MEMOIR ON THE PIGMENTATION SURVEY OF SCOTLAND.[1]

By John Gray, B.Sc.

[With Plates XXVII–XLVII.]

In 1895 the author, who had been engaged in an historical investigation of the origin of the races of Scotland, conceived the idea that the somewhat scanty evidence of history with reference to the origin of the Picts might be usefully supplemented by anthropometric work on the living population. Acting on this suggestion, he submitted the scheme to Mr. J. F. Tocher, Secretary of the Buchan Field Club, and he and other members of the Buchan Field Club agreed to co-operate with the author in making anthropometric observations on the people of East Aberdeenshire, which was, in early historical times, one of the seats of the Picts. As a result of this co-operation, pigmentation statistics of about 3,000 adults and measurements of 169 adults were obtained at Mintlaw in August, 1895. Some time after this a pigmentation survey of about 14,000 school children was carried out by Mr. Tocher in co-operation with the author. The results of these observations were given in a paper read before the British Association at Dover, 1899, and the whole of the observations made in East Aberdeenshire were described in a joint paper by the author and Mr. Tocher published in the *Journal of the Anthropological Institute*, vol. xxx, 1900. In 1900 anthropometric observations were made by Mr. Tocher and the author at the Louach gathering, West Aberdeenshire. On this occasion pigmentation statistics of 361 males and 243 females, and measurements of 90 adult males, were obtained. These results were described in a paper read before the British Association at Bradford, A.D. 1900. In 1901 a proposition was made at the British Association meeting at Glasgow to form a Committee to carry out a Pigmentation Survey of the whole of the school children of Scotland, but as no financial support was received from the British Association, a committee was formed consisting of Sir William Turner, K.C.B., Edinburgh (Chairman), Professor R. W. Reid, M.D., Aberdeen, J. Gray, B.Sc., London (Recorder), and J. F. Tocher, F.I.C., Peterhead (Secretary). This Committee received financial assistance from the Royal Society Government Grant Committee. Mr. Tocher and the author proceeded conjointly to organise the survey. Scotland was divided into districts; schedules were drawn up; appeals sent out to the teachers; this work being done by Mr. Tocher and the author in cooperation. The duty of sending out the circulars to the schools, of receiving them when filled in by the teachers, of compiling the tables dealing with about half a million school children, was left to Mr. Tocher, because he was on the spot, and was carried out by him and the clerks under his supervision. A

[1] This memoir is published by permission of Sir William Turner (Chairman), and Professor R. W. Reid, members of the Pigmentation Committee.

summary of the complete statistical tables, containing the percentages of each hair- and eye-colour and also the actual numbers of individuals in each category in each district, was supplied to the author by Mr. Tocher, and it is on these tables (I–IV) that the maps in this memoir are based, and these figures have also been used as the raw material for the calculations of divergence that have been made by the author (Table V) and represented in maps XLVI and XLVII.

It should not be forgotten that perhaps the greatest credit for carrying out this survey is due to the school teachers of Scotland. Without their co-operation the work could not have been done with the limited financial resources at the disposal of the Committee. The teachers' patriotism and their desire to advance knowledge of the origin of their people was appealed to, and not in vain.

The scheme of hair- and eye-colours adopted was practically the same as the Proposed Standard given in the *Journal of the Anthropological Institute*, vol. xxx, pp. 105 and 106, with the exception that jet black hair was made a separate category.

It was recognised before the survey was started that standard colour cards would add greatly to the precision of the results, and one of the best firms in this country was applied to and made a strenuous attempt to reproduce the shades of samples by the three-colour photo-lithographic process. But the attempt was a failure. The investigations of Mr. Udny Yule[1] have since shown that the inconsistency among observers who classify different shades by the help of names only is much greater than was suspected. This means that small differences of intensity of pigmentation may not be significant of any real difference, and that all deductions from these small differences must be received with reserve. There can be no doubt, however, that valuable conclusions as to broad differences can be safely drawn from this Survey, and the results obtained, it is hoped, will be of considerable interest. No future pigmentation survey, however, should be carried out without the use of standard samples.

METHOD OF DRAWING THE MAPS.

The number of hair-colours noted in the observations was five, namely, fair, red, medium, dark, black, and the number of eye-colours noted was four, namely, blue, light, medium, and dark.

A separate map has been drawn to show the distribution of each of these hair- and eye-colours for boys, and also a similar series of maps for girls.

The method of drawing the maps will now be described. To fix ideas let us assume that a map is to be drawn to show the distribution of fair hair among boys. A sheet of tracing paper is placed over the key map, on which the number of each district is printed in the centre of the district.[2] The percentage of fair hair in each district is marked on the tracing paper over the number. If we assume that

[1] *Jour. Anthropological Institute*, vol. xxxvi, p. 325.

[2] The districts were selected so as to contain about the same numbers, and so as to lie, whenever possible, in the same river basin. The centres were found empirically.

these numbers denote heights in a map of the physical features of a country, contour lines can be drawn on that assumption.

The intervals between adjacent contour lines are determined by the following considerations. If samples of n persons are drawn at random from the population after it has been thoroughly mixed, the standard deviation σ of the number of fair-haired persons from the mean will be $\sigma = \sqrt{npq}$ where n equals the number of persons in the sample, p is the probability of a fair-haired person being drawn, and q the probability of some other coloured person being drawn. If σ is expressed as a percentage, the formula becomes

$$\sigma = \frac{1}{\sqrt{n}}\sqrt{\mathrm{P}\,(100-\mathrm{P})}$$

where P is the general percentage of fair-haired persons (including both boys and girls) for the whole of Scotland.

If the deviation of a random sample from the mean is more than[1] three times the standard deviation of all random samples, it is known that such a sample will not be drawn oftener than once in 1,000 times. If the odds are 1,000 to 1 against any sample being a random sample of a population which is all of the same stock, then it becomes probable that such sample belongs to a different stock. If a contour line is drawn for a distance of 3 σ from the mean, then all included within that contour line may be taken as probably belonging to the average type for Scotland, as far as relates to fair hair, while those who are outside that contour line may be taken as probably belonging to a different stock. A second degree of abnormality may be indicated by drawing a second contour line indicating a deviation of 6 σ from the mean. The chances are 1,000,000,000 to 1 against the samples outside this second contour line belonging to the normal stock. The difference D between the mean and the first contour line and between any two adjacent contour lines will be

$$\mathrm{D} = 3\,\sigma = \frac{3}{\sqrt{n}}\sqrt{\mathrm{P}\,(100-\mathrm{P})}$$

As it is desirable for the sake of comparison that the same means and the same contour lines should be used for both boys and girls, P will be taken as the general percentage for the whole of the school children, including both boys and girls, though the percentages for the two sexes differ by a few per cent.

The following table gives the general percentages for the whole of Scotland :—

	Fair.	Red.	Med.	Dark.	Black	Blue.	Light.	Med.	Dark.	Total number.
Boys	24·9	5·5	43·3	25·0	1·2	14·6	30·3	32·7	22·3	257,535
Girls	27·4	5·1	40·9	25·4	1·2	14·9	30·3	32·0	22·8	244,017
Mean	26·1	5·3	42·1	25·2	1·2	14·7	30·3	32·3	22·5	—

[1] 3·1 times is more accurate.

Applying now the above formula (for which I have to thank Professor Karl Pearson) we can calculate the value of D for each hair- and eye-colour. The number n is taken as 2,000, which is somewhat below the average number of boys or girls in each district. The nearest whole number to the general mean is taken as the value of P.

If we exclude the large towns, the mean number n for each rural district will be about 1,800, but the values of D when n is taken as 1,800 are not perceptibly different from those obtained by making $n = 2{,}000$, since the next highest whole number has been taken in all cases.

Taking as an example the determination of the contour lines for fair-haired children, we find

$$\begin{aligned} D &= \frac{3}{\sqrt{n}}\sqrt{P\,(100-P)} \\ &= \frac{3}{\sqrt{2000}}\sqrt{26(74)} \\ &= \frac{3}{44{\cdot}72}\sqrt{1924} \\ &= \frac{3 \times 43{\cdot}86}{44{\cdot}72} \\ &= 2{\cdot}9 \\ \text{say} &= 3 \end{aligned}$$

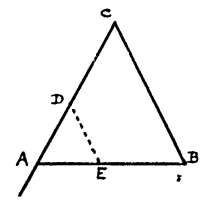
The maximum percentage of fair hair in any district being 36·9 and the minimum 19·7, the distribution of fair hair will be sufficiently represented by the following series of contour lines, of which the central line passes through, all points having the approximate mean value 26 :—

Contour lines for fair hair at 20, 23, *26*, 29, and 32.

The following table shows the contour lines for each hair- and eye-colour determined as explained above :—

	Mean.	Max.	Min.	Map mean.	D.	Contour lines.					
Fair hair ...	26·1	36·9	19·7	26	3	20	23	*26*	29	32	—
Red „ ...	5·3	7·7	3·1	5	2	—	3	*5*	7	—	—
Medium „ ...	42·1	51·0	30·0	42	4	34	38	*42*	46	50	—
Dark „ ...	25·2	32·1	18·8	25	3	19	32	*25*	28	31	—
Black „ ...	1·2	3·7	·3	1	1	—	—	*1*	2	3	—
Blue eyes ...	14·7	25·9	7·3	15	3	9	12	*15*	18	21	24
Light „ ...	30·3	42·7	20·9	30	4	22	26	*30*	34	38	—
Medium „ ...	32·3	38·2	20·9	32	4	24	28	*32*	36	40	—
Dark „ ...	22·5	29·2	17·2	23	3	17	30	*23*	26	29	—

To determine the points through which a contour line is to be drawn, it is best to use a graphic process for which a straight-edge, a set square, and a paper scale divided into 500 mm. are all that is necessary. Suppose we wish to determine a point through which a contour line 26 is to be drawn. Let us assume that there are two adjacent points A and B on the map marked respectively with percentages 25·6 and 27·3. These two points are in the first place joined by a straight line AB. AC is then set off at any convenient angle to represent $273 - 256 = 17$ on any scale, and AD = 260 — 256 on the same scale. If then DE is drawn parallel to CB, E is the point required. The construction can be carried out with the instruments mentioned, without drawing any lines on the map except the line joining AB. The edge of the paper scale is placed in any direction AC so that the point 256 of the scale coincides with the point A. The hypotenuse of the set square is placed so as to join the point 273 mm. on the scale with the second point on the map. Placing the straight edge against one of the shorter sides of the set square, the latter is slid along the straight edge till its hypotenuse coincides with 260 mm. on the scale. A line is then drawn passing through the point 260 mm., so as to intersect the line joining the two points on the map. This point of intersection is a point through which the contour line 26 passes.



It will be found advisable in drawing contour lines on a map to start from the points marked with the highest and the lowest percentages.

The five largest towns, Glasgow, Edinburgh, Leith, Dundee, Aberdeen, have not been included in the general system of contour lines. Each town, therefore, may be regarded, in accordance with the physical geography analogy, as an isolated block with perpendicular sides. This was found to be necessary because there is usually in large towns an immense difference between their pigmentation and that of the surrounding country. In rural districts there are usually no abrupt changes of this kind, and the distribution of pigmentation can be represented by a comparatively simple system of contour lines, as may be seen by an examination of the maps.

The intervals between the contour lines have been shaded according to a scheme, which makes readily obvious to the eye the various densities of pigmentation between the contour lines. No densities have been marked in figures except in the case of the large towns. If it is desired to know the exact percentage of a colour in any one of the 110 districts into which the country has been divided, that may be ascertained by the aid of the key map (XXVII) and the table of percentages (Tables I and II).

DETAILED DISCUSSION OF THE DISTRIBUTION OF PIGMENTATION AS SHOWN BY THE MAPS.

Maps XXVIII and XXIX. Fair hair.

The average percentage of boys with fair hair for the whole of Scotland is 24·9 per cent. It will be interesting to compare this percentage with that of

the countries in which the highest percentage of fair hair is found, namely, North Germany and Scandinavia, because history records that considerable migrations took place from these countries to the British Isles. The Saxons, according to these records, came from North Germany, the Angles from Schleswig-Holstein, and, later, the Vikings came from Scandinavia. A comparison of the percentages of fair hair will show whether this Anglo-Saxon and Norse invasion resulted in a complete transformation of our population to the blonde type, assuming that the population was not of the blonde type before the invasion took place.

According to Virchow's survey, the percentage in Schleswig-Holstein of fair hair among school children (boys and girls) was 82; in the district of Lüneburg, lying directly south of Schleswig-Holstein, the percentage was 83, the highest known in any district of equal size in Europe, or indeed in the world. The percentage for the whole of Prussia is 72·4 (Virchow). Among the conscripts of the Swedish army Retzius found 75·3 per cent. with fair hair, and judging from experience in Germany and elsewhere the percentage among Swedish children would be considerably higher than this.

Comparing these figures with the 25 per cent. in Scotland, we are driven to the conclusion that the pure Norse or Anglo-Saxon element in our population is by no means predominant. There is evidently also a dark or brunette element which is at least equal in amount and probably greater than that of the Norse element.

Coming now to the detailed consideration of the distribution of fair hair as shown by Map XXVIII, we see at once that the greatest density of fair hair is to be found in the great river valleys opening on to the German Ocean, and also in the Western Isles. The Tweed, the Forth, the Tay, the Don, on the east coast, all show indications of the settlement of a blonde race, by a higher density of fair hair in their valleys or in those of their tributaries. This is probably due to the Anglo-Saxon invasions.

The Spey Valley has evidently received a large infusion of the blonde type. The highest percentage of fair hair (among boys) in Scotland is to be found at the mouth of the Spey. The Hebrides and opposite coasts have also a high percentage of fair hair. Both the Spey Valley and the Western Isles have probably acquired their blonde characteristics from the Viking invasions.

The distribution of fair hair in the case of girls (Map XXIX), shows the same general characters as in the case of boys. One or two special points are, however, worth noting. The highest percentage in Scotland of fair hair among girls is to be found in and around Dunfermline. Margaret, a Saxon princess about the time of the Norman Conquest, became the queen of Malcolm Canmore, who then had his court at Dunfermline. This suggests an interesting speculation. Many fair-haired Saxon ladies must have come in Margaret's train. Have the blonde characteristics of these fair ladies survived through the thirty to forty generations that have passed since their arrival in Dunfermline?

Karl Pearson has shown[1] that the hereditary resemblance between relatives

[1] *Grammar of Science.* 2nd edition, p. 459.

of the same sex is greater than between members of the opposite sex. Pairs of relatives of the same sex are more alike than pairs of the opposite sex. This has been proved to be true for eye-colour, stature, head index and coat-colour, and no doubt is true for all characters, since all characters in man have so far been found to be more or less correlated. It follows that inheritance in a line through one sex is prepotent over inheritance in the same degree with a change of sex: that a man, in eye- and hair-colour, or in any other character, more closely resembles his paternal than his maternal grandfather; and a woman more closely resembles her maternal grandmother than her paternal grandmother. It is this law of separate inheritance by the two sexes, as if they were to a certain extent separate races, that makes it important to observe the differences in the distribution of pigmentation of the two sexes. In many of the earlier invasions of the British Isles, men with few, if any, women must have settled in the country, and taken to themselves wives from the native women of the country. If the natives differed considerably in any physical character from the male invaders, then we should expect to find this difference preserved more or less in the opposite sexes at the present day.

It will be observed that in the Hebrides (especially in the southern islands) the percentage of fair hair is less for girls than for boys. The difference is not great, but if it is real and not due to the inconsistency of observers, it points to a settlement of blonde Norse invaders among a darker native population. In Orkney and Shetland there is a considerably higher percentage of girls with fair hair than of boys. This would imply that Norse women had been extensively settled in these islands. As the Norse were for a long time in peaceful occupation of these islands and they were not far distant from Norway, the extensive settlement of Norwegian women is probable.

The effect of an urban environment on the percentage of fair hair in the population has been investigated by several anthropologists. Shrubsall has found that the percentage of fair hair in slum districts of London, such as Southwark, is very much below the average. This agrees with what we find in Glasgow, where the average percentage is 21·7 for girls and 22·1 per cent. for boys; that is more than 4 per cent. below the average for Scotland. Dundee (24·8 for girls and 23·3 per cent. for boys) is also below the average for Scotland. In Leith the girls (27·5 per cent.) are above the average, and the boys (23·6 per cent.) are below the average; and in Aberdeen the girls (27·3 per cent.) are above average, and the boys (24·5 per cent.) are slightly below the average. In Edinburgh both the girls (26·6 per cent.) and the boys (26·3) are slightly above the average.

It would appear, therefore, that industrial towns like Glasgow and Dundee are unhealthy for the blonde type. In Dundee the conditions appear to be specially unfavourable to blonde men. In Leith the conditions also appear to be unfavourable to blonde men. In all these five large towns, in fact, except in Glasgow and Edinburgh, the blonde men appear less fitted to survive than the blonde women.

Of course, it must not be forgotten that these deviations from the normal in towns may not be wholly due to selective birth-rate and death-rate. It may be, in part, at least, due to selective immigration. Town life may have a greater attraction for the brunette than the blonde type. Whatever be the cause, certain towns, of the industrial type, appear to act as selective centres. It follows from this that the opinion promulgated by certain writers who have not studied the facts, that the improved facilities for locomotion in modern times have had the effect of making the population more homogeneous, is entirely erroneous. On the contrary, owing to the existence of selective centres, all improvements in transport apparently tend to make the population more heterogeneous.

Maps XXX and XXXI. Red hair.

The average percentage of red hair in Scotland (including boys and girls) is 5·3 per cent.; the percentage of red-haired boys (5·5) being slightly higher than that of red-haired girls (5·1). The variation in different parts of the country is not great, only three contour lines being required to show the whole distribution. Virchow found only ·3 per cent. in Prussia, but he admits that he considered the returns of red hair were too low. Baxter has recently found 5 per cent. of red hair among the peasants of North Dorsetshire, so that it is probable that there is not much difference between the percentages of red hair in Scotland and in England. Retzius found 2·3 per cent. among the Swedish conscripts, Livi found ·6 per cent. in Italy, and Ammon 1·7 per cent. in Baden.

The Maps XXX and XXXI show no very striking features in the distribution of red hair. There appears to be a slightly higher percentage round the coasts than in the interior. There is a patch of high density in the case of girls near the mouth of the Spey, and the N.W. corner of Scotland appears to have a high percentage in the case of both boys and girls. Judging from the European percentages given above, a very high percentage of either dark or fair hair means a small percentage of red hair. When the percentage of dark and fair is more nearly equal as in the British Isles, the percentage of red hair appears to increase. But the origin of red hair is a question that requires further investigation.

An examination of the percentages for the five large towns appears to show that urban conditions tend to increase the percentage of red hair among men, but does not perceptibly affect that among women.

Maps XXXII and XXXIII. Medium or brown hair.

Medium or brown hair includes all the lighter browns which at some distance from the observer appear brown and not black. The percentage (42·1) of brown-haired persons in Scotland is far larger than the percentages of other colours. Brown hair probably results from the thorough admixture of the blonde and dark types. The percentage (43·3) is rather higher among boys than among girls (40·9).

Comparing Scotland with other European countries, we find 21·6 per cent. in Sweden (conscripts), 26 per cent. in Prussia (school children), 60·1 per cent. in Italy (conscripts), 38·6 per cent. in Baden (conscripts). These figures appear to indicate that an excess of dark over fair is correlated with a high percentage of brown hair.

The distribution of brown hair in Scotland broadly supports this view. Among both boys and girls the highest percentages of brown hair are in the midlands and south of Scotland, and on certain parts of the east coast, not, however, closely associated with the great river valleys, and, therefore, probably not due to immigration. The highlands of the south, in Peebles and Selkirk, appear, from reasons difficult to explain, to have a high percentage of brown hair, and small percentages of fair and dark. In Ayrshire there is, in the case of girls, a higher percentage of brown hair than in the case of boys. Otherwise, the distribution of brown hair in the case of boys and girls corresponds very closely.

