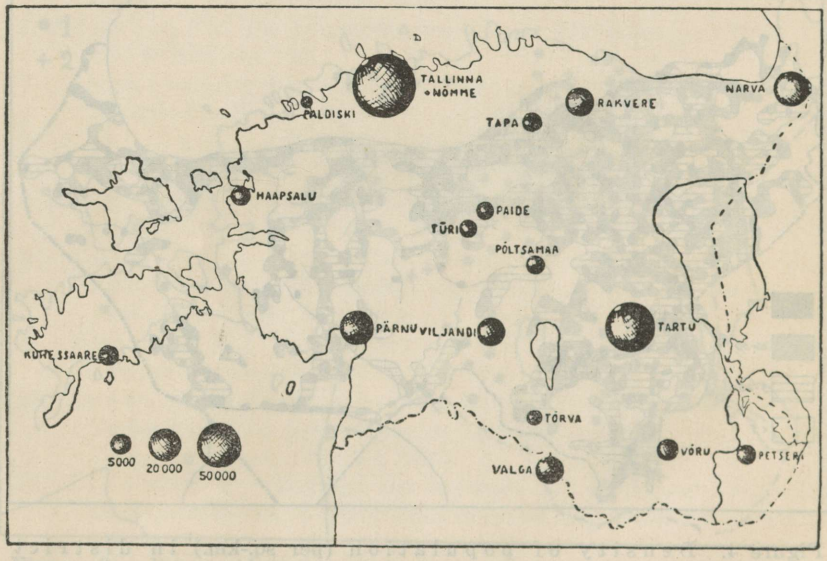


Figure 6. Urban agglomerations in Estonia, 1931. Population of Estonian towns by the help of absolute spherical method.

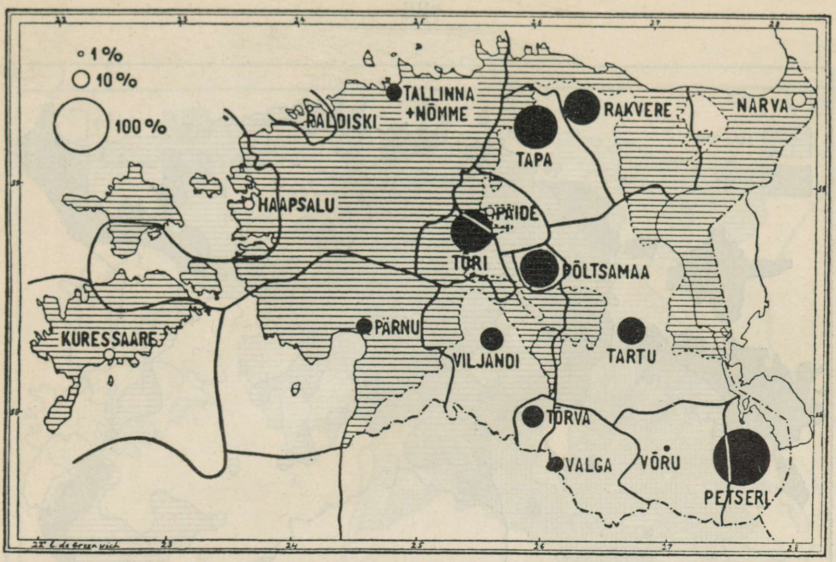


Figure 7. Relative increase (black circles) or decrease (white circles) of urban population 1922—1931 relating to 1922.

Thick lines represent the extension of urban hinterlands, white areas — the superaquatic region.

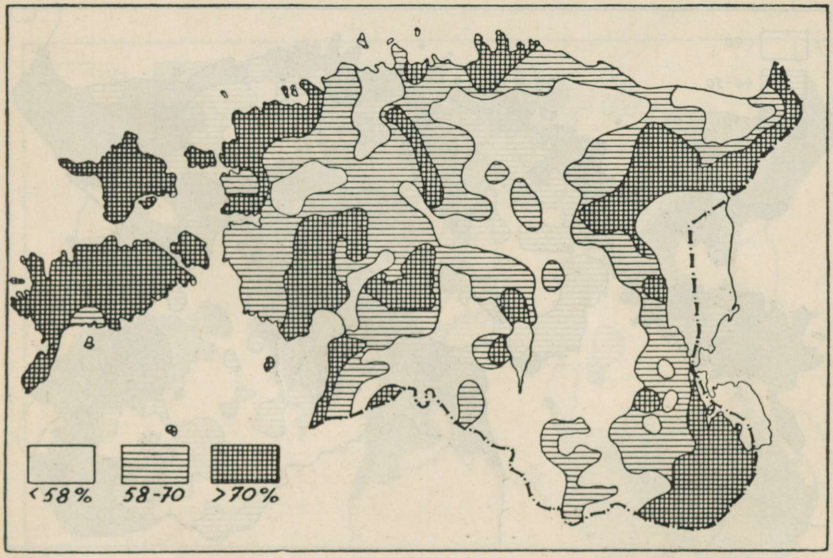


Figure 8. Horizontal mobility of country population in Estonia.

