importance, he arrives at the conclusion that there is a direct relation between it and a standardised death-rate. This is confirmed by some calculations made by Mr. Finch. Applying the death-rates at each quinquennial period of age to a standard population adjusted so as to be in arithmetical progression, for which purpose the mean population for the decade 1891–1900 was adopted, the errors appeared to be remarkably small.

Dr. Farr held that density of population and death-rate were closely connected. The difficulty has arisen in applying the two to London, which possesses a greater absolute healthiness than its density would suggest. May we not infer that this is partly due to good management and sanitary conditions ?

It is less easy to get trustworthy generalisations where the numbers are small. Dr. Brownlee supplies a valuable series of tables of the numbers living and the expectation of life in selected healthy and unhealthy districts for use in calculating the death-rate from various diseases. He infers from them that persons who died at the age of fifty-one years in the average environment might have had a life of seven years longer in the mean had they lived in the country.

Proceeding to the consideration of the effect of particular diseases, Dr. Brownlee takes (1) Phthisis. The age at which phthisis causes death is shown to vary greatly in different districts. (2) Sarcoma and cancer. Here for an equal number of deaths the age at death is shown to be later where the conditions are healthier. (3) Valvular disease of the heart. This seems to behave in much the same way. (4) Diabetes. Here, whether a person lives in a rural district or in a county borough, the commonest age at death is the same. (5) Nephritis. This is much less prevalent in rural than in city districts. (6) Pneumonia. Deaths from this are least in rural districts. Care has to be taken in dealing with the three elements of the problem, age, environment, and disease.

In pt. 2, relating to the mathematical treatment of the subject, Dr. Brownlee seeks to give directions for calculating life-table data by short and easy methods. Those desirous of making inquiry into health conditions will, however, have to bear in mind the many pitfalls that they may meet in so delicate an investigation. Dr. Brownlee's authoritative and suggestive report will enable them to avoid the danger of hasty conclusions.

Population Maps.

THE possibilities of the quantitative representation of geographical data as regards population distribution are discussed in some detail by the originator of a new method, Mr. S. de Geer, in the *Geographical Review* for January. Mr. de Geer has already applied the method in the recently published atlas of the distribution of population in Sweden. In the ordinary map the position and size of cities and smaller centres are shown by dots. A further development is to show relative density by shading or colour-tints of varying depths. The chief defect of such maps is that, as a rule, they show only the average over large areas such as counties or parishes.

The dot method of Mr. de Geer offers the possibility of combining a clear representation of situation and a mass of population within wide limits. The dot represents a unit of population of fixed value ; the larger the scale of the map the smaller the unit. On a scale of 1 : 100,000 a dot might represent ten persons ; on one of 1 : 80,000,000 perhaps a million persons. The unit-dots are considered as small spheres, and should be shaded as such, but this involves expense and difficulties in printing ; they are therefore drawn solid black. Small towns are shown by groups of dots arranged in squares, rectangles, or other figures corresponding roughly with the extent of the settlement. Such regular arrangements at once differentiate urban centres from rural communities. Large centres cannot well be shown by dot-nets because of the space required. Urban populations about a certain number, varying with the dot-unit chosen, are shown by large spheres the volume of which is proportional to the unit-dot and decided by the population of the centre. Thus in the Swedish map the unit-dot, representing 100 persons, has a radius of 0·57 mm., and the sphere representing Stockholm (371,000 inhabitants) has a radius of 8·9 mm. These large spheres are shaded to give a spherical appearance. As the quantitative value of the larger sphere is not readily estimated, it is expressed in units printed on or beside it.

Much geographical judgment must be used in the placing of the dots, especially in rural districts. The population of isolated farms and small hamlets has to be gathered into groups of 100 if that is the unit chosen. The dot is placed either at that place with more than half this number of inhabitants or, if there is no such place, near the centre of gravity of the group. Due regard must also be had to the density of neighbouring groups, particularly near administrative boundaries. The map is further improved by tints of colour distributed to show relative density of population. Mr. de Geer rightly claims that such a population map has many practical applications in questions of the readjustment of administrative boundaries, of the establishment of public institutions, of lines of communications, of the location of educational facilities, of the stationing of officials, and in other directions.

The International Fishery Investigations.[1]

THE International Council for the Exploration of the Sea met at Copenhagen in July last, and the official account of the proceedings is now available. An unofficial report, with some criticisms, has also been published by M. Ed. le Danois. At this meeting Belgium, Denmark, Finland, France, Great Britain, Holland, Norway, and Sweden were represented, and negotiations are in progress for the inclusion of Spain, Portugal, Esthonia, and Lettonia. The Governments of Canada, Newfoundland, and the United States have meanwhile adopted a joint scheme of oceanographical investigations, and contemplate "establishing contact" with the European organisation.