Round the ancient abbeys of Arbroath and Deer there appear isolated patches of high density of brown hair. These religious institutions, which existed for centuries and were recruited from distant lands, may have been the means of attracting an alien element to their neighbourhoods.

In the hinterland of Caithness there is a high percentage of brown hair, indicating the presence of a dark race driven inward by the later Norse invasions, but now considerably intermarried with the blonde invaders.

The high density of brown hair round the Beauly Firth is difficult to explain. Assuming that the Picts were a dark race, the presence of the king of the Picts at Inverness in the time of Columcille may perhaps have something to do with it.

In Renfrew, North Ayrshire, and the lower Clyde Valley, a considerable alien population has been induced to settle by the attraction of the coal, iron and other industries, and this must be taken into account in trying to explain the high density of brown hair in these districts.

The urban environment appears to be favourable to the survival of brown-haired men, since the percentage in all the five large towns is above the average for boys. In the case of girls the percentage is below the average except in the case of Glasgow and Dundee.

Maps XXXIV and XXXV. Dark hair.

Dark hair includes all the darkest browns which, at a moderate distance from the observer, look black.

In Scotland the percentage of dark-haired girls (25·4) is somewhat higher than the percentage of dark-haired boys (25·0). This tends to confirm the view that a blonde race of men (without women) invaded and intermarried with a darker native race. The percentage for Scotland when both boys and girls are included is 25·2.

To compare this with other countries we must add on the percentage (1·2) of black hair, as black hair is not stated in a separate category by European observers. The percentage for Scotland when these two categories are amalgamated is 26·4. Retzius found among the Swedish conscripts only 0·8 of this type, which again demonstrates how far the population of Scotland is from being a pure Anglo-Saxon or Norse type. In Prussia Virchow found 1·3 per cent. of this type among the school children; in Baden Ammon found 18·1 per cent.; and in Italy Livi found 31·1. This shows how the percentage of dark hair increases as we pass from Scandinavia to the south of Europe. But evidently we have to pass further south than Baden, in that part of Europe, to find a race with as high a percentage of dark hair as the Scotch. Further east we find in Upper Bavaria 24 per cent. of dark hair, but in Belgium (which is also exceptionally dark for its latitude) there is a much higher percentage than in Scotland.

Considering now the distribution of dark hair in Scotland as shown by Maps XXXIV and XXXV, we see that there is a close general resemblance between the distributions in the case of boys and girls. The region of maximum density is, in both cases, in the extreme west of Scotland. In the case of boys, this region is further south than in the case of girls. If we assume for reasons given above that the pigmentation of girls represents more nearly the pre-Norse inhabitants, this native type has been crowded into the Isle of Skye and the opposite coast of the mainland. If the Dalriadic Scots, who invaded Argyllshire in the fifth century, were a dark race, and the invaders who settled there were men only, that would account for the darkest region in the boys' map being in Argyllshire. The Hebrides have been so much affected by the Viking and other Norse invasions from Scandinavia which have passed round the north of Scotland, that they have a much smaller percentage of the dark type than the islands and mainland lying further east. The island of Lewis has a higher percentage of dark girls than boys, indicating the presence of a pre-Norse dark native population. The south-west corner of Scotland in both the boys' and the girls' maps is darker than the average; and since, in historical times, the Picts inhabited this region, this evidence points to the conclusion that the Picts were a dark race.

In the girls' map we have the same isolated patches of high density near Arbroath and in East Buchan, as were shown by the brown hair maps. This peculiarity is, however, not seen on the boys' map for dark hair.

In the midlands, from Glasgow to the Forth, there is a somewhat irregular distribution of regions of high density of dark hair.

The lowest percentage of dark hair is found in a district lying due south of Edinburgh extending through Midlothian, Selkirk and Peebles to the border.

The urban environment appears to be favourable to the survival of dark-haired women, for in all the five largest towns except Leith the percentage of dark-haired girls is higher than the average for Scotland. The dark-haired boys,

on the contrary, are below the average in three towns, equal to the average in one, and above the average in one.

Maps XXXVI and XXXVII. Black hair.

Black hair includes all shades which are really jet black without any trace of brown. This colour of hair is very rare among North European peoples, though common enough among South European and Asiatic races. The percentage for the whole of Scotland is only 1·2 per cent., and is the same for both boys and girls.

There are no data for comparison with other countries.

In Scotland, the greatest density is in the central highlands and on the wild west coast. The boys' map shows this distribution more emphatically than the girls where the central region of high density is not so well marked.

In Glasgow the percentage is the same as for the whole of Scotland. Edinburgh, Leith and Aberdeen are below the average, while Dundee is above. These relations hold for both boys and girls.

It must not be forgotten that the boundary line between dark and jet black hair is very indefinite, and a considerable variation in the small percentage of black hair must on that account be due to the inconsistency of observers. Any conclusions deduced from the distribution of black hair must, therefore, be taken as subject to correction.

Maps XXXVIII and XXXIX. Pure blue eyes.

The category of pure blue eyes does not occur in the scheme of eye-colours employed by Beddoe, nor was it used in the observations made by the Buchan Field Club.[1] It was, however, used by Virchow in his survey of the German school children, and for the sake of comparison with the German results, it was considered desirable to include this category in the eye-colour scheme for the pigmentation survey of Scotland.

The percentage of pure blue eyes for the whole of Scotland (including boys and girls) is 14·7. Virchow found in Prussia 42·9 per cent. This again shows how large a percentage of the brunette type is mixed with the blonde type in Scotland. The percentage of pure blue eyes among girls, namely, 14·8, is only very slightly higher than that for boys, namely, 14·6.

The distribution of blue eyes in Scotland corresponds broadly with the distribution of fair hair, a result which was to be expected from the fact that there has always been found a fairly high correlation between them.

In the boys' map a very high density occurs in the lower Spey Valley and on the north side of the Beauly Firth. The Tweed, Forth, and Tay Valleys show high densities, as do also the north-west corner of Scotland, and the Hebrides. The highest density exists in East Lanarkshire in the coal and iron districts. This

[1] *Jour. Anthropological Institute*, vol. xxx, p. 104. 1900.

is probably due to the Irish immigrants, it being well known that blue eyes are very common among the Irish, as they are often associated with the darker as well as the lighter colours of hair. Here we have an example of the powerful influence of certain industrial conditions in effecting a change in the pigmentation of the population.

In the girls' map the same general distribution is seen, though the higher density in the east coast valleys is not so well marked. In the Spey Valley the density is quite as high for girls as for boys, suggesting the Norse invasion of the Spey Valley was a peaceful penetration, in which the Norse men brought their Norse women with them. The peak in East Lanark is not so prominent in the case of girls as of boys, which suggests that the Irish men immigrants have not generally brought Irish wives with them.

The urban environment has reduced the percentage of blue eyes below the average in all the large towns except Edinburgh, in the case of both boys and girls. In Leith and Glasgow the reduction is largest. This again shows how fatal the environment in large seaport and manufacturing towns is to the blonde type.

Maps XL and XLI. Light Eyes.

Light eyes include bluish grey and light grey eyes. There must necessarily be a considerable amount of inconsistency among different observers in drawing the line between pure blue eyes and light eyes, so that conclusions founded on small differences of percentage should be received with some reserve.

The general percentage for Scotland is 30·3 and is the same for boys and girls. No comparison can be made with Germany in this case, because Virchow's category of grey eyes is much wider.[1]

One of the most striking features on the maps is the high percentage of light eyes in Argyllshire, and in the islands of Jura and Islay. This has also a high percentage of dark hair, so that the Irish type with dark hair and light eyes must be predominant. This peculiarity may be inherited from the Dalriadic Scots who passed over from Ireland to this district in the fifth century.

Maps XLII and XLIII. Medium Eyes.

Medium eyes is a sort of residual category to take all those colours of eyes lying between dark and light eyes.

The general percentage for Scotland is 32·3, the percentage for boys, namely, 32·7, being rather higher than the percentage for girls, namely, 32·0.

There are few noteworthy features in the distribution of medium eyes as shown by the maps. The Peebles and Selkirk district has a large percentage of medium eyes (among boys) and we have seen that this district had also a large percentage of brown or medium hair. Scotland south of the Forth, the east coast districts, and Argyllshire on the west have high percentages of medium eyes.

[1] See *Jour. Anthropological Institute*, vol. xxx, p. 105. 1900.

The urban environment appears to be favourable to medium eyes, most of the large towns having percentages above the average.

Maps XLIV and XLV. Dark Eyes.

This category includes brown and all darker shades of eyes.

The general average percentage for Scotland is 22·5, the percentage (22·8) for girls being somewhat higher than the percentage (22·3) for boys.

In Prussia Virchow found 24·5 per cent. of this type, and in Sweden, Retzius found only 4·5 per cent. In Italy, Livi found 69·1 per cent.

The distribution of dark eyes in Scotland by no means corresponds with that of dark hair. For example, the percentage in Argyllshire is low with a high percentage of dark hair, and in the Tay Valley the percentage is high with a high percentage of fair hair.

The urban environment appears to be very favourable to the dark-eyed type, all the percentages in the large towns for both boys and girls, with one exception, being higher than the average for Scotland.

Maps XLVI and XLVII. Divergence.

These maps are of quite a different character from those previously described, which illustrated the distribution of a single hair- or a single eye-colour. Map XLVI exhibits the distribution of deviations of the pigmentation of boys' hair from the average for Scotland, when account is taken of the whole five hair-colours. Map XLVII shows the distribution of deviations when the whole four eye-colours (of boys) are taken into account.

These maps have been drawn in accordance with a suggestion made to the author by Professor Karl Pearson, and promise to be of great value in giving a numerical estimate of the effect of environment on the physique of the population, or for indicating the presence of an alien race in any part of the country. The calculations involved in the making of these maps are somewhat laborious, but the result appears to justify the labour.

In order to draw divergence maps, numbers are first determined for each district, which indicate how often the observed frequencies, say of the hair-colours, in that district would be drawn as a random sample, from a population, in which the frequencies are the same as for the whole of Scotland. As the range of variation of these numbers would be too great to be represented on a map, their logarithms are marked in the centre of each district on the map. The contour lines are then drawn on the assumption that the numbers marked on the map represent heights.

For example, Glasgow is marked with the number 43·6. This signifies that if $10^{43·6}$ samples were drawn at random from a population having everywhere the same average frequency of hair-colours as the average frequency for the whole of Scotland, the special frequencies of the hair-colours in Glasgow would be drawn only once. In other words, the odds against the population of Glasgow being a random sample of the population of Scotland are $10^{43·6}$ to 1. These odds are

enough and more than enough to establish the important conclusion, that the population of Glasgow[1] has been so much changed by an urban environment, and by alien immigration, that it can no longer, as a whole, be regarded as Scotch. The contour lines have been drawn at 3, 6, 9, 12, 15, and 18 degrees of abnormality or divergence. All the districts lying below the three contour lines are considered to have a population of the normal Scotch type, because in these districts the odds against their population being drawn as a sample from the general population is less than $10^3 = 1{,}000$ to 1. These odds are arbitrary, but they are usually selected by statisticians to mark the practical limits between the possible and the impossible.

The abnormality or divergence numbers marked on the map are Log $\frac{1}{P}$ where P is the probability of the sample observed occurring as a random sample of the general population. P is determined by formulæ due to Karl Pearson,[2] and tables of the values of P have been calculated from these formulæ by Palin Elderton.[3] For the purposes of the Memoir the values of P were taken from Elderton's tables as far as they went, but certain values were beyond the range of the tables, and these were calculated from Pearson's formulæ.

The first step in the process is the calculation of a function χ^2 for each district, χ^2 being separately calculated for hair-colours and eye-colours.

$$\chi^2 = \mathrm{S}\left\{\frac{(m_r - m_r^1)^2}{m_r}\right\} = \text{sum}\left(\frac{\text{squares of the differences of theoretical and observed frequencies}}{\text{theoretical frequency}}\right)$$

The theoretical frequency of a hair- and eye-colour in a district is the number of persons that would have that colour if the distribution of pigmentation in the district was the same as for the whole of Scotland. For example, in Glasgow 41,526 boys were observed. If the distribution of pigmentation in Glasgow were the same as in the whole of Scotland, 24·9, or in round numbers 25 per cent.[4] of these boys would have fair hair, that is—

Theoretical frequency of fair hair in Glasgow

$$m_r = \cdot 25 \times 41{,}526 = 10{,}381.$$

The theoretical frequencies of the remaining colours are calculated in the same way. The frequencies actually observed are subtracted from the theoretical frequencies calculated as above. The differences are squared and divided by the

[1] That is, of course, in so far as it is correctly represented by the school children observed.

[2] *Phil. Mag.*, vol. l, pp. 157–175. July, 1900.

[3] *Biometrika*, vol. i, p. 155.

[4] It might be possible for a very large district, with, say, a distribution of hair-colours identical with the standard distribution, to appear to differ significantly from that standard when the theoretical frequencies were calculated from percentages thus rounded off to the nearest unit or half unit. I have tested the rough work, however, against the use of more accurate proportions, in several instances, and find that no sensible difference has been made by my use of round numbers which very much lessened the arithmetic.

theoretical frequencies, and the quotients obtained are summed for all the colours. The sum obtained in this way is χ^2 for the district.

An example of the calculation of the value of χ^2 for hair-colours and for eye-colours is given below, for districts 13 (Glasgow), 44 (Edinburgh), 66 (Dundee), and 77 (Aberdeen). χ^2 is obtained by summing the values of $\frac{(m_r - m^1_r)^2}{m_r}$ for all the hair-colours and for all the eye-colours. A single χ^2 might have been calculated for the hair- and eye-colours combined, but it was considered desirable to deal with them separately for the purpose of comparing the results.

χ^2 having been calculated for each district, the probability P of the sample occurring in a homogeneous population may be found from Elderton's tables, or if χ^2 is beyond the range of the tables, may be calculated from the following formulæ:—

$$P = \sqrt{\frac{2}{\pi}} \int_{\chi}^{\infty} e^{-\frac{1}{2}\chi^2} d\chi + \chi \sqrt{\frac{2}{\pi}} e^{-\frac{1}{2}\chi^2} \qquad (1)$$

when the number of categories $n^1 = 4$, as in the case of eye-colours,
and

$$P = e^{-\frac{1}{2}\chi^2}\left(1+\frac{\chi^2}{2}\right) \qquad (2)$$

when the number of categories $n^1 = 5$, as in the case of hair-colours.

From formulæ (1), by neglecting the first term which becomes insensible for values of χ^2 above 30, we get

$$\text{Log}\,\frac{1}{P} = \cdot 4343 \times \tfrac{1}{2}\chi^2 - (\bar{1}\cdot 9019 + \log \chi)$$

and with this formula it is easy to calculate in the case of eye-colours $\text{Log}\,\frac{1}{P}$ for all values of χ^2 beyond the range of Elderton's tables.

From formula (2) we get

$$\text{Log}\frac{1}{P} = \cdot 4343 \times \tfrac{1}{2}\chi^2 - \log\left(1+\frac{\chi^2}{2}\right)$$

and from this formula it is easy in the case of hair-colours to calculate $\text{Log}\,\frac{1}{P}$ for any value of χ^2.

The values of χ^2 and $\text{Log}\,\frac{1}{P}$ for each district is given in Table V.

Map XLVI, showing the divergence or deviation from normal of the population of Scotland in the matter of hair-colours of boys, shows some interesting features. The unshaded districts which lie within the contour line 3 are inhabited by normal Scotch, in the sense that the odds are less than $10^3 = 1{,}000$ to 1, that any sample of the population drawn from these districts is not normal, *i.e.*, it may be taken as normal.

EXAMPLES OF THE CALCULATION OF χ^2 FOR GLASGOW, EDINBURGH, DUNDEE, AND ABERDEEN.

Boys.

District.		Hair colours.					χ^2	Eye colours.				χ^2
13.	m_r	10381	2284	17981	10381	498	—	6104	12582	13579	9260	—
	m^1_r	9161	2227	18999	10658	481	—	4964	12679	13887	9996	—
	$m_r - m^1_r$	1220	57	1018	277	17	—	1140	97	308	736	—
	$(m_r - m^1_r)^2$	1488400	3249	1036324	76729	289	—	1299600	9409	94864	541696	—
	$\frac{(m_r - m^1_r)^2}{m_r}$	143·38	1·42	57·63	7·39	·58	210·40	212·91	·75	6·99	58·50	279·15
44.	m_r	2454	540	4252	2455	118	—	1443	3211	2975	2190	—
	m^1_r	2584	529	4220	2388	98	—	1484	2927	2992	2416	—
	$m_r - m^1_r$	130	11	32	67	20	—	41	284	17	226	—
	$(m_r - m^1_r)^2$	16900	121	1024	4489	400	—	1681	80656	289	51076	—
	$\frac{(m_r - m^1_r)^2}{m_r}$	6·89	·22		1·83	3·39	12·57	1·17	25·12	·10	23·32	49·71
66.	m_r	2188	481	3790	2188	105	—	1280	2652	2862	1952	—
	m^1_r	2038	476	3964	2152	122	—	1270	2409	2950	2123	—
	$m_r - m^1_r$	150	5	174	36	17	—	16	243	88	171	—
	$(m_r - m^1_r)^2$	22500	25	30276	1296	289	—	256	59049	7744	29241	—
	$\frac{(m_r - m^1_r)^2}{m_r}$	10·28	·05	7·99	·59	2·75	21·66	·20	22·27	2·71	14·98	40·16
77.	m_r	2921	643	5059	2922	140	—	1718	3541	3820	2606	—
	m^1_r	2868	727	5061	2943	86	—	1494	3613	3908	2670	—
	$m_r - m^1_r$	53	84	2	21	54	—	224	72	88	64	—
	$(m_r - m^1_r)^2$	2809	7056	4	441	2916	—	50176	5184	7744	4096	—
	$\frac{(m_r - m^1_r)^2}{m_r}$	·96	10·97	·00	·15	22·43	34·51	29·21	1·46	2·03	1·57	34·27

South of the Forth the inhabitants of Galloway and Dumfries and of the Lothians, Peebles, Selkirk, and Roxburgh are normal Scotch in the matter of boys' hair-colours. North of the Forth, Forfar, Kincardine, and East Aberdeenshire are normal. It is significant that most of these districts were seats of the Picts in the earliest historical times, from which we may infer that the Pictish element is predominant in the normal racial type in Scotland. The normal district running across from the Clyde to the Forth and Tay corresponds very closely with the seats of the ancient Dumnoni,[1] the same tribe which inhabited Devon and Cornwall, and therefore probably of the same Mongoloid Bronze Age race as the Picts themselves.

The same general distribution of the normal is shown by Map XLVII, the divergence map derived from boys' eye-colours. The normal districts in this case are, however, more restricted, owing probably to the fact that eye-colours have not been observed with the same precision as hair-colours.

Maps XLVI and XLVII are in very good agreement also with respect to large deviations from the normal type of the population. For example, large deviations from the normal appear in both maps in the district of the coal and iron industries in East Lanarkshire. The lower valley of the Spey in both maps shows large deviations, due, no doubt, to a Norse invasion or colonisation.

In the eye-colour map (XLVII) there is a unique deviation in East Inverness, to which there is nothing to correspond in the hair-colour map. The same holds for the Shetlands, and is sufficient to show that though the inhabitants of Orkney and Shetland happen to be normal in hair-colours, they are by no means of the same race.

The considerable deviations in West Argyle and in Islay and Jura suggest that the Scots who came over from Ireland in the fifth century differed considerably in type from the native Picts.

Glasgow shows an immense deviation from the normal both on the hair- and eye- colour map.