Percentage of rural inhabitants born in the same commune, where they lived at the census of 1922.

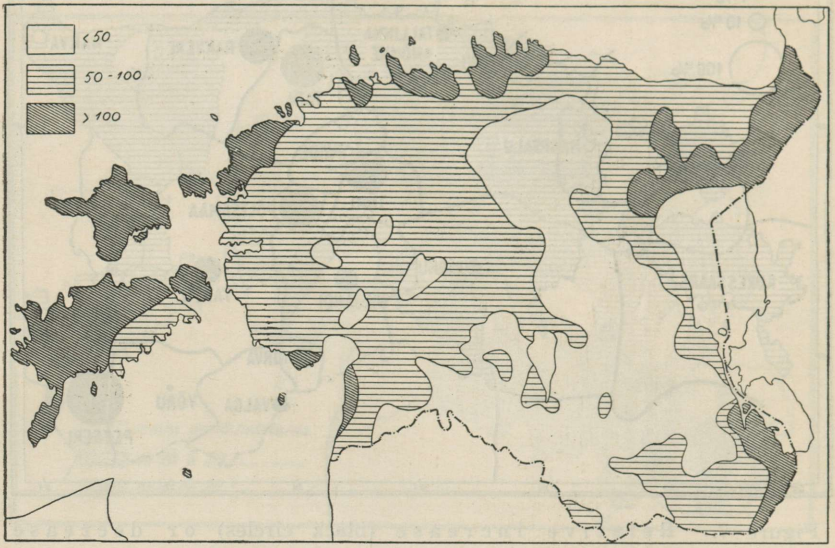


Figure 9. Density of agricultural (farm) population relating to arable land, 1929.
Number of farm inhabitants to each 100 ha arable land.

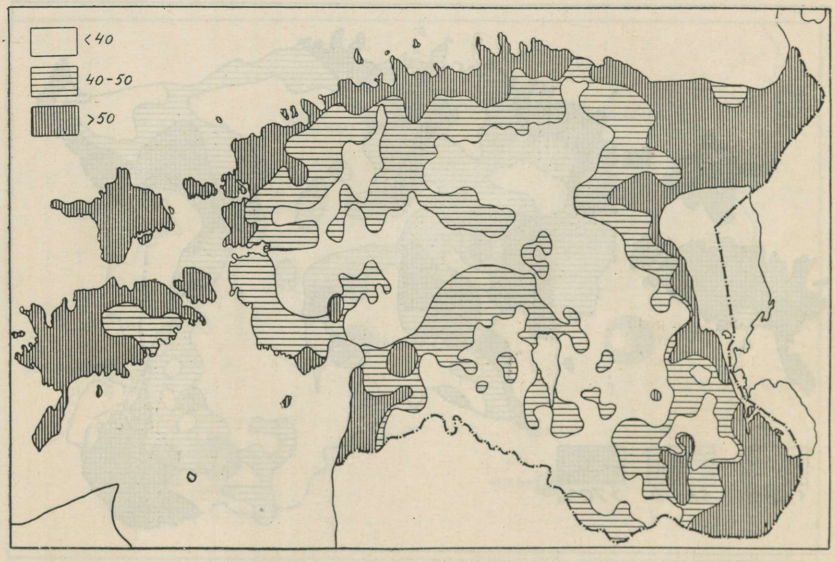


Figure 10. Density of agricultural population relating to „yield-land", 1929.
Number of farm inhabitants to each 100 yield-land units.

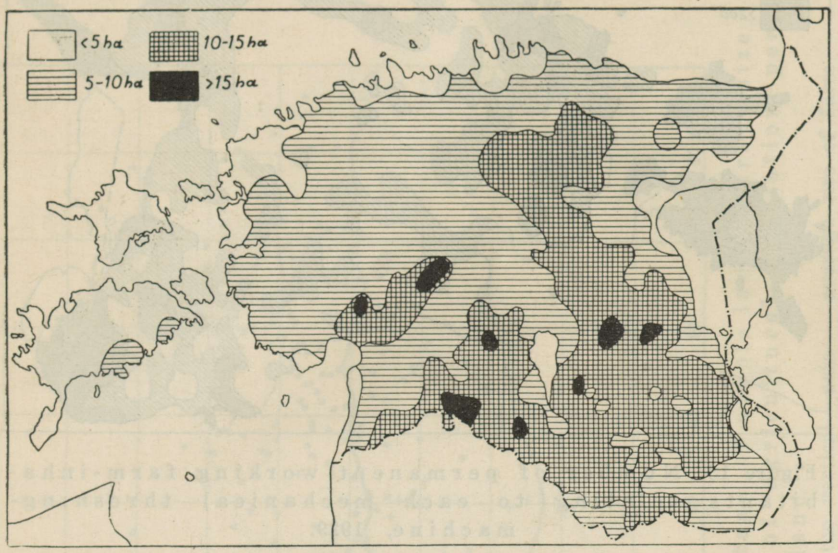


Figure 11. Average size of arable land per farm in ha according to agricultural census, 1929.

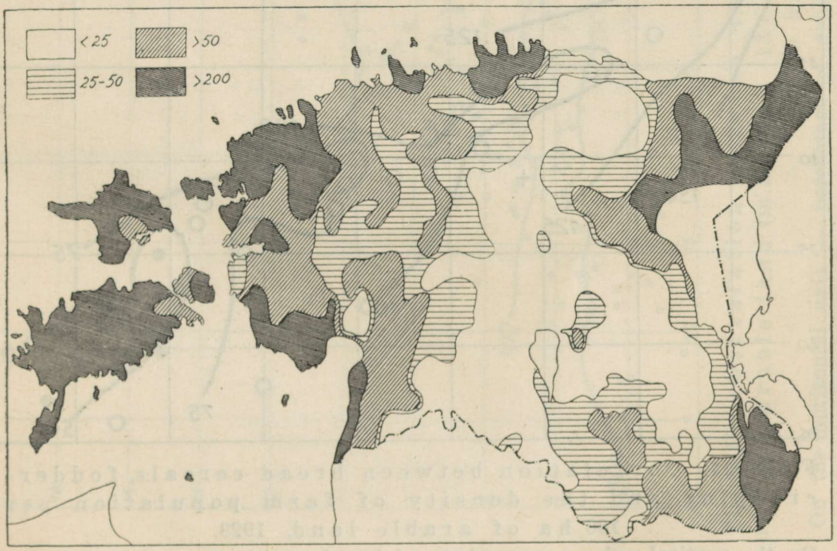


Figure 12. Number of permanent working farm-inhabitants relating to each mowing-machine, 1929.

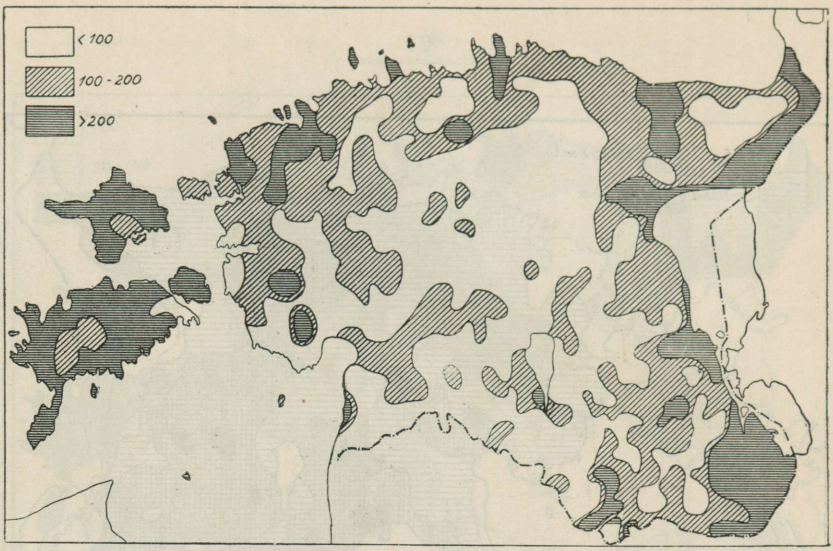


Figure 13. Number of permanent working farm-inhabitants relating to each mechanical threshing-machine, 1929.