These divergence maps promise to be of great value in showing differences of race type, due either to selection by a new environment or to alien immigration. The method is specially adapted for the interpretation of pigmentation statistics, but it may also be applied to measurements of dimensions.

[1] Rhys, *Celtic Britain*, p. 154.

TABLE I.

Boys.—Percentages in each district.

District No.	Hair.					Eyes.			
	Fair.	Red.	Med.	Dark.	Jet Black.	Pure Blue.	Light.	Med.	Dark.
1	28·18	5·81	40·54	23·89	1·58	13·50	28·47	33·99	24·04
2	31·74	7·59	38·10	21·07	1·50	25·86	20·86	27·43	25·85
3	22·19	5·66	48·00	23·11	1·04	14·36	27·48	36·68	21·48
4	24·61	4·15	42·04	27·82	1·38	15·10	31·97	30·08	22·85
5	27·77	5·02	40·21	25·47	1·53	12·81	31·26	33·98	21·95
6	25·54	5·87	42·43	24·79	1·37	10·12	32·12	35·49	22·27
7	25·83	4·96	41·21	26·84	1·16	12·43	29·45	37·64	20·48
8	28·79	6·65	40·42	22·70	1·44	12·07	39·98	30·79	17·16
9	29·16	4·84	40·53	24·36	1·11	11·17	34·77	33·05	21·01
10	22·29	4·91	51·05	21·20	0·55	12·71	30·32	37·72	19·25
11	21·83	4·96	47·64	24·42	1·15	12·37	29·59	36·44	21·60
12	23·68	6·06	41·76	27·86	0·64	11·30	34·24	33·38	21·08
13	22·07	5·36	45·75	25·66	1·16	11·96	30·53	33·44	24·07
14	22·93	5·43	43·11	27·58	0·95	14·67	29·53	31·46	24·34
15	22·42	6·35	48·07	22·04	1·12	10·46	33·37	37·30	18·87
16	25·92	5·69	40·96	26·93	0·50	17·42	26·06	35·35	21·17
17	24·97	5·60	42·21	26·00	1·23	14·54	34·30	31·21	19·95
18	25·46	5·28	44·24	22·73	2·29	15·61	27·22	33·69	23·48
19, 20 & 22	23·56	5·48	44·93	24·19	1·54	10·50	32·99	34·33	22·18
21	25·89	4·59	45·64	22·41	1·47	15·06	29·57	35·35	20·02
23 & 30	29·08	5·01	43·55	21·48	0·88	17·42	33·89	30·42	18·27
24	20·54	5·35	47·27	25·57	1·27	14·76	29·00	32·57	23·67
25	25·74	6·66	38·38	27·86	1·36	12·79	33·84	29·68	23·69
26	27·96	4·78	42·75	23·26	1·25	16·95	27·42	34·52	21·11
27	23·79	5·79	45·67	23·79	0·96	14·08	34·37	30·63	20·92
28	29·07	5·35	40·39	23·30	1·89	17·04	32·21	29·20	21·55
29	25·09	5·66	41·37	27·11	0·77	21·25	28·93	27·32	22·50
31	23·47	4·47	41·25	29·72	1·09	12·99	29·12	33·64	24·25
32 & 33	24·21	6·00	40·43	27·97	1·39	17·87	27·25	32·53	22·35
34	23·76	6·09	41·18	28·10	0·87	15·89	31·90	29·64	22·57
35	25·83	5·40	44·60	23·19	0·98	9·94	34·48	36·87	18·71
36	26·94	5·45	40·78	25·48	1·35	14·06	34·81	31·05	20·08
37	26·92	4·27	45·43	22·95	0·43	16·21	29·32	34·06	20·41
38	31·72	5·57	39·49	22·03	1·19	14·26	34·46	29·89	21·39
39	26·70	6·19	42·18	23·61	1·32	19·89	28·48	26·93	24·70
40	25·78	5·71	48·53	18·81	1·17	18·22	22·50	37·95	21·33
41	21·73	6·09	50·96	20·10	1·12	12·28	33·50	33·10	21·12
42	31·72	4·76	37·75	24·51	1·26	16·39	34·10	29·27	20·24
43	24·49	6·06	44·95	22·97	1·53	18·73	29·03	31·59	20·65
44	26·31	5·39	42·98	24·32	1·00	15·11	29·81	30·47	24·61
45	23·57	5·92	45·42	24·37	0·72	10·55	32·60	34·16	22·69
46	27·28	5·81	43·45	22·53	0·93	16·04	31·94	31·10	20·92
47	26·35	5·30	44·52	23·04	0·79	18·93	28·44	31·12	21·51
48	23·92	6·37	45·90	22·59	1·22	11·50	33·18	35·01	20·31
49	29·74	5·74	43·70	19·82	1·00	20·14	30·24	28·74	20·88
50	21·54	4·47	42·87	29·14	1·98	14·67	25·29	36·94	23·10
51	26·40	4·75	43·82	24·58	0·45	13·23	33·32	33·06	20·39
52	29·89	4·08	37·98	26·93	1·12	15·18	31·78	29·06	23·98
53	25·26	4·94	46·05	23·19	0·56	13·79	32·26	33·08	20·87
54	24·47	5·29	46·49	22·37	1·38	17·60	27·08	33·74	21·58
55 & 56	27·08	5·01	41·70	24·18	2·03	15·15	30·56	30·18	23·61
57	23·26	5·74	47·14	22·83	1·03	12·83	27·06	38·38	21·73
58	22·62	5·43	44·77	25·98	1·20	14·95	31·17	34·69	19·19

Boys. TABLE I.—*continued.*

District No.	Hair.					Eyes.			
	Fair.	Red.	Med.	Dark.	Jet Black.	Pure Blue.	Light.	Med.	Dark.
59	29·83	4·41	38·19	25·71	1·86	18·53	34·01	26·39	21·07
60	21·21	5·39	48·31	23·50	1·59	10·37	31·31	34·69	23·63
61	25·94	5·28	40·58	20·27	1·93	19·61	27·42	31·77	21·20
62	22·35	5·16	43·80	27·14	1·55	14·01	27·87	37·13	20·99
63	24·10	3·89	44·78	26·01	1·22	16·71	29·90	28·68	25·25
64	24·33	4·27	42·55	28·45	0·40	14·10	27·56	29·09	29·25
65	22·30	5·84	46·69	24·04	1·13	19·48	29·52	29·22	21·78
66	23·29	5·44	45·29	24·59	1·39	14·51	27·52	33·71	24·26
67 & 68	28·68	5·81	38·46	25·29	1·76	18·95	26·34	31·10	23·61
69	26·93	4·55	43·51	24·18	0·83	11·61	29·64	34·24	24·51
70	30·47	5·28	36·42	25·62	2·21	19·66	25·19	29·70	25·45
71 & 76	26·21	4·21	39·80	26·80	2·98	17·15	33·53	27·38	21·94
72	28·09	5·25	39·27	26·77	0·62	13·74	33·41	30·40	22·45
73	23·69	5·68	46·42	23·34	0·87	16·70	31·47	31·03	20·80
74	25·32	5·64	38·24	29·60	1·20	14·63	32·25	31·22	21·90
75	26·26	5·12	44·67	22·93	1·02	18·07	28·48	32·74	20·71
77	24·54	6·22	43·31	25·19	0·74	12·79	30·92	33·44	22·85
78	27·23	5·95	42·43	22·80	1·59	13·16	27·85	38·12	20·87
79	22·31	6·47	43·17	27·02	1·03	18·20	32·16	31·20	18·44
80	27·63	6·92	40·29	23·51	1·65	19·46	29·24	32·31	18·99
81	22·52	5·66	45·31	25·01	1·50	12·09	28·06	35·22	24·63
82	24·09	5·96	45·69	23·28	0·98	15·17	33·30	32·48	19·05
83	27·08	5·51	41·92	23·58	1·91	19·40	29·04	33·86	17·70
84	21·54	7·40	45·94	24·21	0·91	18·24	30·56	31·99	19·21
85	24·14	6·35	45·94	22·92	0·65	11·63	28·23	37·07	23·07
86	25·61	6·24	43·95	22·69	1·51	17·58	27·41	32·70	22·31
87	27·72	6·07	40·11	25·37	0·73	15·90	26·78	33·42	23·90
88	33·67	5·26	36·24	23·70	1·13	23·26	26·77	26·40	23·57
89	26·18	6·19	46·33	20·23	1·07	13·30	30·14	37·90	18·66
90	25·81	6·82	39·20	26·16	2·01	23·80	29·22	25·90	21·08
91	31·60	6·58	31·92	26·93	2·97	23·12	28·74	27·15	20·99
92	23·57	6·13	41·62	26·77	1·91	16·01	25·88	37·06	21·05
93 & 94	28·17	5·21	37·39	27·75	1·48	23·17	31·17	27·12	18·59
95	22·52	5·82	37·78	30·92	2·96	14·12	32·54	34·26	19·08
96	24·95	7·44	35·81	30·92	0·88	21·23	24·46	30·63	23·68
97	28·68	6·10	35·48	26·63	3·11	12·08	26·98	36·01	24·93
98	19·68	5·76	47·52	25·71	1·33	13·74	30·59	32·09	23·58
99	27·04	5·63	34·77	30·24	2·32	17·70	32·04	27·97	22·29
100	27·93	5·53	33·55	30·41	2·58	17·05	33·82	29·31	19·82
101	23·45	5·62	38·68	30·86	1·39	11·65	36·07	32·49	19·79
102	23·92	3·85	35·20	35·84	1·19	11·92	42·71	26·95	18·42
103	24·05	4·70	41·38	28·33	1·54	17·81	26·02	35·69	20·48
104	20·37	6·44	45·62	25·60	1·97	11·43	31·28	35·00	22·29
105	28·36	4·66	38·38	27·01	1·59	17·28	31·46	27·77	23·49
106	29·03	3·53	43·65	22·78	1·01	8·67	32·56	38·21	20·56
107	26·32	3·08	39·75	29·58	1·27	19·06	31·40	28·49	21·05
108	27·74	4·64	41·51	24·43	1·68	19·94	30·50	28·35	21·21
109	28·14	5·03	40·79	24·70	1·34	17·58	30·63	34·41	17·38
110	27·10	6·65	39·45	25·27	1·53	25·86	24·03	27·90	22·21
Whole of Scotland.	**24·95**	**5·50**	**43·28**	**25·03**	**1·24**	**14·64**	**30·32**	**32·73**	**22·31**

TABLE II.

Girls.—Percentages in each district.

District No.	Hair.					Eyes.			
	Fair.	Red.	Med.	Dark.	Jet Black.	Pure Blue.	Light.	Med.	Dark.
1	30·08	5·67	37·07	26·14	1·04	14·57	28·86	33·26	23·31
2	33·68	6·09	38·52	20·54	1·17	21·20	28·39	23·85	26·56
3	27·28	5·12	44·05	22·68	0·87	15·12	29·32	36·10	19·46
4	26·37	5·68	41·58	25·21	1·16	18·84	26·85	30·82	23·49
5	30·72	5·42	37·64	25·09	1·13	13·20	31·52	32·34	22·94
6	29·19	4·92	41·30	23·70	0·89	10·92	33·69	33·60	21·79
7	28·62	5·71	40·47	24·42	0·78	13·20	29·19	35·38	22·23
8	31·57	5·50	40·41	21·12	1·40	18·97	31·57	31·79	17·67
9	27·55	4·38	41·03	26·05	0·99	12·36	34·72	29·06	23·86
10	29·26	4·82	44·13	21·46	0·32	13·02	31·67	33·84	21·46
11	25·31	5·33	42·75	25·37	1·04	11·82	28·64	36·18	23·36
12	25·68	6·22	40·74	26·03	1·33	12·14	36·00	30·50	21·36
13	21·75	4·91	44·08	28·04	1·22	12·52	30·13	33·03	24·32
14	25·41	4·13	42·26	27·37	0·83	15·26	30·77	30·37	23·60
15	22·72	5·71	48·29	22·51	0·77	10·11	32·96	35·33	21·60
16	28·91	4·08	37·47	28·58	0·96	10·17	30·50	36·99	22·34
17	24·71	4·76	41·68	27·74	1·11	11·18	32·64	34·16	22·02
18	24·14	5·26	41·93	26·34	2·33	17·19	27·12	31·50	24·19
19, 20 & 22	24·92	5·24	43·74	24·62	1·48	9·66	34·03	31·79	24·52
21	24·47	4·34	45·02	24·90	1·27	17·80	24·89	34·85	22·46
23 & 30	29·89	5·40	40·24	23·18	1·29	17·92	32·85	29·38	19·85
24	21·62	5·05	44·51	27·91	0·91	14·30	29·47	33·39	22·84
25	26·75	4·76	41·18	26·83	0·48	14·26	34·25	29·33	22·16
26	32·71	5·44	39·63	21·11	1·11	18·27	28·50	33·22	20·01
27	22·84	4·33	47·47	24·63	0·73	13·32	34·01	30·95	21·72
28	31·13	4·84	38·45	24·54	1·04	17·95	32·41	28·10	21·54
29	30·06	4·47	41·16	22·68	1·63	17·81	23·56	37·37	21·26
31	28·01	5·01	39·80	25·90	1·28	15·28	28·21	32·68	23·83
32 & 33	28·20	5·06	37·52	27·70	1·42	19·29	28·75	28·70	23·26
34	28·41	4·93	38·83	26·50	1·33	14·87	34·49	29·65	20·99
35	27·88	4·49	40·62	26·00	1·01	11·08	34·76	33·31	20·85
36	34·08	4·93	36·42	23·08	1·49	12·14	34·48	33·51	19·87
37	32·24	4·76	39·90	22·11	0·99	16·39	30·34	31·91	21·36
38	32·87	5·43	38·60	21·82	1·28	14·51	32·68	28·13	24·68
39	30·41	5·91	38·36	23·92	1·40	17·81	29·45	28·44	24·30
40	28·54	5·86	45·08	19·38	1·13	17·77	25·43	36·01	20·79
41	24·80	4·98	47·36	22·05	0·81	12·20	32·01	34·35	21·44
42	34·69	5·01	36·57	22·79	0·94	16·29	34·22	29·44	20·05
43	30·99	5·35	38·18	24·59	0·89	17·50	31·58	29·50	21·42
44	26·61	4·98	41·14	25·84	1·43	14·75	29·85	30·75	24·65
45	27·53	4·97	41·99	24·89	0·62	11·04	32·88	34·53	21·55
46	30·14	6·08	41·43	21·73	0·62	15·34	30·58	32·00	22·08
47	31·68	5·78	42·49	19·28	0·77	17·80	29·66	31·78	20·76
48	28·73	5·67	40·95	23·92	0·73	13·41	30·62	34·43	21·54
49	34·73	4·44	38·49	21·40	0·94	18·91	33·18	25·57	22·34
50	28·29	4·57	41·42	24·83	0·89	10·02	28·40	34·97	26·61
51	29·59	4·19	42·14	23·68	0·40	12·50	33·72	33·14	20·64
52	36·89	3·38	35·91	23·14	0·68	18·48	28·98	27·99	24·55
53	29·96	5·25	42·28	21·99	0·52	13·79	32·31	33·39	20·51
54	30·89	4·86	42·71	20·72	0·82	16·61	27·82	33·13	22·44
55 & 56	31·25	5·39	36·20	25·55	1·61	14·82	30·07	29·01	26·10
57	27·15	4·53	43·35	24·38	0·59	13·71	25·88	37·38	23·03
58	26·77	5·82	40·24	25·90	1·27	14·82	31·39	33·15	20·64

Girls. TABLE II.—*continued.*

District No.	Hair.					Eyes.			
	Fair.	Red.	Med.	Dark.	Jet Black.	Pure Blue.	Light.	Med.	Dark.
59	30·61	4·64	38·07	24·50	2·18	17·98	36·96	25·03	20·03
60	24·97	4·01	46·39	23·83	0·80	11·01	29·51	34·38	25·10
61	32·06	4·90	36·77	24·76	1·51	19·80	28·35	28·60	23·25
62	25·06	4·15	43·46	25·35	1·98	15·26	26·70	36·26	21·78
63	23·01	4·16	43·29	28·61	0·93	15·45	29·71	29·88	24·96
64	22·69	5·11	40·92	30·15	1·13	11·18	29·17	29·99	29·66
65	24·23	5·35	46·02	23·21	1·19	18·32	27·59	29·75	24·34
66	24·76	5·04	42·29	26·48	1·43	14·00	28·45	33·03	24·52
67 & 68	31·79	5·52	37·22	23·68	1·79	18·63	26·27	30·10	25·00
69	27·99	4·92	43·01	23·47	0·61	12·89	28·60	35·13	23·38
70	35·09	6·04	29·83	26·12	2·92	22·13	24·95	26·80	26·12
71 & 76	29·30	4·71	35·84	27·97	2·18	18·06	33·10	28·32	20·52
72	30·81	3·95	40·69	23·23	1·32	15·32	31·80	28·00	24·88
73	28·26	5·86	42·53	22·31	1·04	17·30	34·40	26·28	22·02
74	32·30	6·81	34·45	25·32	1·12	16·02	33·76	31·44	18·78
75	31·23	6·31	36·62	24·01	1·83	17·50	27·47	31·43	23·60
77	27·29	5·58	40·82	25·62	0·69	13·93	28·84	33·68	23·55
78	29·41	5·71	40·39	23·25	1·24	13·06	29·53	37·27	20·14
79	29·39	5·40	37·43	26·43	1·35	16·53	34·98	28·23	20·26
80	33·33	5·84	35·68	23·65	1·50	19·72	31·87	29·62	18·79
81	25·39	4·86	40·83	27·42	1·50	13·53	27·24	33·72	25·51
82	30·17	4·74	40·55	23·47	1·07	13·81	31·59	33·73	20·87
83	31·30	5·56	38·72	22·72	1·70	17·82	29·59	32·24	20·35
84	25·73	4·45	45·79	22·12	1·91	16·96	31·87	30·53	20·64
85	27·48	6·42	43·00	22·54	0·56	10·42	29·14	35·94	24·50
86	29·78	6·90	39·91	21·92	1·49	20·44	26·55	30·92	22·09
87	32·68	5·77	38·82	21·70	1·03	17·78	27·73	31·91	22·58
88	33·53	5·20	35·58	23·98	1·71	22·13	24·64	29·12	24·11
89	28·71	5·22	42·13	23·31	0·63	14·22	27·99	37·18	20·61
90	32·11	7·67	35·20	23·27	1·75	22·60	27·11	29·44	20·85
91	34·69	6·88	30·39	26·19	2·65	23·65	27·07	26·30	22·98
92	25·22	4·68	39·27	29·61	1·22	18·30	27·74	32·28	21·68
93 & 94	31·36	5·18	34·76	26·61	2·09	22·63	31·84	27·60	17·83
95	26·70	4·05	37·59	29·78	1·88	13·84	29·38	32·84	23·94
96	34·93	5·21	36·04	22·72	1·10	22·62	29·03	24·53	23·82
97	31·81	4·85	34·34	26·40	2·60	14·43	29·68	32·29	23·60
98	25·55	4·21	45·24	23·90	1·10	13·38	31·22	29·85	25·55
99	31·17	3·93	31·81	30·97	2·12	19·70	30·46	26·40	23·44
100	28·83	5·38	30·05	32·08	3·66	16·95	31·78	30·56	20·71
101	26·12	4·91	37·69	29·88	1·40	12·89	34·09	33·39	19·63
102	27·04	5·66	35·33	30·50	1·47	14·05	38·99	27·04	19·92
103	27·88	4·25	38·54	27·02	2·31	16·71	29·83	31·63	21·83
104	25·11	5·48	40·89	26·93	1·59	12·19	32·24	33·76	21·81
105	30·15	3·34	34·95	30·01	1·55	16·58	33·49	27·41	22·52
106	31·71	3·13	41·86	22·98	0·32	7·34	35·60	35·38	21·68
107	21·94	6·54	43·25	25·74	2·53	20·89	35·44	20·89	22·78
108	28·30	5·03	38·70	25·84	2·13	20·58	27·41	30·03	21·98
109	32·59	4·95	38·23	23·04	1·19	18·26	29·92	33·39	18·43
110	33·48	5·67	36·14	23·12	1·59	25·16	24·09	27·46	23·29
Whole of Scotland.	**27·43**	**5·09**	**40·91**	**25·36**	**1·21**	**14·85**	**30·31**	**32·03**	**22·81**

TABLE III.