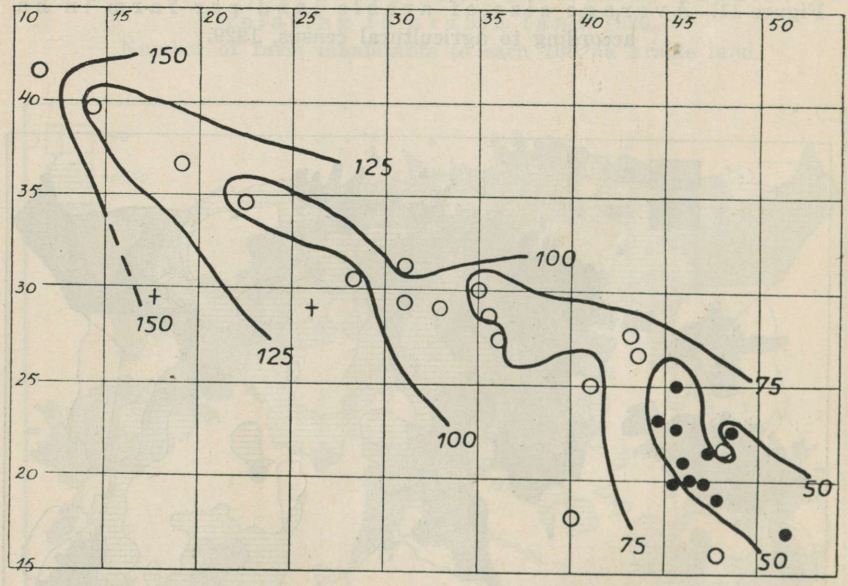


Figure 14. Correlation between bread cereals, fodder-cropping and the density of farm population per 100 ha of arable land, 1929.

On the vertical axis — percentage of bread cereals (rye + barley), on the horizontal axis — percentage of fodder-crops (clover, oats etc.), in the field — isarithmes of the density of farm population per 100 ha arable land.

White circles — landscapic units of subaquatic region, black circles — geographical districts of superaquatic region, crosses — units which are partly subaquatic, partly superaquatic.

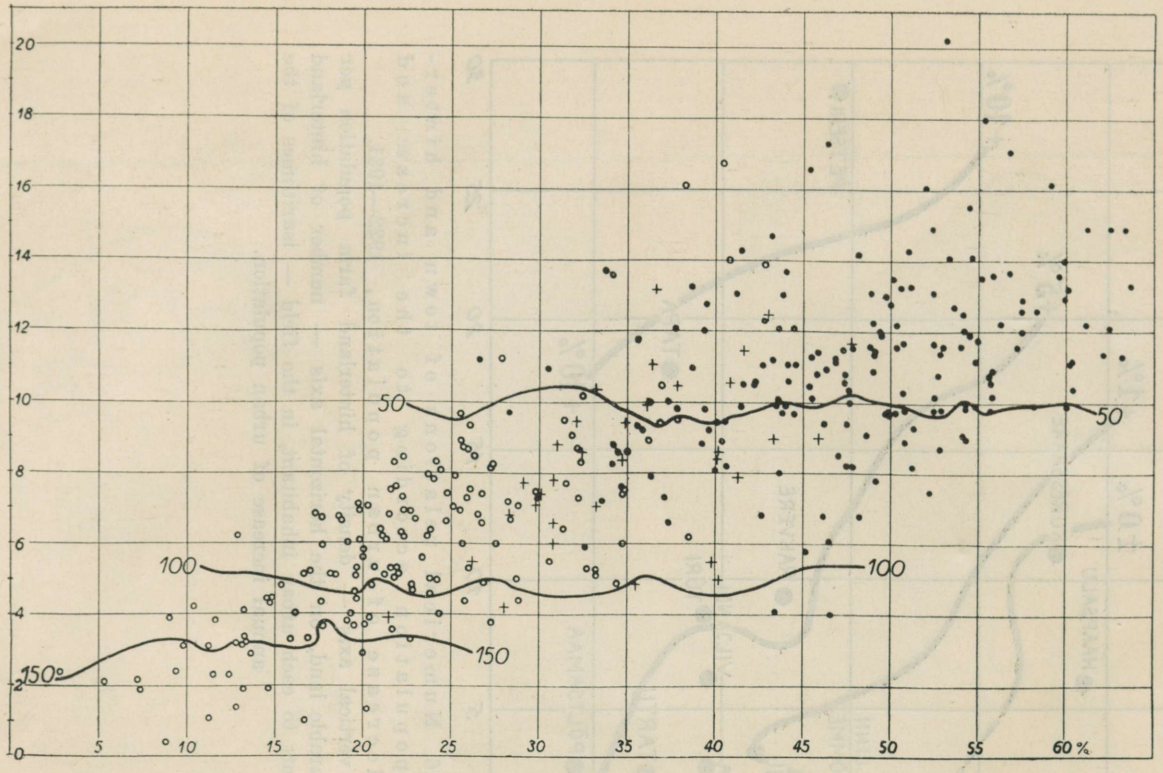


Figure 15. Correlation between the percentage of arable land, average size of farm arable land (in ha) and the density of agricultural population per 100 ha arable land.

On the horizontal axis -- percentage of arable land, on the vertical axis — average size of farm arable land in ha, in the field isarithmes of farm population per 100 ha arable land.