Boys.—Actual numbers in each district and in each category.

District No.	Hair.					Eyes.				Distric Totals.
	Fair.	Red.	Med.	Dark.	Black.	Blue.	Light.	Med.	Dark.	
1	572	118	823	485	32	274	578	690	488	2,030
2	464	111	557	308	22	378	305	401	378	1,462
3	533	136	1,153	555	25	345	660	881	516	2,402
4	391	66	668	442	22	240	508	478	363	1,589
5	963	174	1,394	883	53	444	1,084	1,178	761	3,467
6	931	214	1,547	904	50	369	1,171	1,294	812	3,646
7	536	103	855	557	24	258	611	781	425	2,075
8	260	60	365	205	13	109	361	278	155	903
9	765	127	1,063	639	29	293	912	867	551	2,623
10	286	63	655	272	7	163	389	484	247	1,283
11	837	190	1,826	936	44	474	1,134	1,397	828	3,833
12	664	170	1,171	781	18	317	960	936	591	2,804
13	9,161	2,227	18,999	10,658	481	4,964	12,679	13,887	9,996	41,526
14	650	154	1,222	782	27	416	837	892	690	2,835
15	360	102	772	354	18	168	536	599	303	1,606
16	360	79	569	374	7	242	362	491	294	1,389
17	388	87	656	404	19	226	533	485	310	1,554
18	579	120	1,006	517	52	355	619	766	534	2,274
19, 20 & 22	460	107	877	478	30	205	644	670	433	1,952
21	282	50	497	244	16	164	322	385	218	1,089
23 & 30	888	153	1,330	656	27	532	1,035	929	558	3,054
24	760	198	1,749	946	47	546	1,073	1,205	876	3,700
25	340	88	507	368	18	169	447	392	313	1,321
26	673	115	1,029	560	30	408	660	831	508	2,407
27	522	127	1,002	522	21	309	754	672	459	2,194
28	1,044	192	1,451	837	68	612	1,157	1,049	774	3,592
29	359	81	592	388	11	304	414	391	322	1,431
31	515	98	905	652	24	285	639	738	532	2,194
32 & 33	573	142	957	662	33	423	645	770	529	2,367
34	601	154	1,042	711	22	402	807	750	571	2,530
35	421	88	727	378	16	162	562	601	305	1,630
36	479	97	725	453	24	250	619	552	357	1,778
37	819	130	1,382	698	13	493	892	1,036	621	3,042
38	347	61	432	241	13	156	377	327	234	1,094
39	466	108	736	412	23	347	497	470	431	1,745
40	307	68	578	224	14	217	268	452	254	1,191
41	214	60	502	198	11	121	330	326	208	985
42	453	68	539	350	18	234	487	418	289	1,428
43	497	123	912	466	31	380	589	641	419	2,029
44	2,584	529	4,220	2,388	98	1,484	2,927	2,992	2,416	9,819
45	1,365	343	2,630	1,411	42	611	1,888	1,978	1,314	5,791
46	643	137	1,024	531	22	378	753	733	493	2,357
47	795	160	1,343	695	24	571	858	939	649	3,017
48	822	219	1,577	776	42	395	1,140	1,203	698	3,436
49	477	92	701	318	16	323	485	461	335	1,604
50	207	43	412	280	19	141	243	355	222	961
51	523	94	868	487	9	262	660	655	404	1,981
52	506	69	643	456	19	257	538	492	406	1,693
53	588	115	1,072	540	13	321	751	770	486	2,328
54	338	73	642	309	19	243	374	466	298	1,381
55 & 56	708	131	1,090	632	53	396	799	802	617	2,614
57	863	213	1,749	847	38	476	1,004	1,424	806	3,710
58	283	68	560	325	15	187	390	434	240	1,251
59	528	78	676	455	33	328	602	467	373	1,770

Boys. TABLE III.—*continued.*

District No.	Hair.					Eyes.				District Totals.
	Fair.	Red.	Med.	Dark.	Black.	Blue.	Light.	Med.	Dark.	
60	307	78	699	340	23	150	453	502	342	1,447
61	471	96	737	477	35	356	498	577	385	1,816
62	490	113	960	595	34	307	611	814	460	2,192
63	316	51	587	341	16	212	392	376	331	1,311
64	302	53	528	353	5	175	342	361	363	1,241
65	435	114	911	469	22	380	576	570	425	1,951
66	2,038	476	3,964	2,152	122	1,270	2,409	2,950	2,123	8,752
67 & 68	651	132	873	574	40	430	598	706	536	2,270
69	645	109	1,042	579	20	278	710	820	587	2,395
70	358	62	428	301	26	231	296	349	299	1,175
71 & 76	405	65	615	414	46	265	518	423	339	1,545
72	364	68	509	347	8	178	433	394	291	1,296
73	271	65	531	267	10	191	360	355	238	1,144
74	296	66	447	346	14	171	377	365	256	1,169
75	308	60	524	269	12	212	334	384	243	1,173
77	2,868	727	5,061	2,943	86	1,494	3,613	3,908	2,670	11,685
78	480	105	748	402	28	232	491	672	368	1,763
79	369	107	714	447	17	301	532	516	305	1,654
80	703	176	1,025	598	42	495	744	822	483	2,544
81	406	102	817	451	27	218	506	635	444	1,803
82	416	103	789	402	17	262	575	561	329	1,727
83	511	104	791	445	36	366	548	639	334	1,887
84	332	114	708	373	14	281	471	493	296	1,541
85	631	166	1,201	599	17	304	738	969	603	2,614
86	271	66	465	240	16	186	290	346	236	1,058
87	530	116	767	485	14	304	512	639	457	1,912
88	537	84	578	378	18	371	427	421	376	1,595
89	317	75	561	245	13	161	365	459	226	1,211
90	295	78	448	299	23	272	334	296	241	1,143
91	298	62	301	254	28	218	271	256	198	943
92	346	90	611	393	28	235	380	544	309	1,468
93 & 94	535	99	710	527	28	440	591	515	353	1,899
95	236	61	396	324	31	148	341	359	200	1,048
96	255	76	366	316	9	217	250	313	242	1,022
97	489	104	605	454	53	206	460	614	425	1,705
98	222	65	536	290	15	155	345	362	266	1,128
99	466	97	599	521	40	305	552	482	384	1,723
100	303	60	364	330	28	185	367	318	215	1,085
101	288	69	475	379	17	143	443	399	243	1,228
102	261	42	384	391	13	130	466	294	201	1,091
103	343	67	590	404	22	254	371	509	292	1,426
104	351	111	786	441	34	197	539	603	384	1,723
105	676	111	915	644	38	412	750	662	560	2,384
106	288	35	433	226	10	86	323	379	204	992
107	145	17	219	163	7	105	173	157	116	551
108	544	91	814	479	33	391	598	556	416	1,961
109	565	101	819	496	27	353	615	691	349	2,008
110	371	91	540	346	21	354	329	382	304	1,369
Whole of Scotland.	64,255	14,153	111,470	64,459	3,198	37,714	78,086	84,278	57,457	257,535 Boys.
Per-centages.	24·95	5·50	43·28	25·03	1·24	14·64	30·32	32·73	22·31	

TABLE IV.

Girls.—Actual numbers in each district and in each category.

District No.	Hair.					Eyes.				District Totals.
	Fair.	Red.	Med.	Dark.	Jet Black.	Pure Blue.	Light.	Med.	Dark.	
1	520	98	641	452	18	252	499	575	403	1,729
2	459	83	525	280	16	289	387	325	362	1,363
3	628	118	1,014	522	20	348	675	831	448	2,302
4	385	83	607	368	17	275	392	450	343	1,460
5	1,003	177	1,229	819	37	431	1,029	1,056	749	3,265
6	978	165	1,384	794	30	366	1,129	1,126	730	3,351
7	551	110	779	470	15	254	562	681	428	1,925
8	293	51	375	196	13	176	293	295	164	2,928
9	642	102	956	607	23	288	809	677	556	1,330
10	364	60	549	267	4	162	394	421	267	3,244
11	897	196	1,515	899	37	419	1,015	1,282	828	544
12	677	164	1,074	686	35	320	949	804	563	2,636
13	8,648	1,952	17,529	11,151	484	4,977	1,982	13,134	9,617	39,764
14	701	114	1,166	755	23	421	849	838	651	2,759
15	326	82	693	323	11	145	473	507	310	1,435
16	361	51	468	357	12	127	381	462	279	1,249
17	358	69	604	402	16	162	473	495	319	1,449
18	528	115	917	576	51	376	593	689	529	2,187
19, 20 & 22	490	103	860	484	29	190	669	625	482	1,966
21	231	41	425	235	12	168	235	329	212	944
23 & 30	881	159	1,186	683	38	528	968	866	585	2,947
24	762	178	1,569	984	32	504	1,039	1,177	805	3,525
25	332	59	511	333	6	177	425	364	275	1,241
26	770	128	933	497	26	430	671	782	471	2,354
27	470	89	977	507	15	274	700	637	447	2,058
28	1,049	163	1,296	827	35	605	1,092	947	726	3,370
29	444	66	608	335	24	263	348	552	314	1,477
31	570	102	810	527	26	311	574	665	485	2,035
32 & 33	674	121	899	662	34	461	687	686	556	2,390
34	640	111	875	597	30	335	777	668	473	2,253
35	385	62	561	359	14	153	480	460	288	1,381
36	595	86	636	403	26	212	602	585	347	1,746
37	948	140	1,173	650	29	482	892	938	628	2,940
38	333	55	391	221	13	147	331	285	250	1,013
39	478	93	603	376	22	280	463	447	382	1,572
40	302	62	477	205	12	188	269	381	220	1,058
41	244	49	466	217	8	120	315	338	211	984
42	443	64	467	291	12	208	437	376	256	1,277
43	625	108	770	496	18	353	637	595	432	2,017
44	2,593	485	4,008	2,518	139	1,437	2,908	2,996	2,402	9,743
45	1,602	289	2,443	1,448	36	642	1,913	2,009	1,254	5,818
46	684	138	940	493	14	348	694	726	501	2,269
47	943	172	1,265	574	23	530	883	946	618	2,977
48	943	186	1,344	785	24	440	1,005	1,130	707	3,282
49	516	66	572	318	14	281	493	380	332	1,486
50	254	41	372	223	8	90	255	314	239	898
51	516	73	735	413	7	218	588	578	360	1 744
52	601	55	585	377	11	301	472	456	400	1,629
53	691	121	975	507	12	318	745	770	473	2,306
54	413	65	571	277	11	222	372	443	300	1,337
55 & 56	795	137	921	650	41	377	765	738	664	2,544
57	923	154	1,474	829	20	466	800	1,271	783	3,400
58	366	73	505	325	16	186	394	416	259	1,255
59	521	79	648	417	37	306	629	426	341	1,702
60	374	60	695	357	12	165	442	515	376	1,498

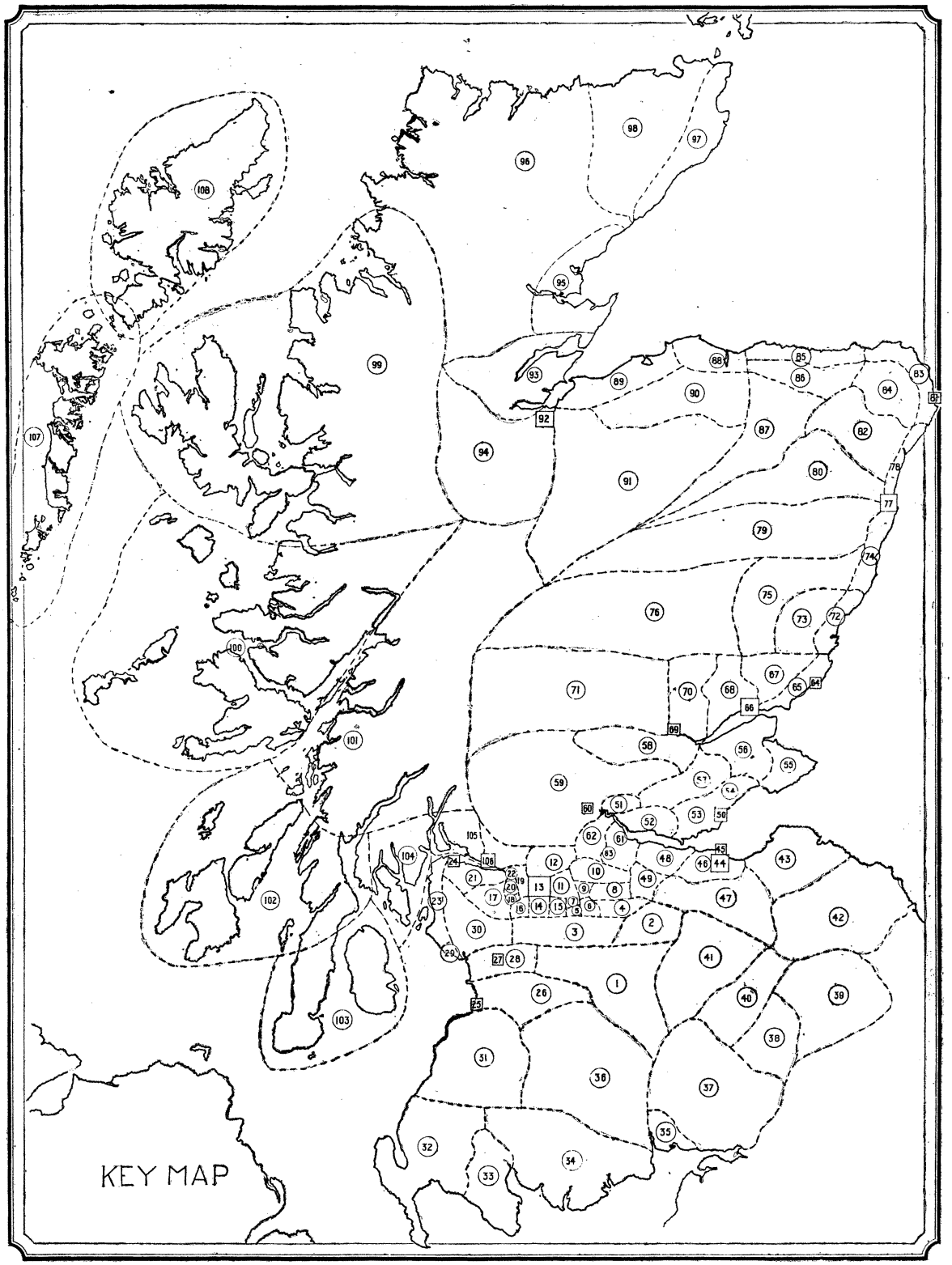
Girls. TABLE IV.—*continued.*

District No.	Hair.					Eyes.				District Totals.
	Fair.	Red.	Med.	Dark.	Jet Black.	Pure Blue.	Light.	Med.	Dark.	
61	510	78	585	394	24	315	451	455	370	1,591
62	519	86	900	525	41	316	553	751	451	2,071
63	271	49	510	337	11	182	350	352	294	1,178
64	280	63	505	372	14	138	360	370	366	1,234
65	426	94	809	408	21	322	485	523	428	1,758
66	2,084	424	3,560	2,229	120	1,178	2,395	2,780	2,064	8,417
67 & 68	674	117	789	502	38	395	557	638	530	2,120
69	643	113	988	539	14	296	657	807	537	2,297
70	360	62	306	268	30	227	256	275	268	1,026
71 & 76	417	67	510	398	31	257	471	403	292	1,423
72	374	48	494	282	16	186	386	340	302	1,214
73	299	62	450	236	11	183	364	278	233	1,058
74	365	79	400	294	13	186	392	365	218	1,161
75	307	62	360	236	18	172	270	309	232	983
77	2,903	594	4,342	2,725	73	1,482	3,068	3,582	2,505	10,637
78	520	101	714	411	22	231	522	659	356	1,768
79	457	84	582	411	21	257	544	439	315	1,555
80	754	132	807	535	34	446	721	670	425	2,262
81	439	84	706	474	26	234	471	583	441	1,729
82	509	80	684	396	18	233	533	569	352	1,687
83	569	101	704	413	31	324	538	586	370	1,818
84	364	63	648	313	27	240	451	432	292	1,415
85	728	170	1,139	597	15	276	772	952	649	2,649
86	341	79	457	251	17	234	304	354	253	1,145
87	634	112	753	421	20	345	538	619	438	1,940
88	509	79	540	364	26	336	374	442	366	1,518
89	319	58	468	259	7	158	311	413	229	1,111
90	385	92	422	279	21	271	325	353	250	1,199
91	314	55	275	237	24	214	245	238	208	905
92	350	65	545	411	17	254	385	448	301	1,388
93 & 94	600	99	665	509	40	433	611	528	341	1,913
95	270	41	380	301	19	140	297	332	242	1,011
96	349	52	360	227	11	226	290	245	238	999
97	465	71	502	386	38	211	434	472	345	1,462
98	279	46	494	261	12	146	341	326	279	1,092
99	484	61	494	481	33	306	473	410	364	1,553
100	284	53	296	316	36	167	313	301	204	985
101	298	56	430	341	16	147	389	381	224	1,141
102	258	54	337	291	14	134	372	258	190	954
103	387	59	535	375	32	232	414	439	303	1,388
104	412	90	671	442	26	200	529	554	358	1,641
105	660	73	765	657	34	363	733	600	493	2,189
106	294	29	388	213	3	68	330	328	201	927
107	104	31	205	122	12	99	168	99	108	474
108	506	90	692	462	38	368	490	537	393	1,788
109	573	87	672	405	21	321	526	587	324	1,758
110	378	64	408	261	18	284	272	310	263	1,129
Whole of Scotland.	66,925	12,432	99,817	61,891	2,952	36,237	73,964	18,157	55,659	244,017 Girls.
Per-centages.	27 ·43	5 ·09	40 ·91	25 ·36	1 ·21	14 ·85	30 ·31	32 ·03	22 ·81	

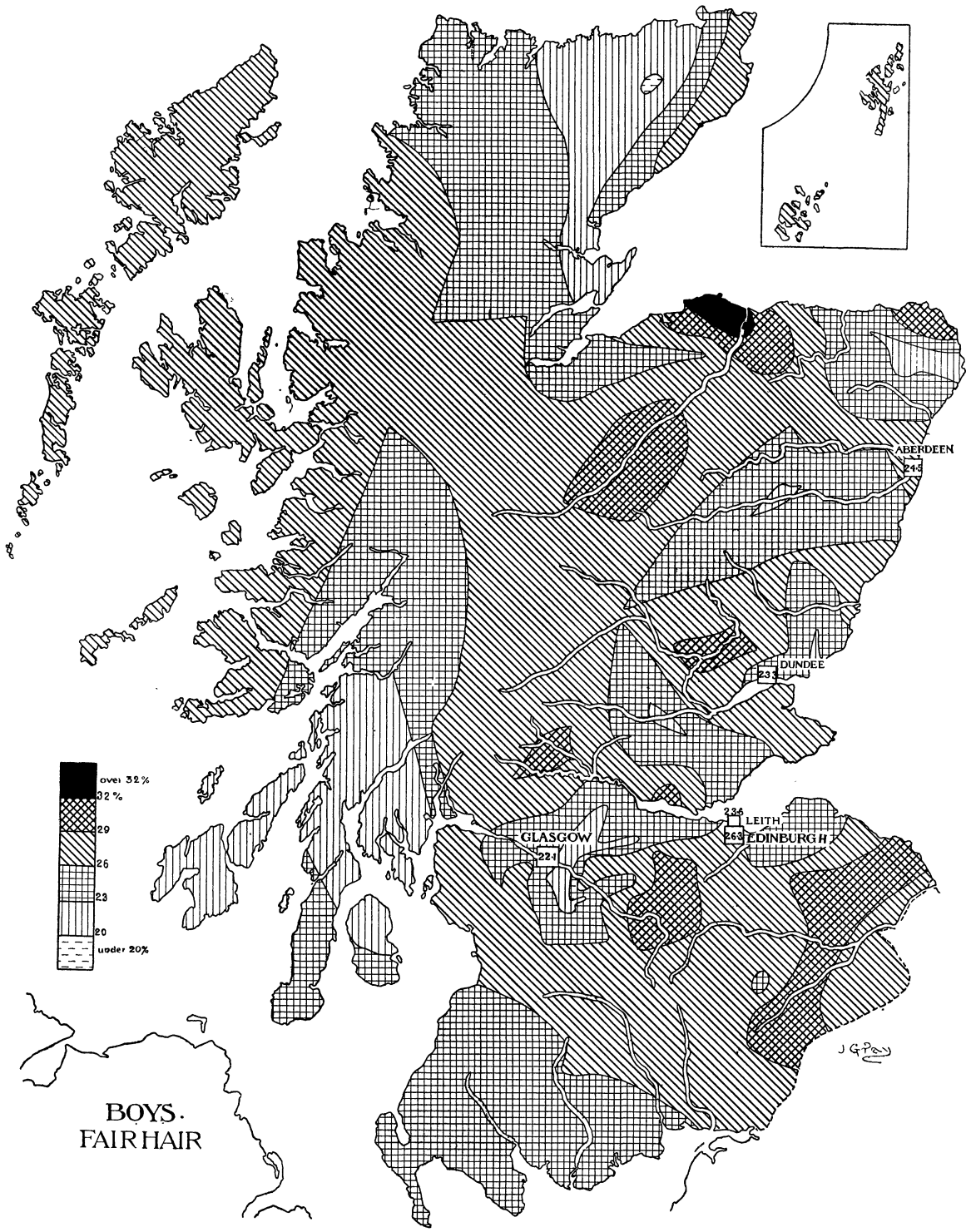
TABLE V.

Boys.—Divergence.

District No.	Hair.		Eyes.		District No.	Hair.		Eyes.	
	χ^2	Log. 1/P.	χ^2	Log. 1/P.		χ^2	Log. 1/P.	χ^2	Log. 1/P.
1	16	2·5	8	1·3	57	26	4·5	48	9·7
2	58	11·1	186	39·3	58	4	0·4	7	1·1
3	24	4·1	19	3·6	59	38	6·9	49	9·9
4	11	1·6	5	0·8	60	20	3·3	22	4·2
5	23	3·9	11	1·9	61	13	1·9	36	7·1
6	3	0·3	65	13·3	62	16	2·5	20	3·8
7	7	0·9	26	5·0	63	8	1·0	14	2·5
8	12	1·8	43	8·6	64	16	2·5	35	6·9
9	26	4·5	42	8·4	65	12	1·8	50	10·1
10	35	6·3	19	3·6	66	22	3·7	40	8·0
11	35	6·3	32	6·3	67 & 68	32	5·7	43	8·6
12	23	3·9	38	7·6	69	11	1·6	23	4·4
13	210	43·6	279	59·4	70	38	6·9	38	7·6
14	14	2·1	7	1·1	71 & 76	55	10·5	25	4·8
15	21	3·5	43	8·6	72	16	2·5	7	1·1
16	10	1·4	19	3·6	73	6	0·7	6	0·9
17	1	0·0	13	2·3	74	8	1·0	2	0·2
18	29	5·1	11	1·9	75	4	0·4	12	2·1
19, 20 & 22	5	0·5	30	5·9	77	34	6·1	34	6·7
21	7	0·9	5	0·8	78	10	1·4	24	4·6
23 & 33	40	7·4	55	11·1	79	11	1·6	28	5·4
24	44	8·2	5	0·8	80	28	4·9	53	10·7
25	15	2·3	14	2·5	81	20	3·3	19	3·6
26	14	2·1	19	3·6	82	6	0·7	14	2·5
27	7	0·9	17	3·1	83	13	1·9	48	9·7
28	50	9·7	32	6·3	84	21	3·5	20	3·8
29	6	0·4	56	11·4	85	19	3·1	36	7·1
31	28	4·9	10	1·7	86	4	0·4	9	1·5
32 & 30	15	2·3	23	4·4	87	15	2·3	12	2·1
34	17	2.7	8	1·3	88	68	13·2	107	22·3
35	4	0·4	53	10·7	89	15	2·3	19	3·6
36	6	0·7	18	3·3	90	15	2·3	82	16·9
37	37	6·7	12	2·1	91	74	14·5	47	9·5
38	28	4·9	10	1·7	92	11	1·6	21	4·0
39	6	0·7	57	11·6	93 & 94	30	5·3	123	25·9
40	26	4·5	45	9·0	95	50	9·4	8	1·3
41	28	4·9	8	1·3	96	35	6·3	44	8·9
42	37	6·7	17	3·1	97	85	16·8	25	4·8
43	8	1·0	27	5·2	98	18	2·9	2	0·2
44	13	1·9	50	10·1	99	68	13·2	24	4·6
45	24	4·1	82	16·9	100	58	11·1	16	2·9
46	12	1·8	9	1·5	101	24	4·1	25	4·8
47	12	1·8	44	8·9	102	73	14·3	69	14·2
48	20	3·3	45	9·0	103	11	1·6	24	4·6
49	32	5·7	41	8·2	104	27	4·7	16	2·9
50	17	2·7	14	2·5	105	34	6·1	31	6·1
51	12	1·8	12	2·1	106	16	2·5	37	7·3
52	36	6·5	11	1·9	107	12	1·8	11	1·9
53	17	2·7	6	0·9	108	14	2·1	49	9·9
54	8	1·0	13	2·3	109	12	1·8	35	6·9
55 & 56	24	4·1	6	0·9	110	12	1·8	144	30·3



THE PIGMENTATION SURVEY OF SCOTLAND.



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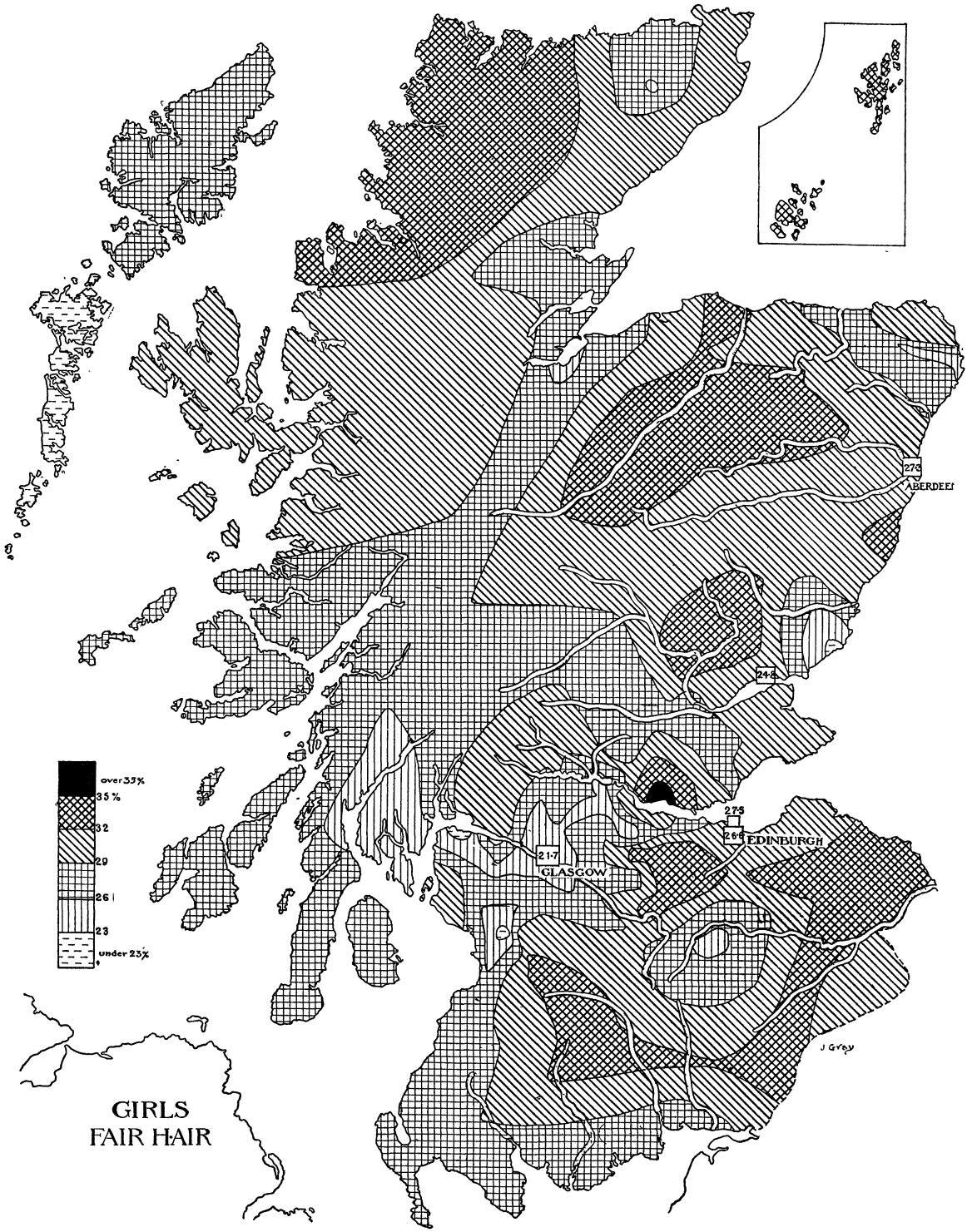

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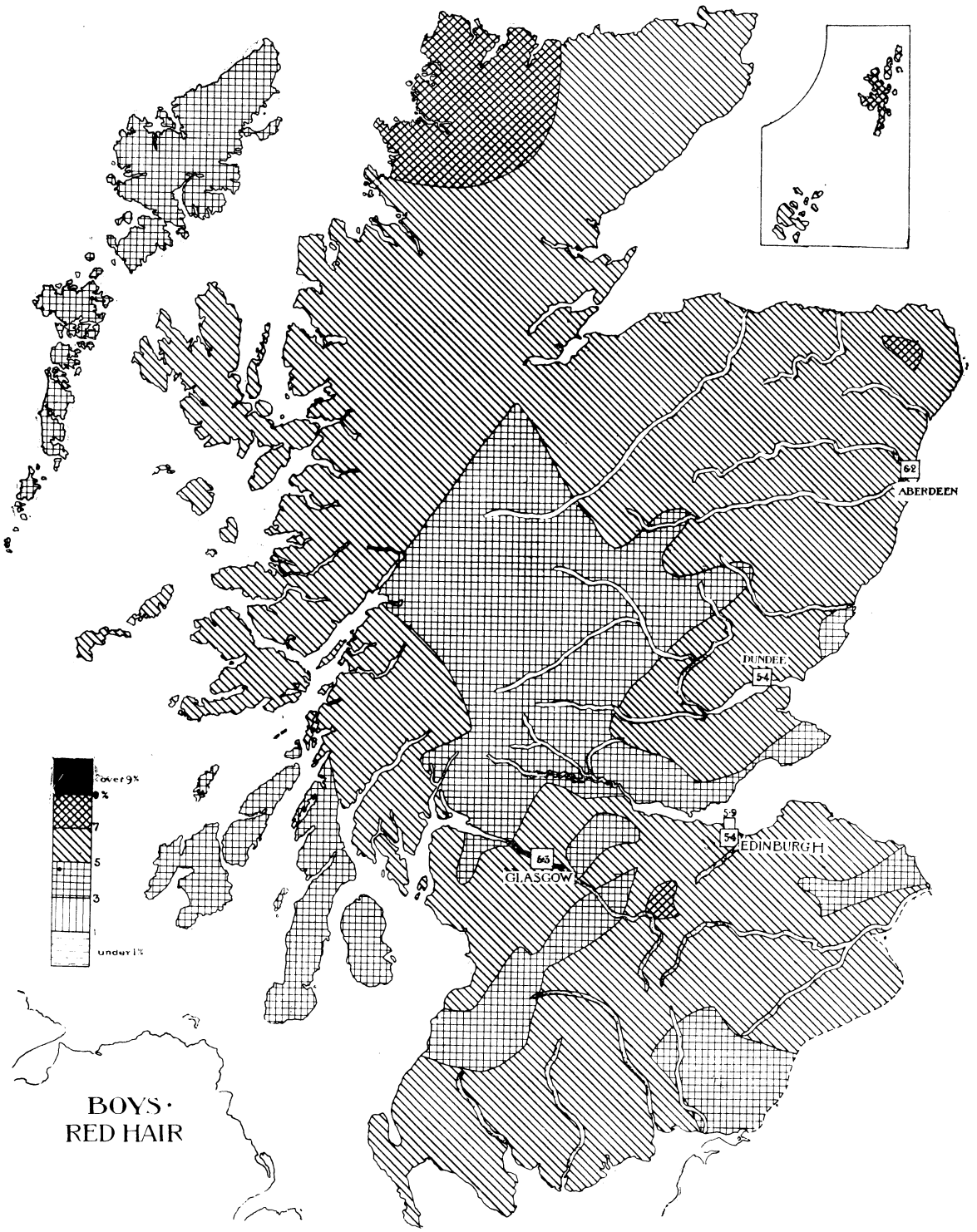

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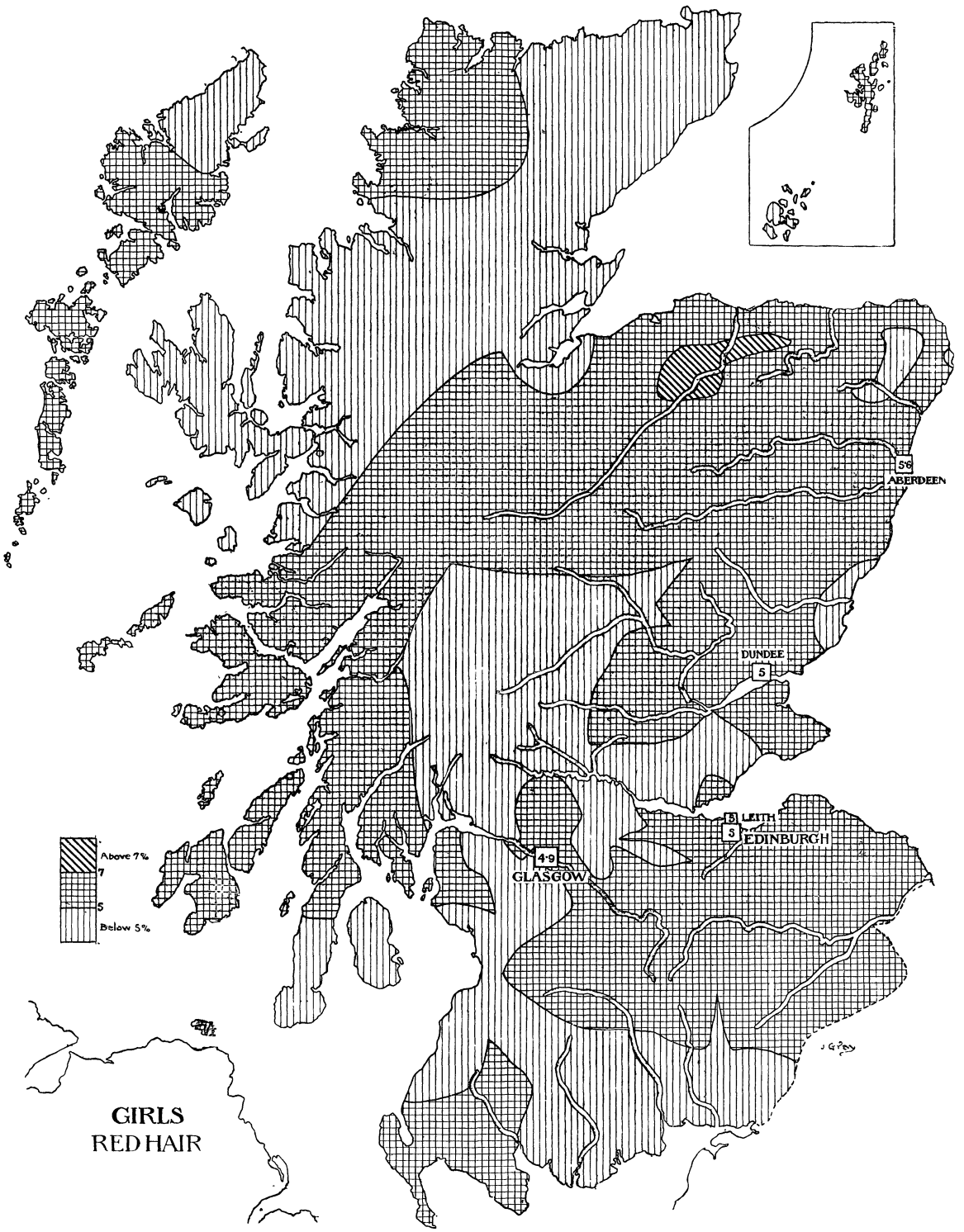

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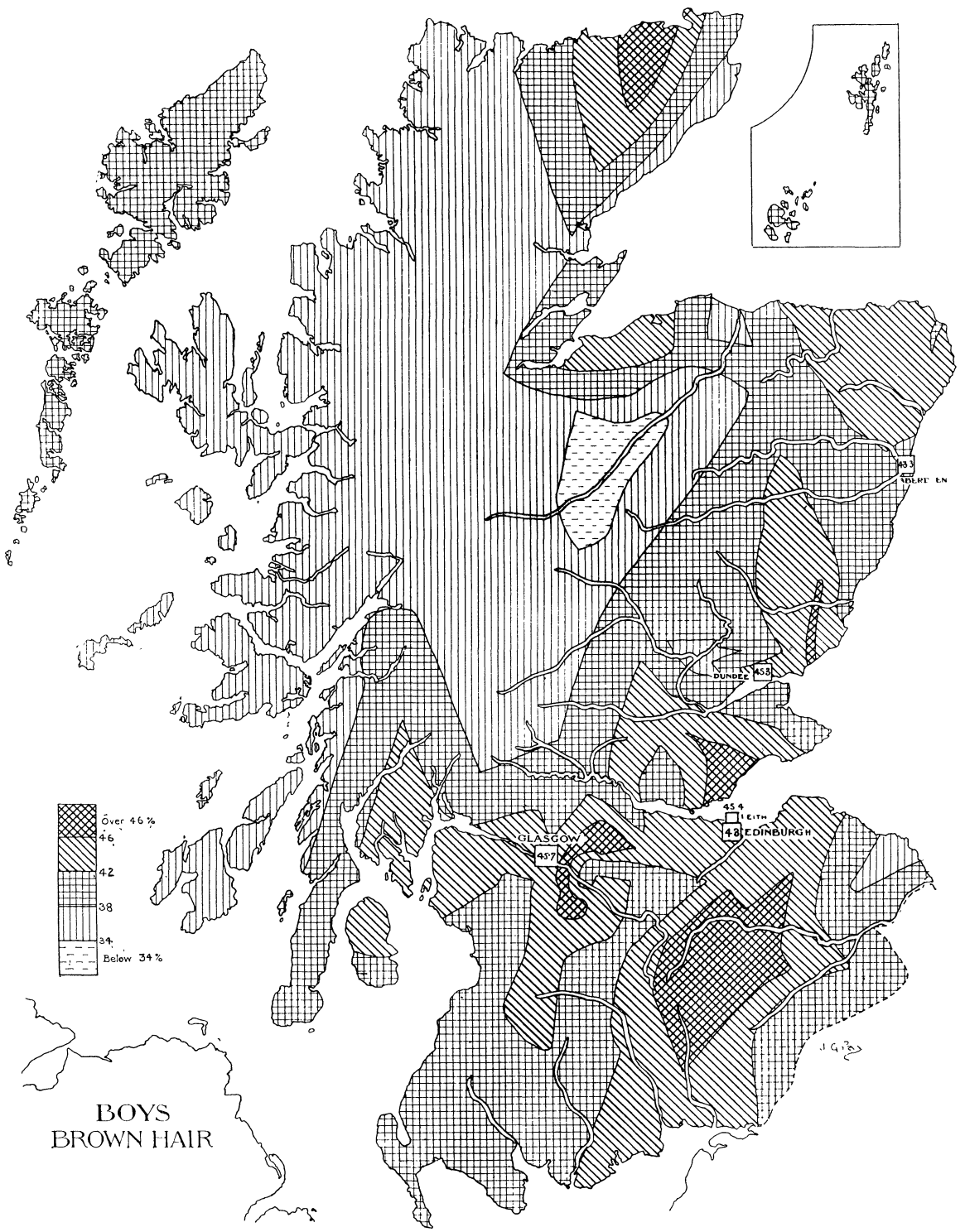