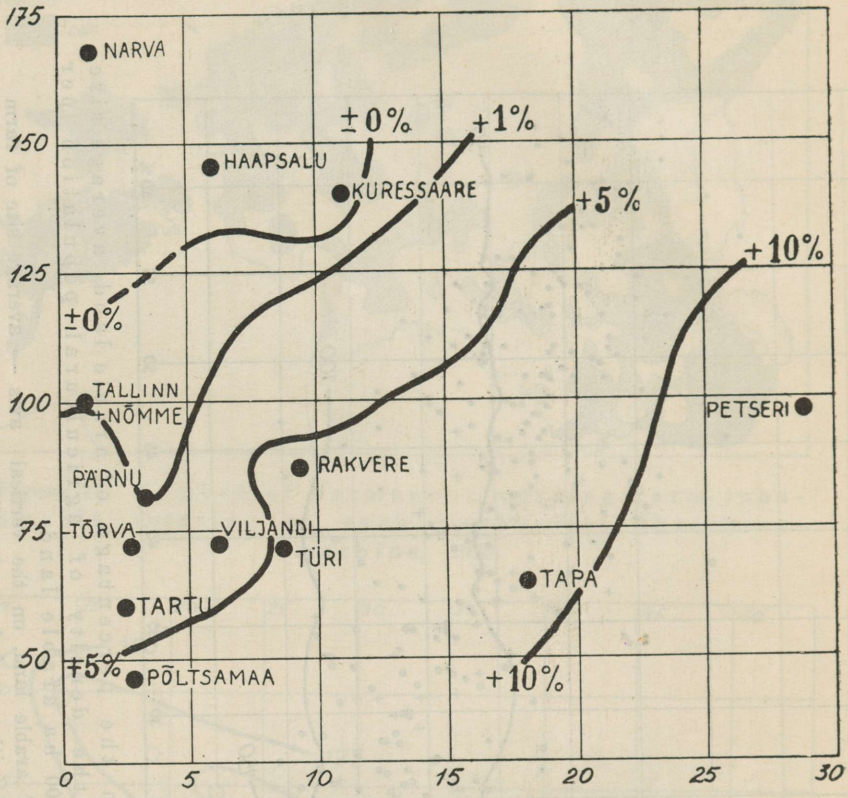
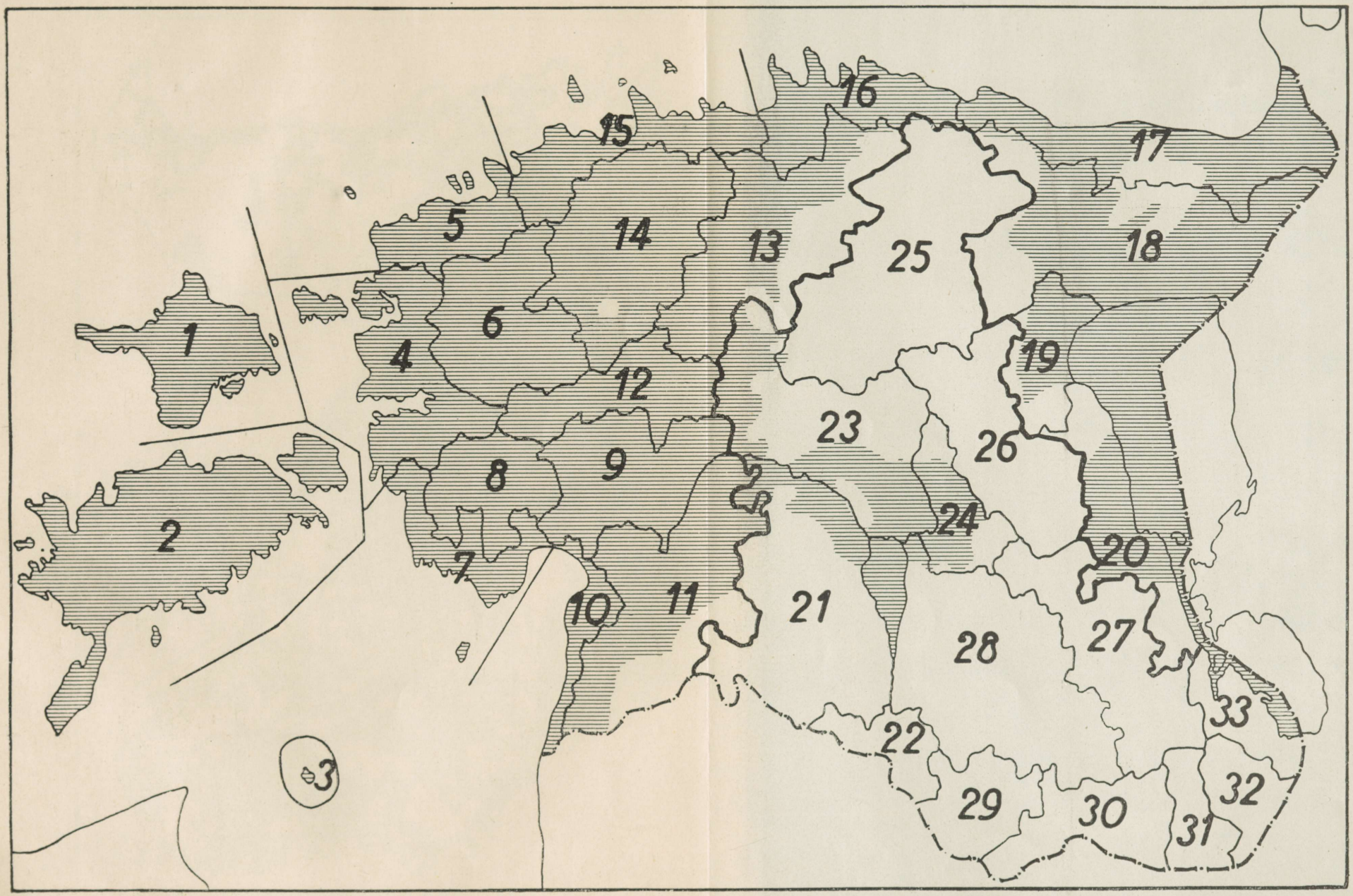
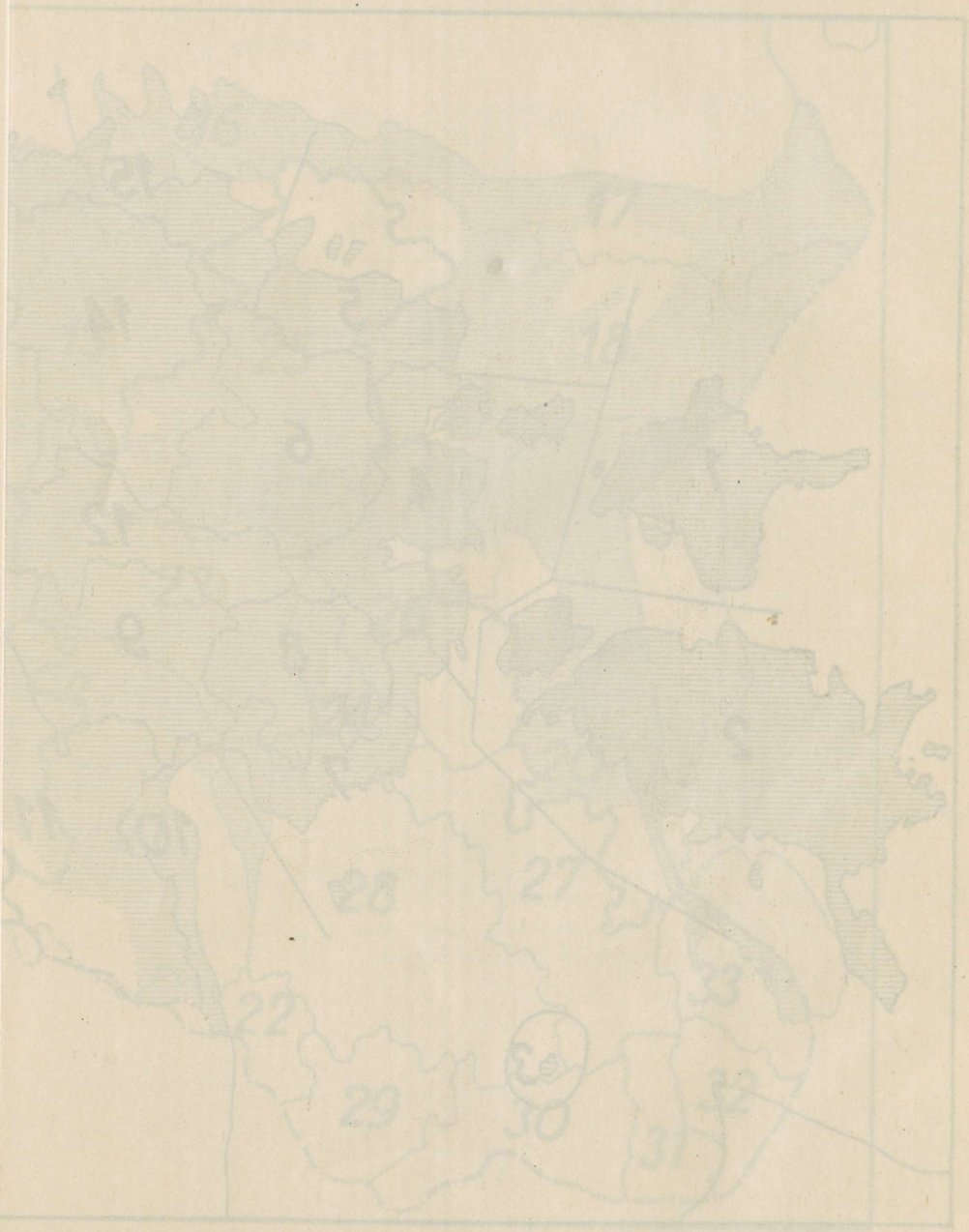