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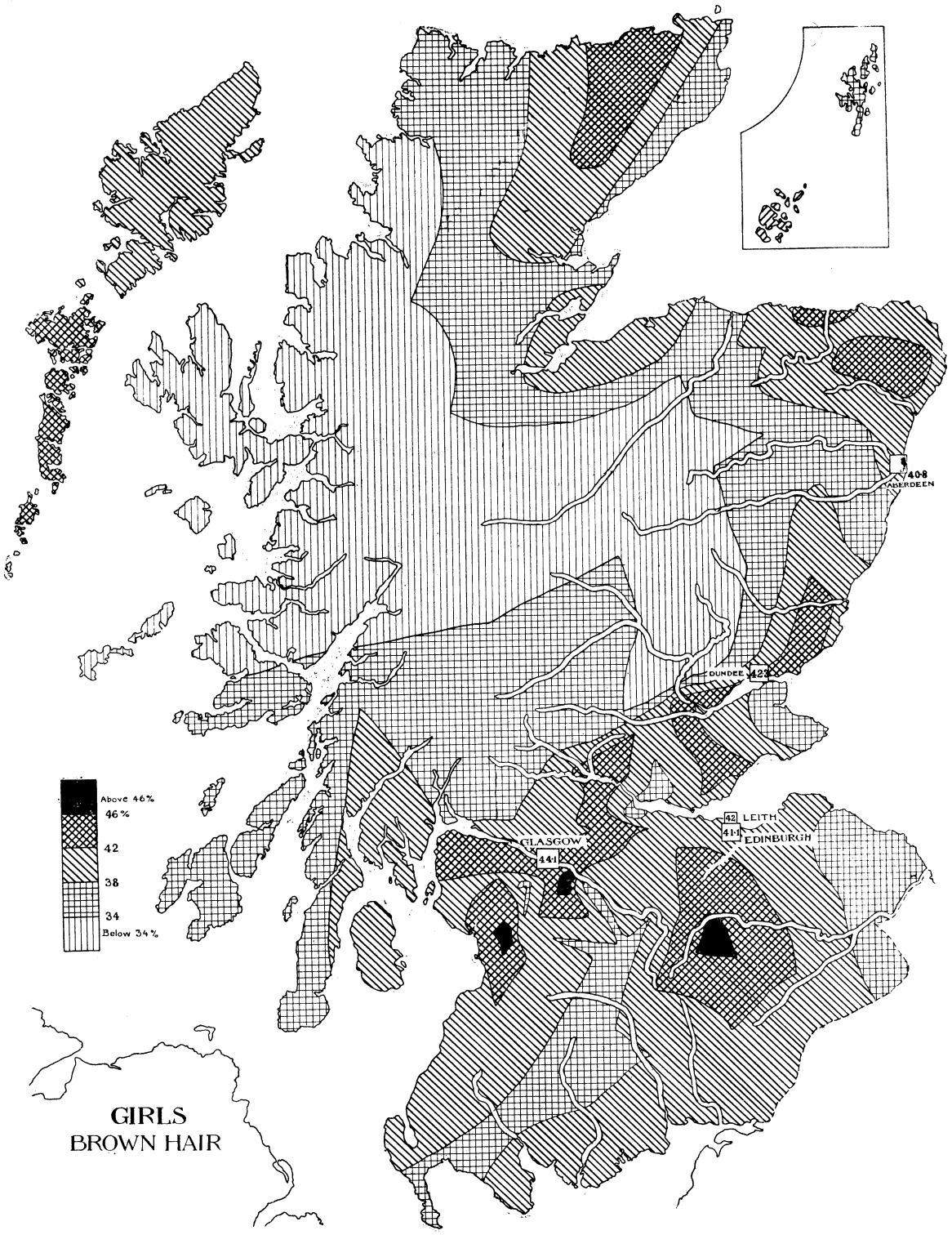

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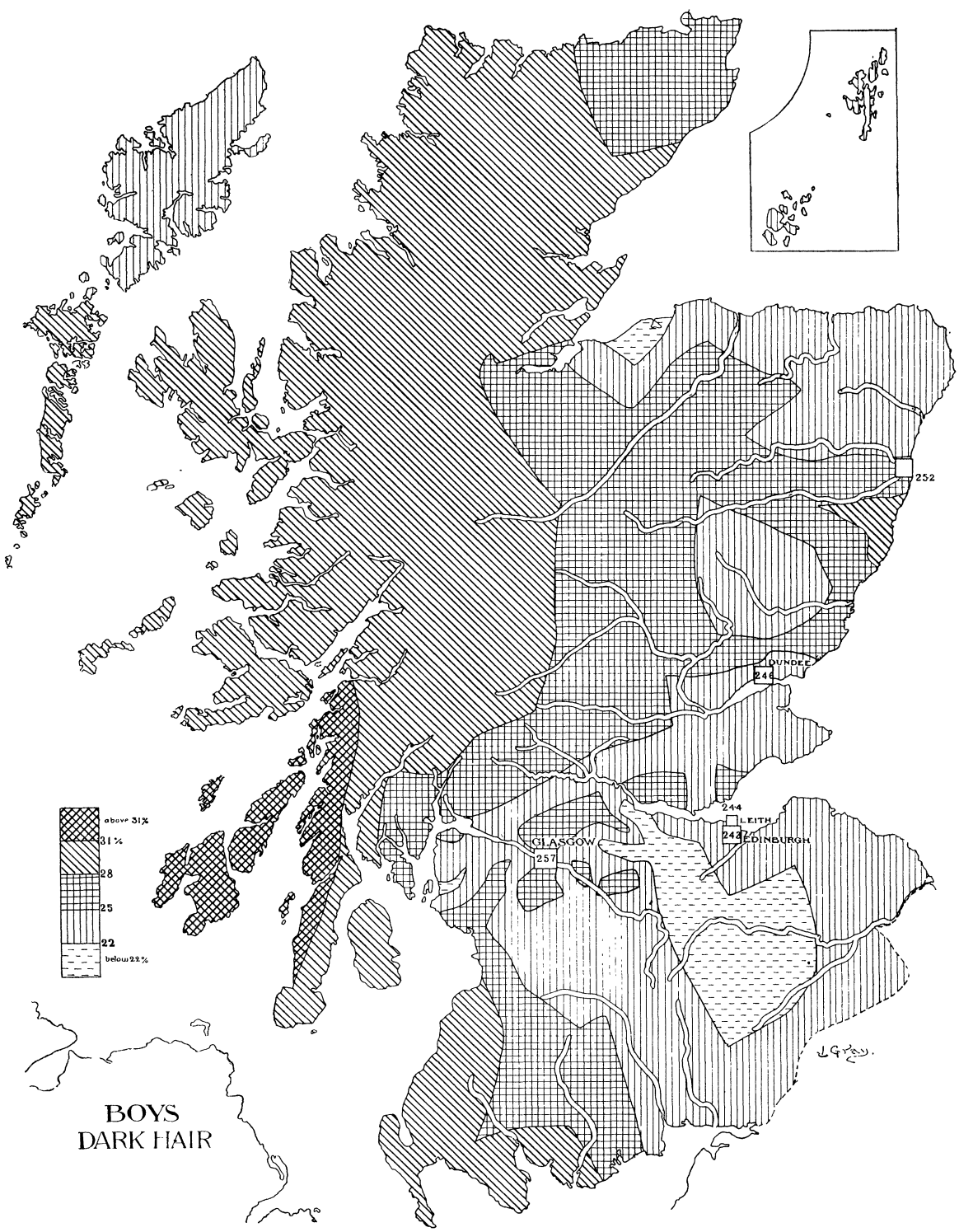

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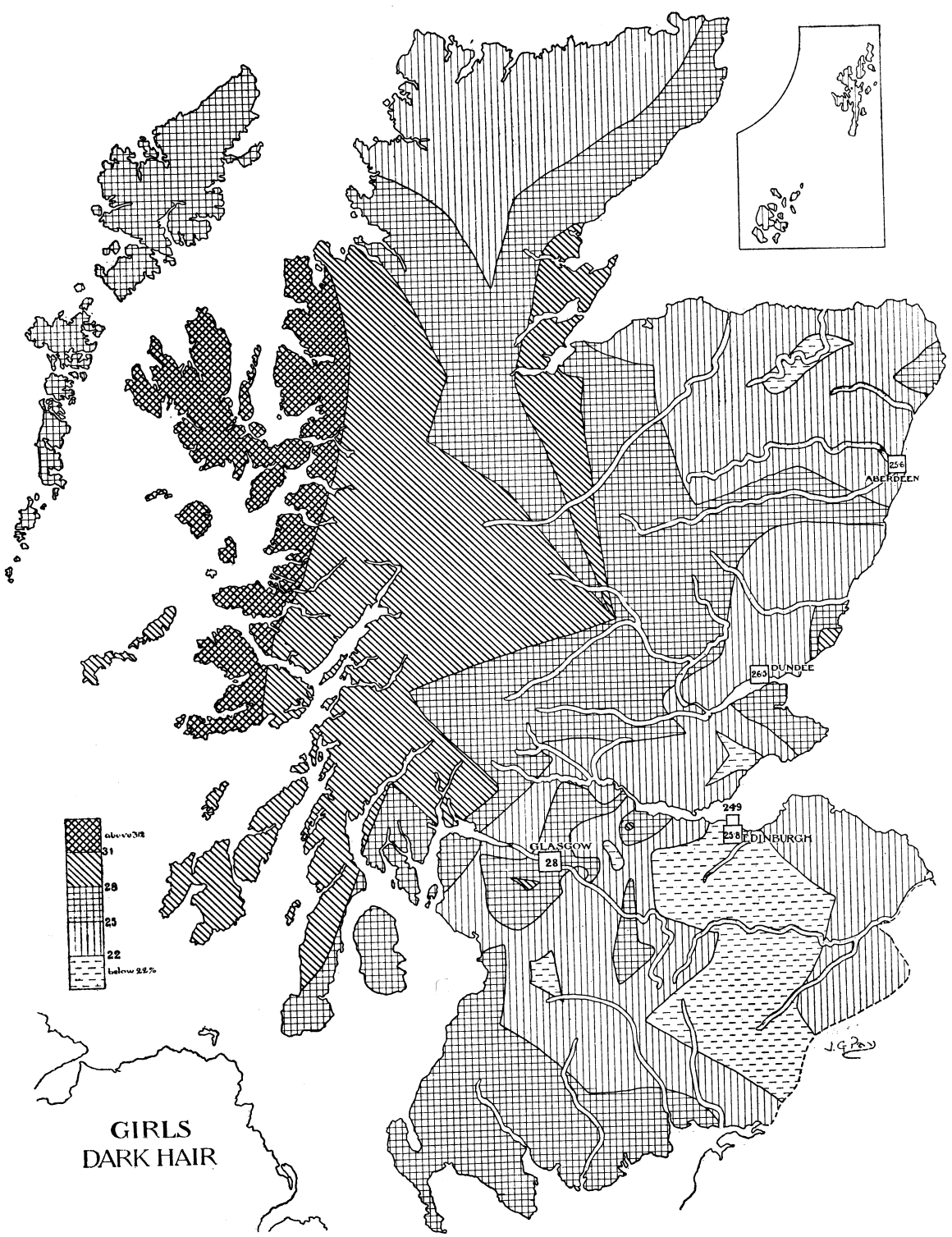

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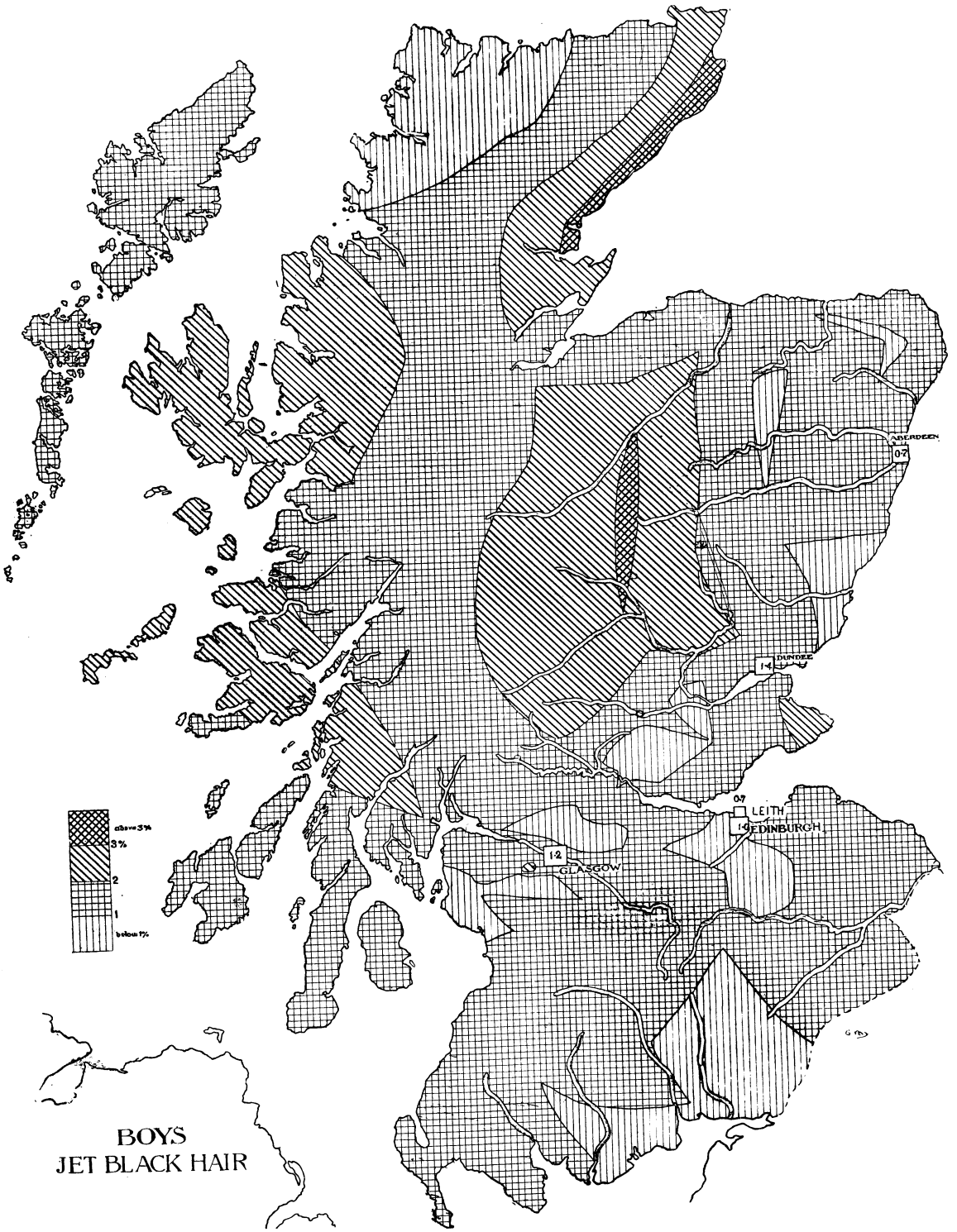

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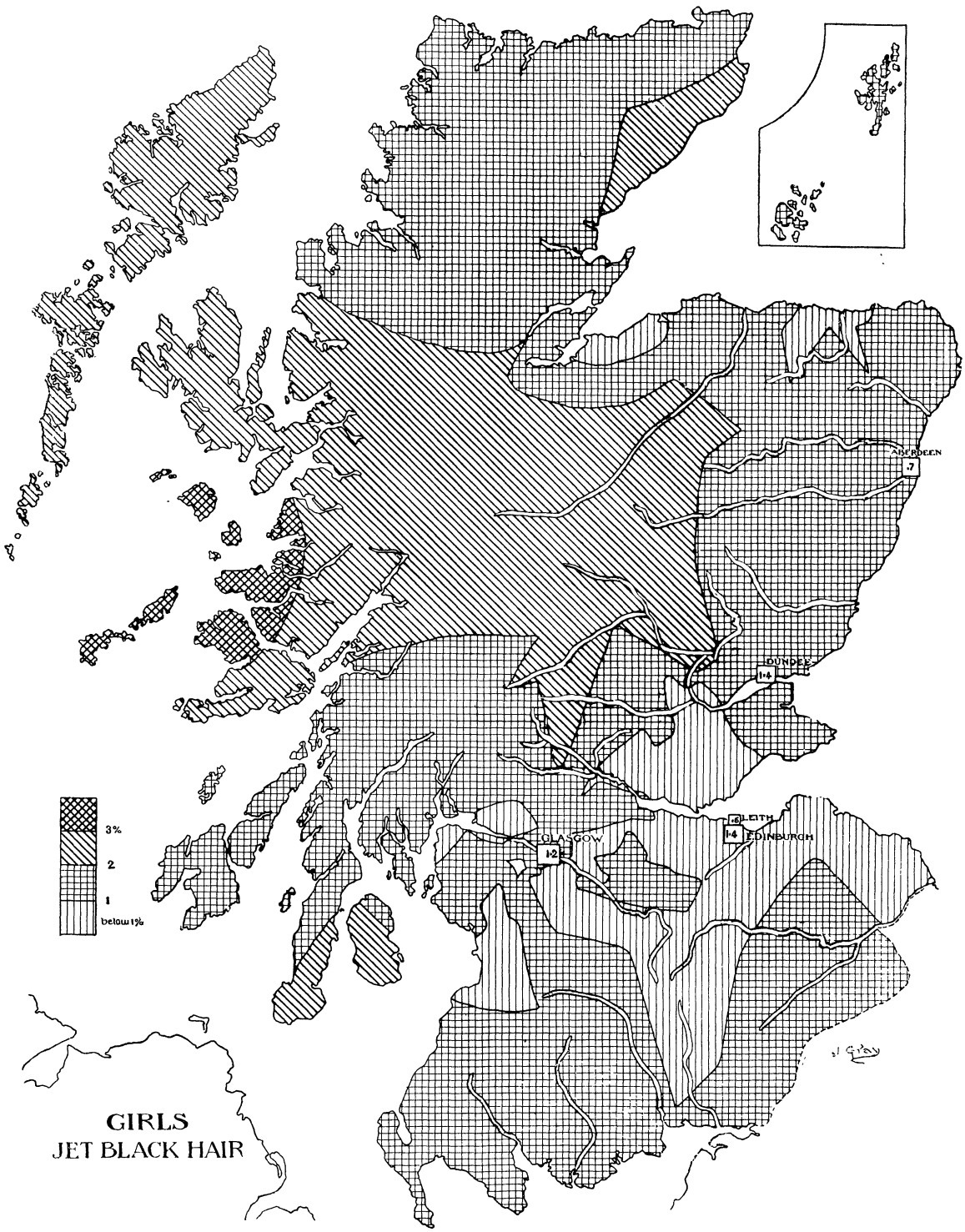

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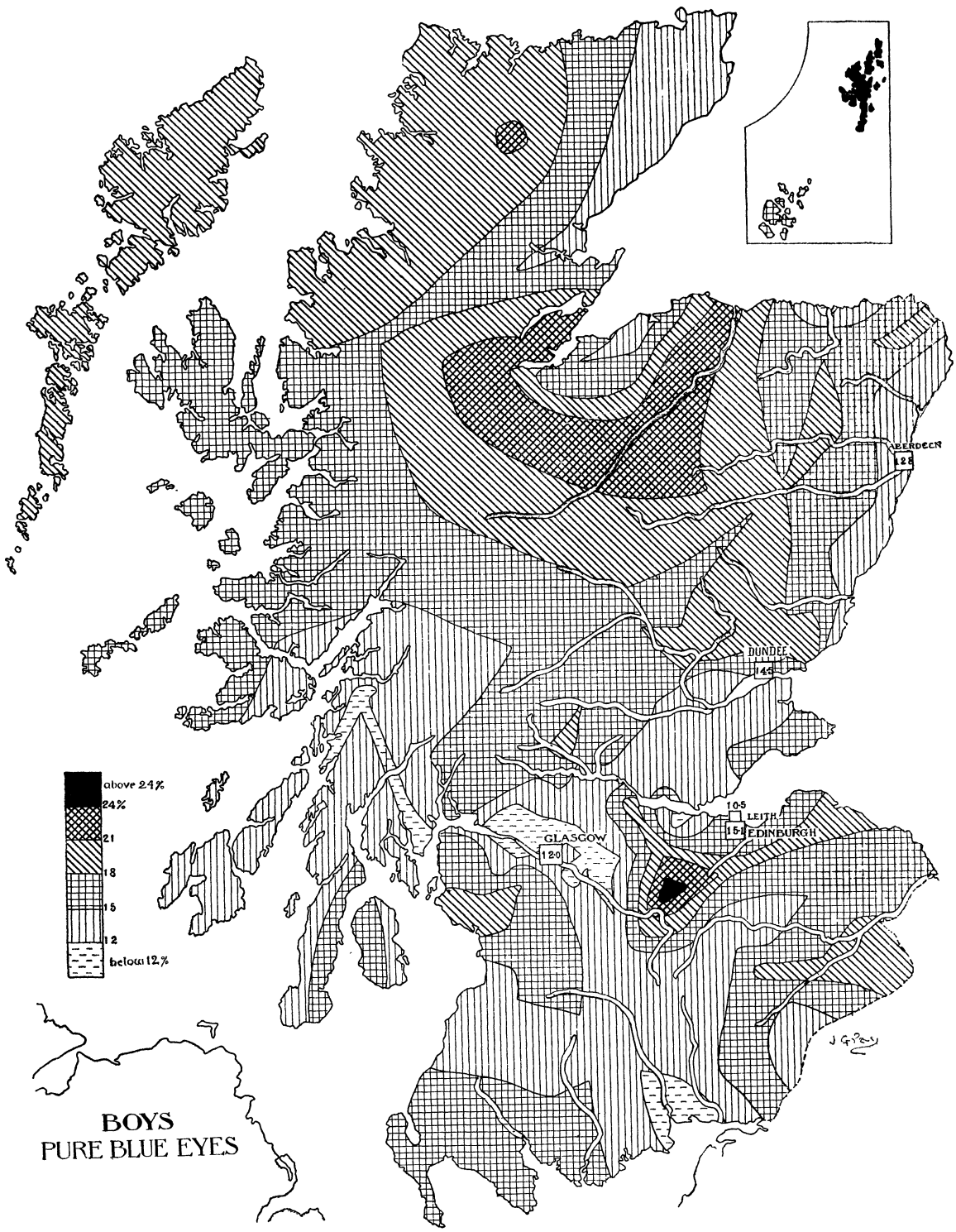

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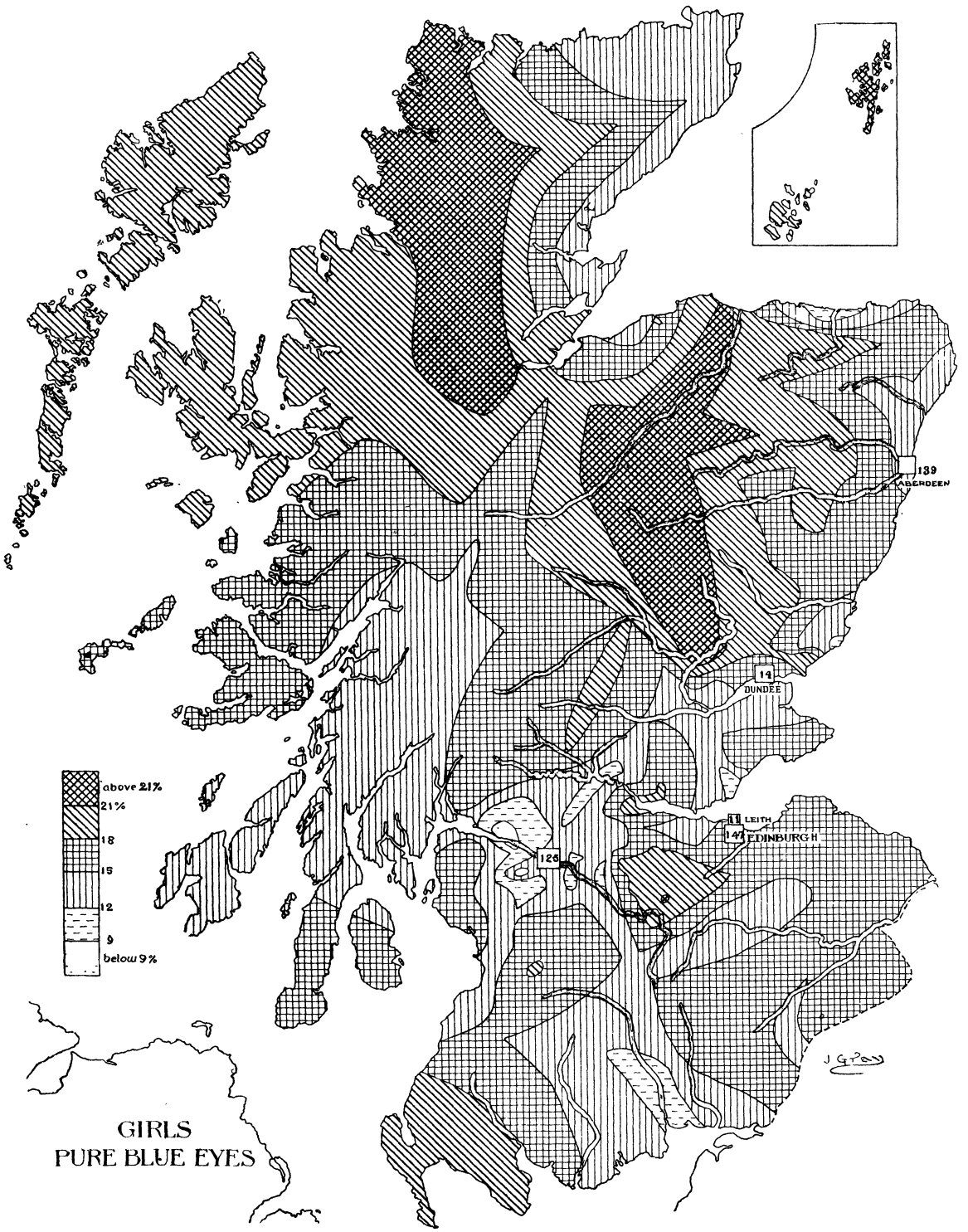

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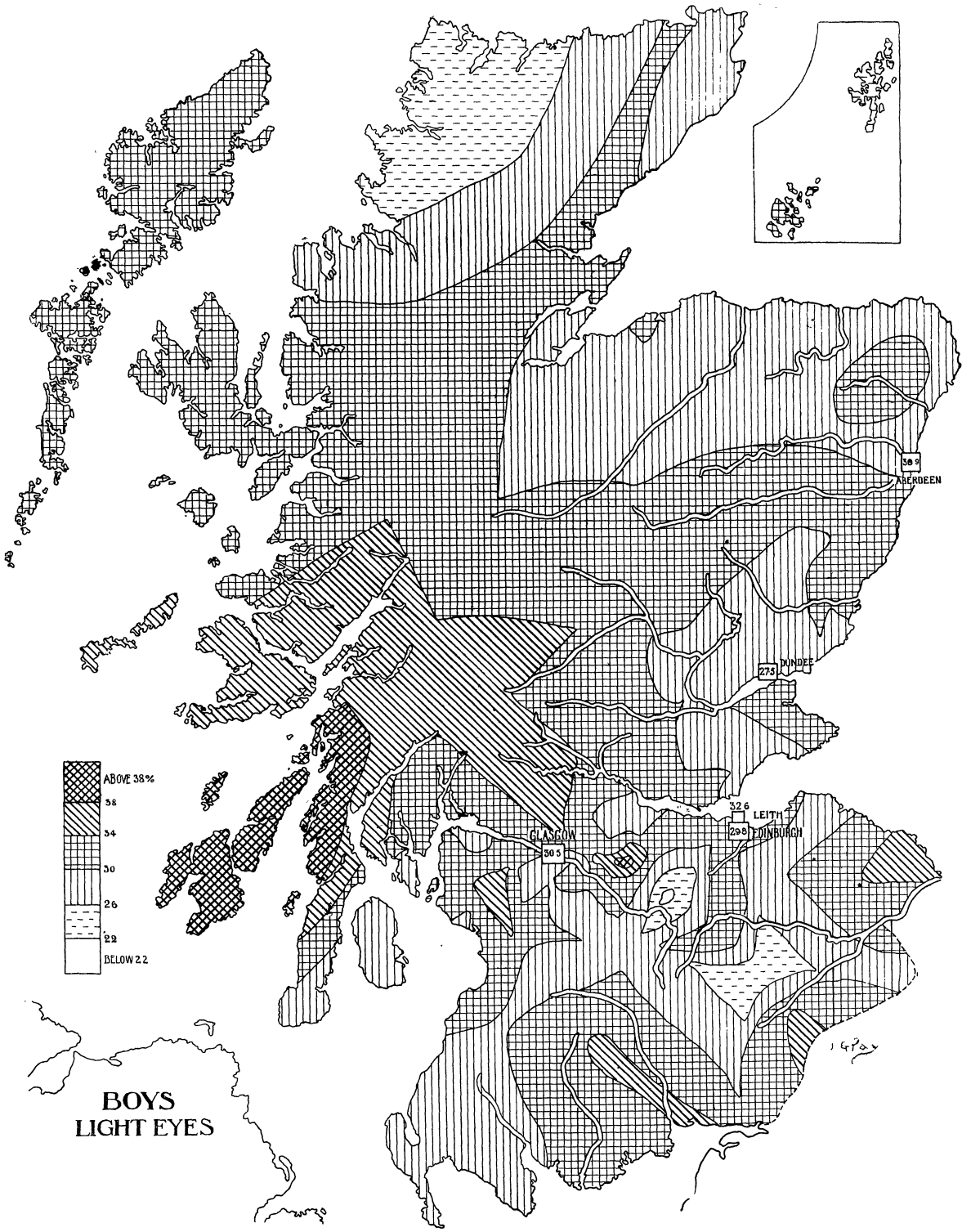

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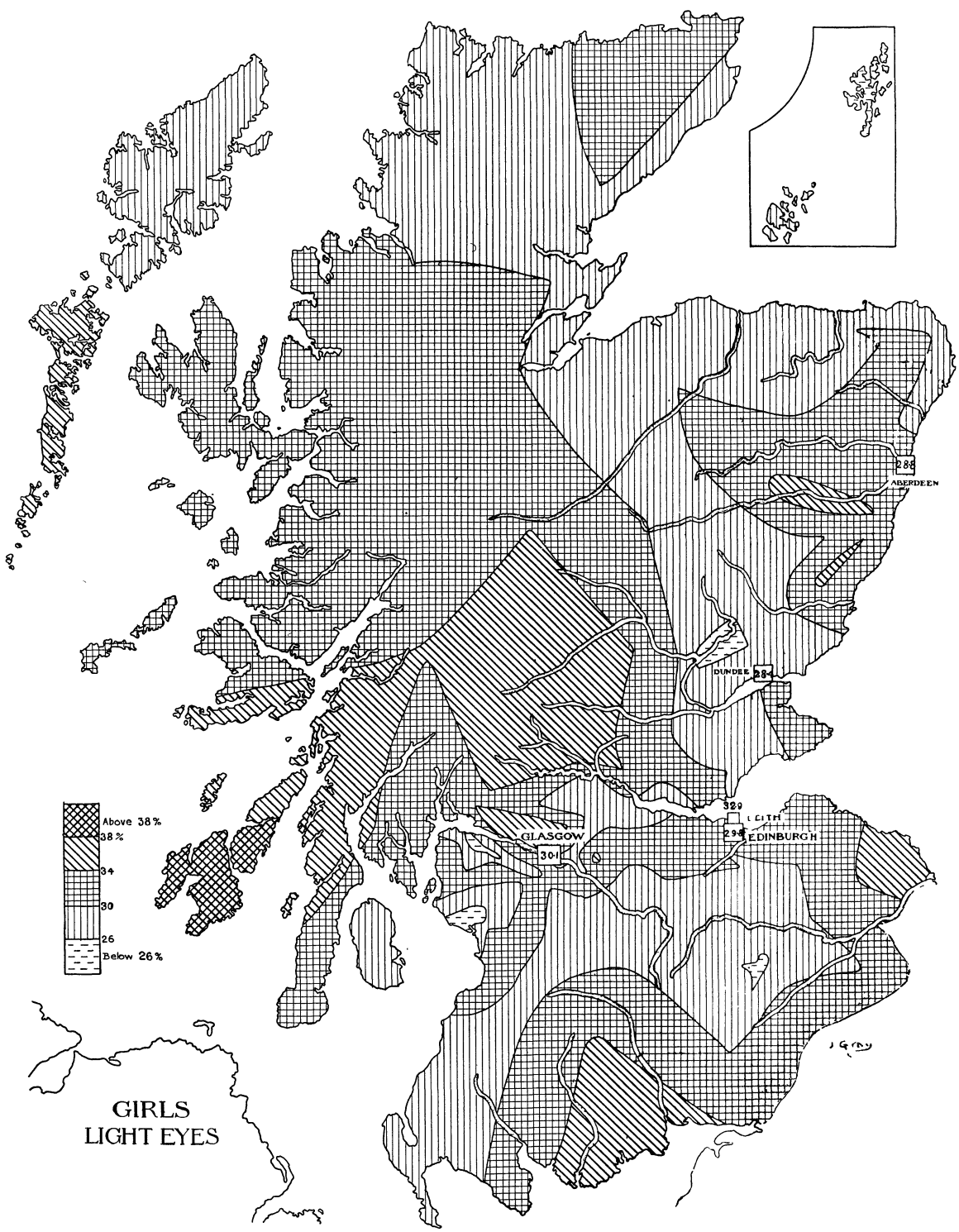

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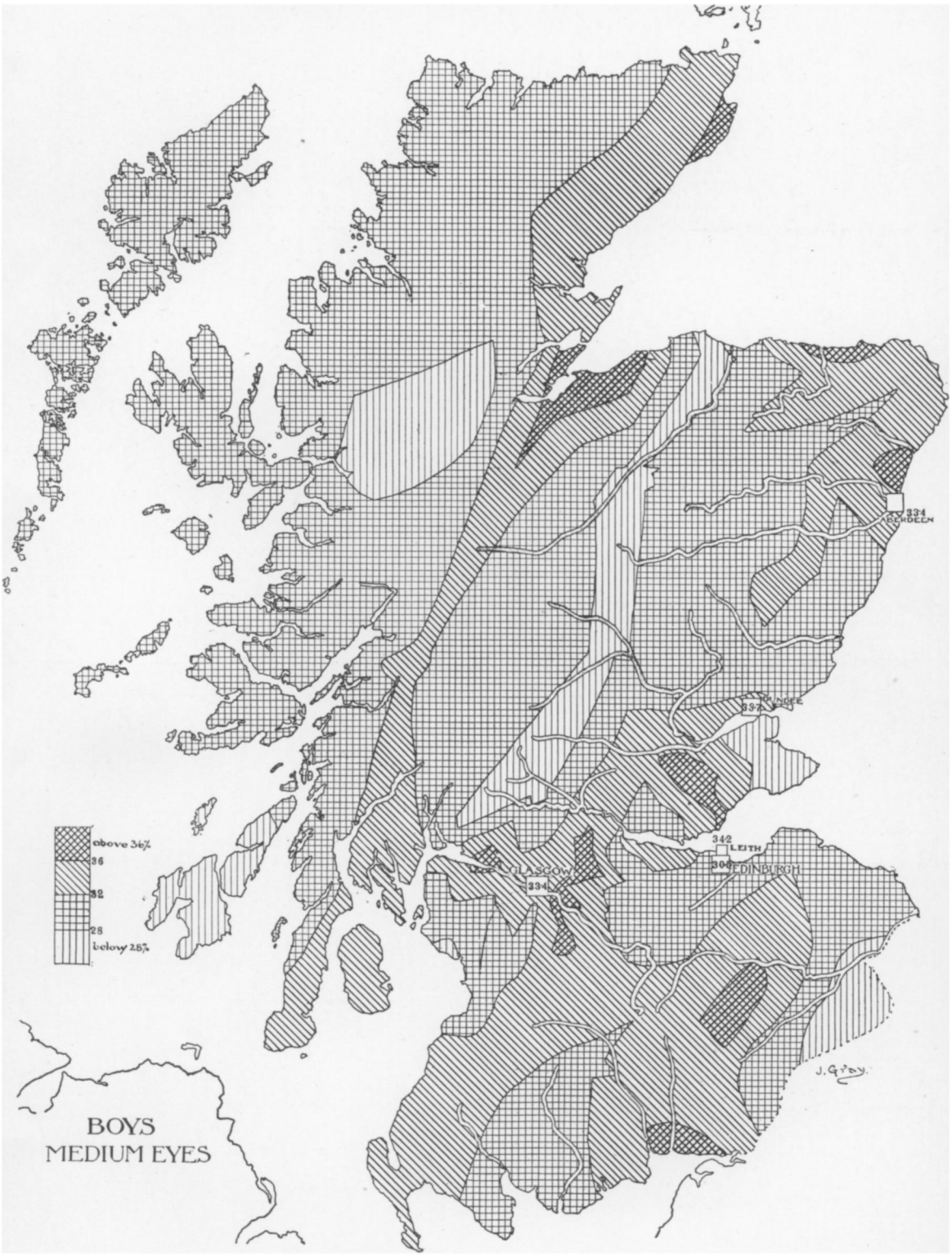