Figure 16. Numerical relations of town and hinterland population according to the increase and decrease of urban population, 1922—1931.
On the vertical axis — density of hinterland farm population per 100 ha arable land, on the horizontal axis — number of hinterland inhabitants to each urban inhabitant, in the field — isarithmes of the annual increase of urban population.



Map I. **Three-matter geographical districts or landscapie units** (numbered) **of Estonia** according to Granö [4].
Boundries of the districts congruate with commune boundaries so as to form statistically applicable commune-groups. White areas — super-aquatic region, hatched areas — subaquatic region.


28
27
22
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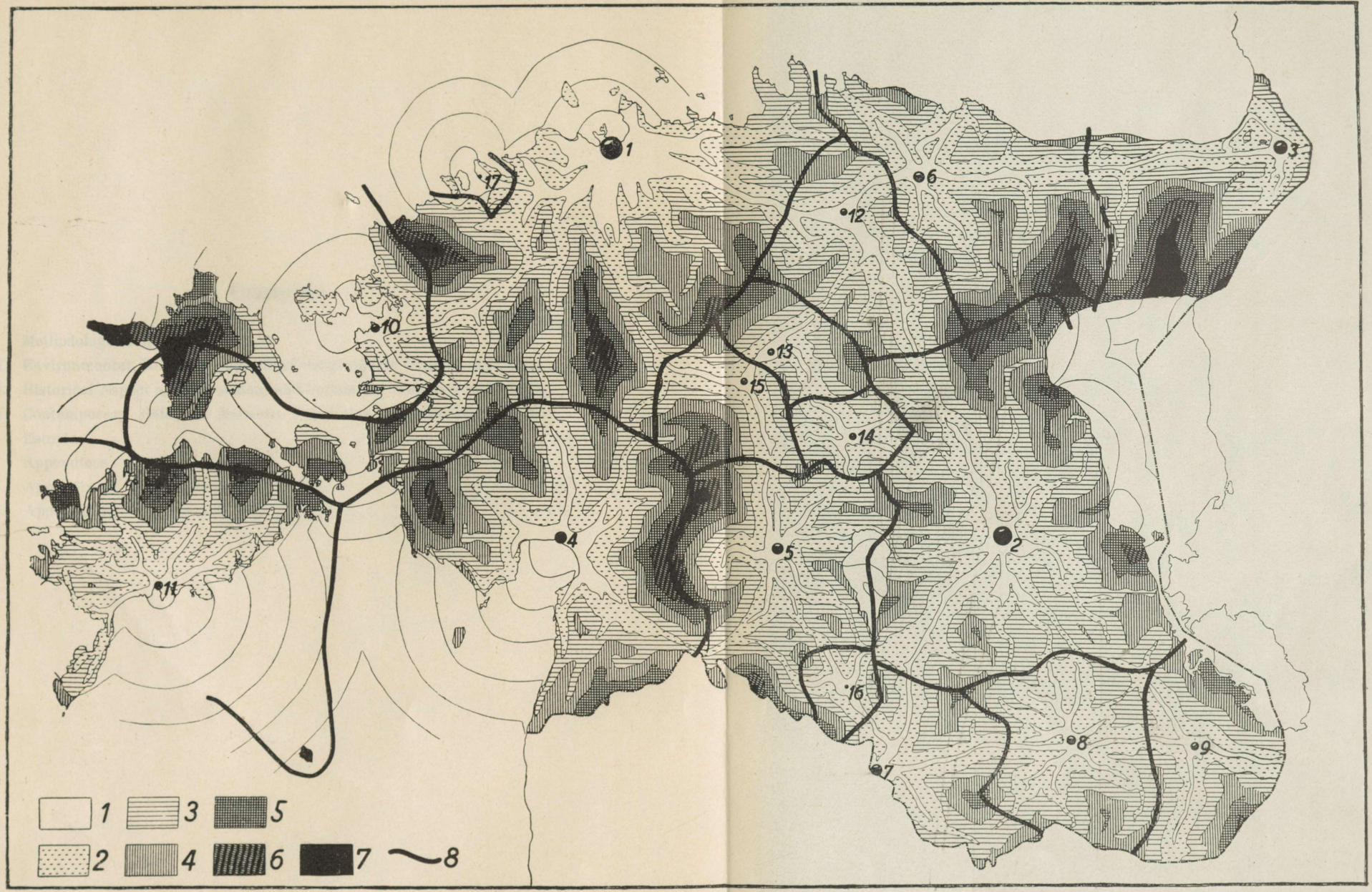
30