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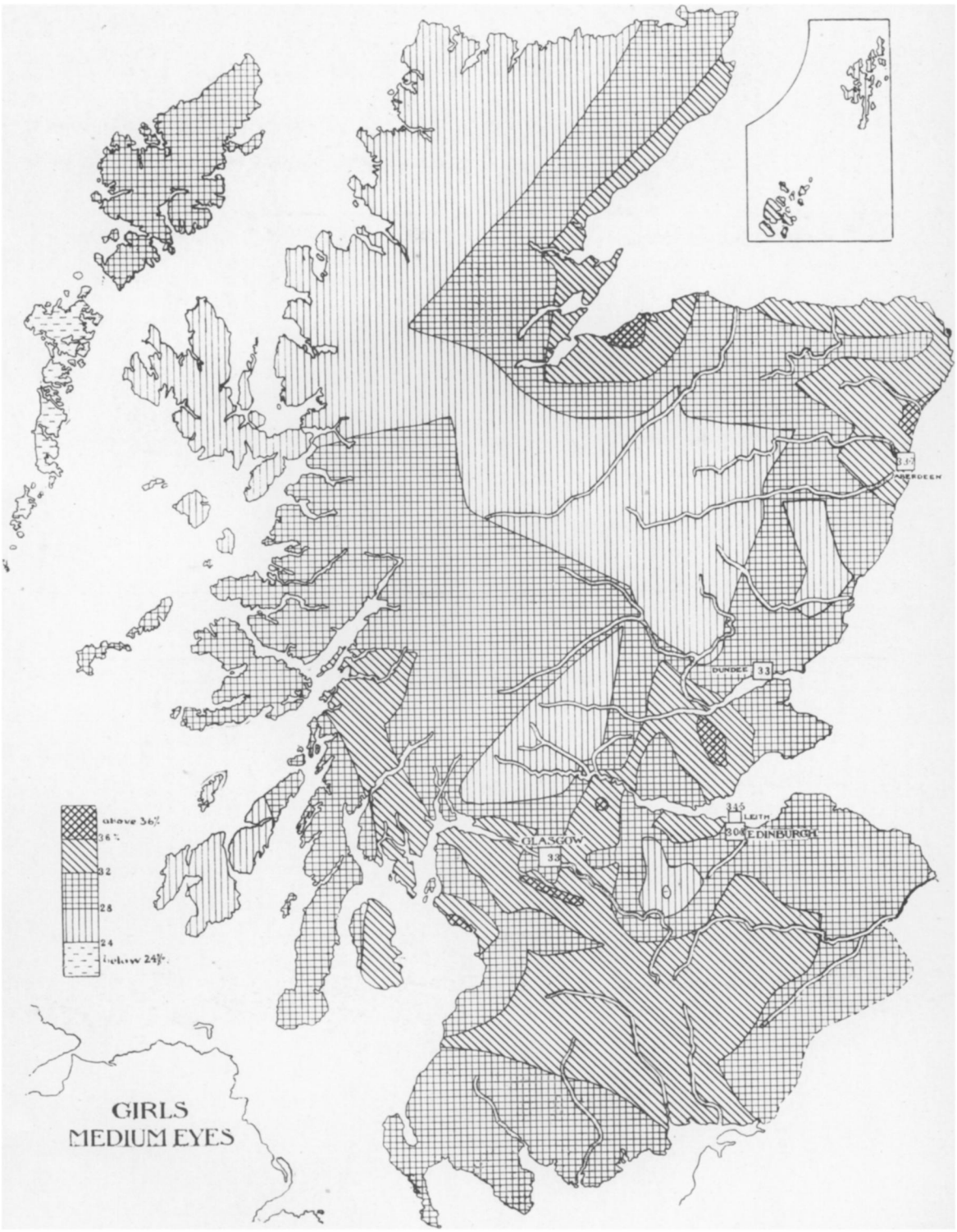

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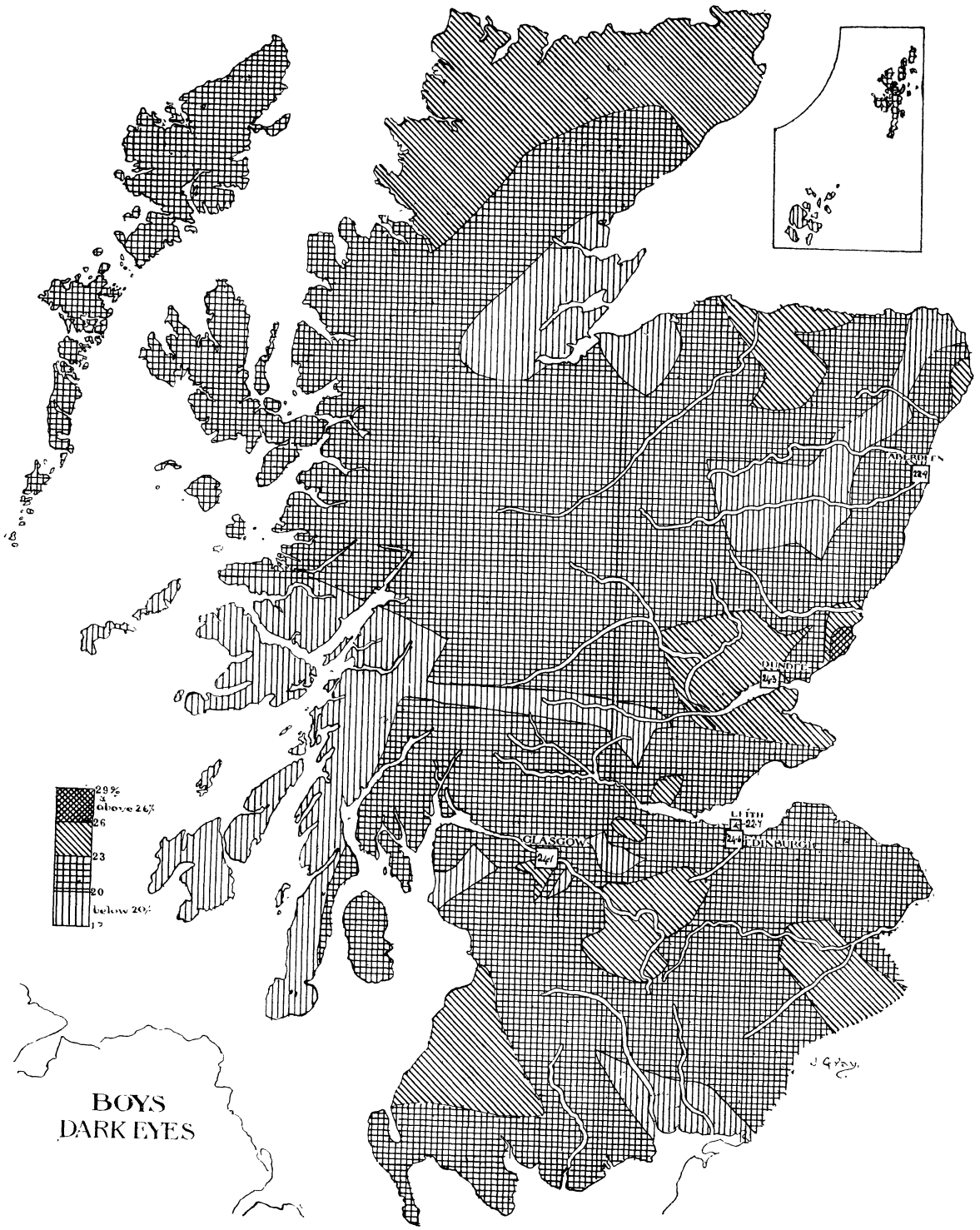

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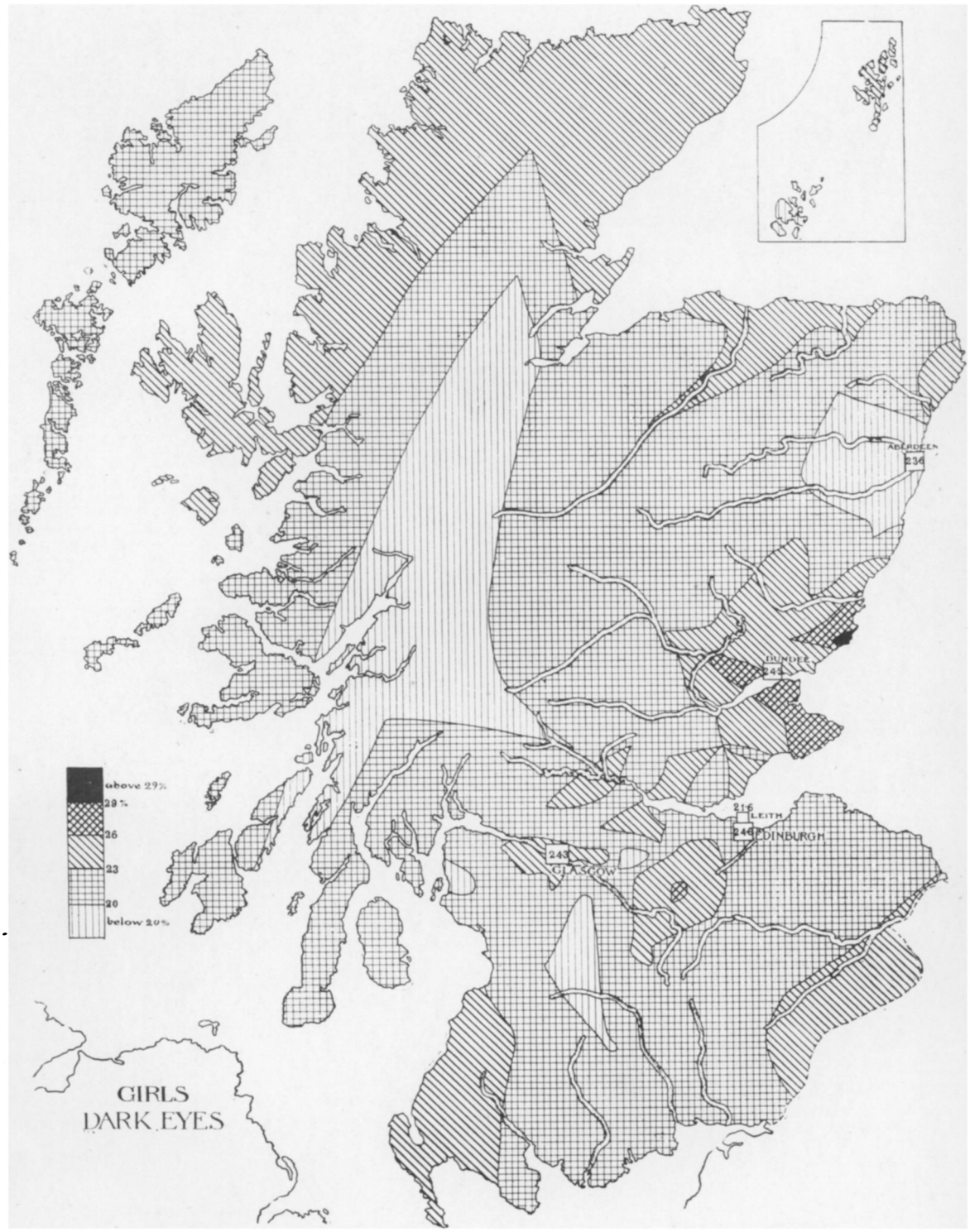

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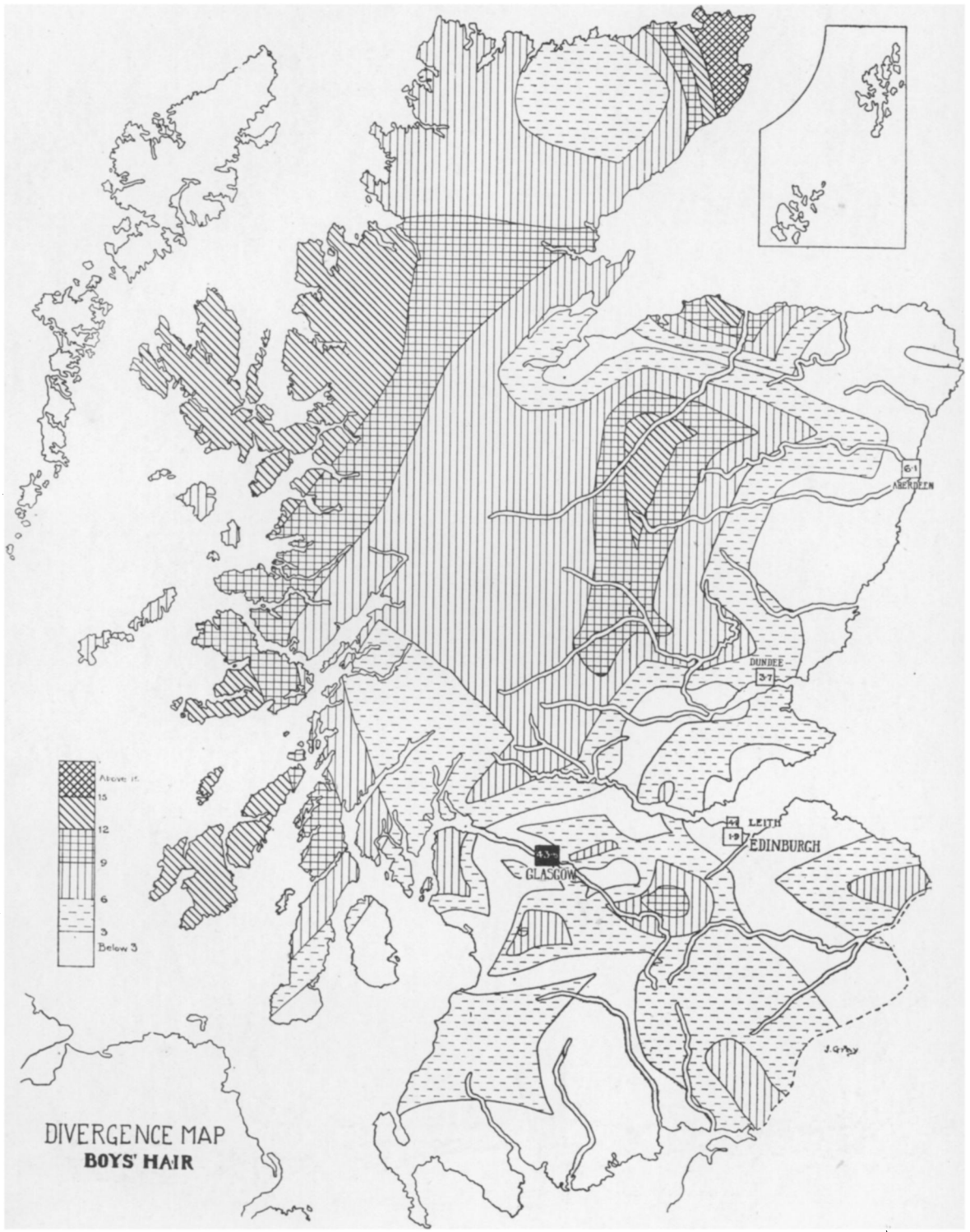

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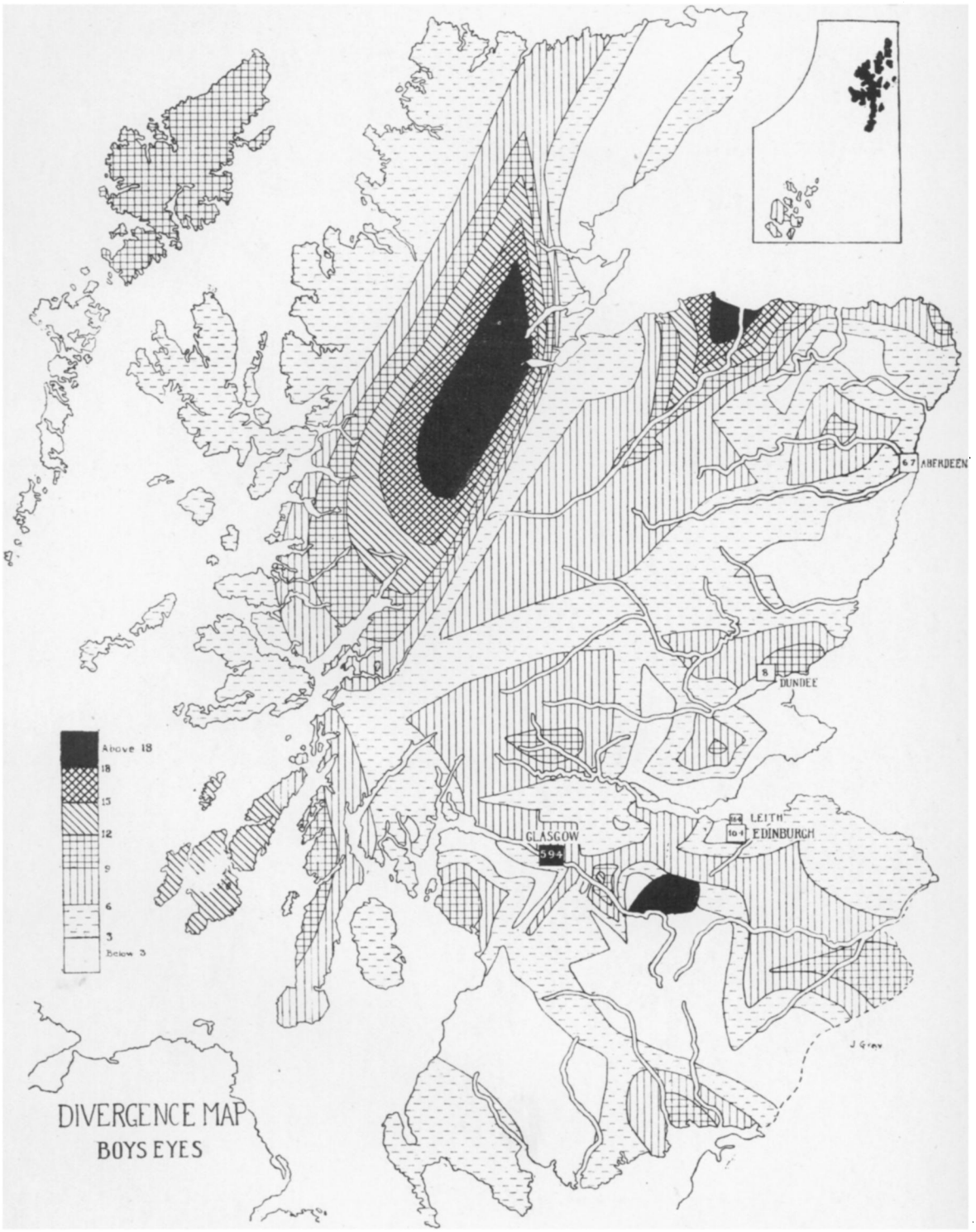

THE PIGMENTATION SURVEY OF SCOTLAND.

TABLE VI.

The percentage pigmentation in the five largest towns.

Boys.

		Hair.					Eyes.			
		Fair.	Red.	Med.	Dark.	Black.	Pure Blue.	Light.	Med.	Dark.
Glasgow ...	13	22·1	5·3	45·7	25·7	1·2	12·0	30·5	33·4	24·1
Edinburgh ...	44	26·3	5·4	43·0	24·3	1·0	15·1	29·8	30·5	24·6
Leith	45	23·6	5·9	45·4	24·4	0·7	10·5	32·6	34·2	22·7
Dundee ...	66	23·3	5·4	45·3	24·6	1·4	14·5	27·5	33·7	24·3
Aberdeen ...	77	24·5	6·2	43·3	25·2	0·7	12·8	30·9	33·4	22·9

Girls.

		Hair.					Eyes.			
		Fair.	Red.	Med.	Dark.	Black.	Pure Blue.	Light.	Med.	Dark.
Glasgow ...	13	21·7	4·9	44·1	28·0	1·2	12·5	30·1	33·0	24·3
Edinburgh ...	44	26·6	5·0	41·1	25·9	1·4	14·7	29·8	30·8	24·6
Leith... ...	45	27·5	5·0	42·0	24·9	0·6	11·0	32·9	34·5	21·6
Dundee ...	66	24·8	5·0	42·3	26·5	1·4	14·0	28·4	33·0	24·5
Aberdeen ...	77	27·3	5·6	40·8	25·6	0·7	13·9	28·8	33·7	23·6