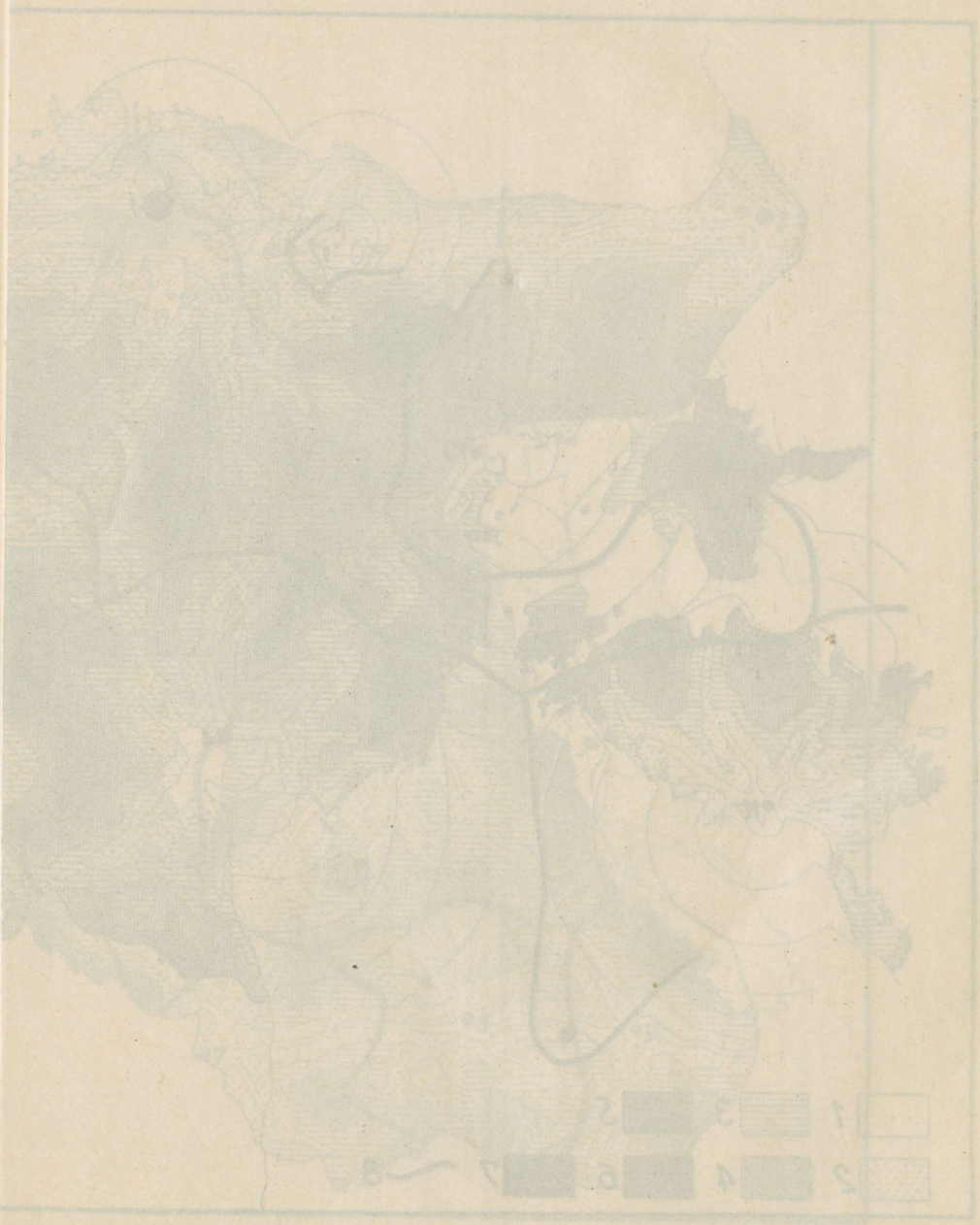
Map II. **Distribution of relative density of country population in Estonia, 1922.**
Relative density of country population per sq.-km by the help of Backhoff method according to census 1922 and the absolute map of Tammekann[24]).


5-20
20-50
>50



Map III. **Urban hinterlands in Estonia with policentric isochrones.**

Urban agglomerations: 1. Greater Tallinna (i. e. Tallinna with Nõmme). — 2. Tartu. — 3. Narva. — 4. Pärnu. — 5. Viljandi. — 6. Rakvere. — 7. Valga. — 8. Võru. — 9. Petseri. — 10. Haapsalu. — 11. Kuressaare. — 12. Tapa. — 13. Paide. — 14. Põltsamaa. — 15. Türi. — 16. Tõrva. — 17. Paldiski. — Thick black lines (8) indicate the hinterland boundaries of towns according to Maide [14]). Hatched areas (1—7) represent 1^h to 6^h and more than 6^h isochronous intervals.



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