The official report summarises the proceedings of the council, the sections, and committees ; the latter relate to investigations on the herring, cod and haddock, plankton, hydrography, limnology, statistics, the Atlantic slope, the Baltic, and the plaice. Programmes of the researches contemplated in each of these subjects are given, and there are indications of the share taken by each country and of the limited progress that has been made. So far little has been published. M. le Danois's unofficial report is, in part,

[1] Rapports et Procès-Verbaux des Réunions : Conseil International, Exploration de la Mer, vol. 27, Copenhague, December 1921.
Notes et Mémoires, No. 11, Office scientifique et technique des Pêches Maritimes, Paris, December 1921.

critical. He finds the methods that have been adopted by the council much too theoretical and too purely scientific. He hopes much from the British delegates, who also wish to see the work directed more strictly towards the treatment of practical problems. These reflections are very interesting.

The first practical outcome of the fishery investigations is the report of the Plaice Committee. For twenty years the question of the depletion of the plaice-stock of the North Sea has been under investigation, but the study of the post-war conditions has now hastened consideration of all the evidence. The workers associated with the International Council hold that a progressive impoverishment was in progress up to the year 1914, and that the great restrictions on fishing due to the war arrested this decline and restored the plaice population of the North Sea. They ask that restrictions on fishing should be imposed so as to prevent the recurrence of the pre-war overfishing. They recommend that the North Sea between latitude 52° and 56° and within the Continental coast and the 12- or 15-fathom contour line be closed to steam trawlers and high-power motor vessels for the whole or part of the year. They also recommend transplantation of small plaice from this closed area to the Dogger Bank.

The fishing industry strongly opposes any restriction on fishing outside the three-miles limit, and it is now evident that this objection will be fatal to the adoption of the recommendations of the Plaice Committee. Any restriction of this kind is bound to lead to decreased profits or earnings at the time of its imposition. As a rule traders take a very short view of the circumstances in question, and are not inclined to make personal sacrifices in order that future generations of traders may obtain advantage. They hold that the evidence available does not justify the Government in accepting the recommendations noted above. Would *any* evidence bring about such industrial altruism? It is doubtful. In the present case, however, the evidence that is available has either not been published or it is presented in such a way that it does not easily appeal to the owners of fishing vessels. Obviously, such restrictions as are indicated must be made and enforced against the strong opposition of the fishing trade and with the approval of the public, and if that is to be so, the fullest publicity should be given to all the data on which the recommendations of the Plaice Committee are based. It is understood, however, that the passion for economy on the part of the Treasury and Stationery Office is now preventing the publication of expensive official scientific reports, and, that being the case, the attitude of the trade is, perhaps, quite justifiable.

J. J.

Gametic and Zygotic Sterility.

A FORM of pollen-sterility in which the anthers are aborted and the flowers fail to open is described by Dr. Bateson and Miss Gairdner (*Journal of Genetics*, vol. 11, No. 3) in flax. Some flowers produced a little pollen, and when self-fertilised gave rise only to male-sterile plants. This male-sterile form appeared as 25 per cent. of the F_2 of a cross between a procumbent variety of *Linum usitatissimum* and the pollen of a common flax. Later it was found that the sterility was determined by the pollen of this flax, the procumbent variety being genetically hermaphrodite on both the male and female sides.

In the same periodical Mr. Rudolph Beer makes a study of the cytology and genetics of Fuchsias, in which partial sterility of pollen and supernumerary pollen-grains are well known to occur. He finds that a pure species, *F. arborescens*, produces a large proportion of sterile pollen, while a cross between the distinct species *F. pumila* and *F. alpestris* shows regular pollen-development and very few bad grains. Such results have an interesting bearing on the hypothesis that bad pollen is in itself a criterion of hybridity. Some of the crosses result in "false hybrids" similar to those obtained in strawberries.

An interesting case in which ratios are altered through zygotic sterility, or rather weakness in development of a zygotic type, is described in the same journal. Mr. Bungo Miyazawa describes a dwarf type of barley which apparently arose as a mutation, and without exceptional care is capable of surviving only in the heterozygous condition. Thus dwarf plants when self-pollinated gave 2 dwarfs : 1 tall, but by careful germination of the seeds the homozygous type was enabled to survive, and was found to be an extreme dwarf which was sterile, producing no flowers.

Prof. E. M. East (*Genetics*, vol. 6, p. 311) has studied the partial sterility in hybrids between *Nicotiana rustica* varieties and *N. paniculata*. Nearly all the F_2 plants resemble *rustica*, a few are almost identical with *paniculata*, while many expected combinations of the parental characters are missing. The sterility varies from almost complete abortion of pollen and seeds to nearly complete seed fertility. This followed a condition of high sterility in F_1, in which only about 3 per cent. of the ovules were functional and only 35-55 per cent. of the seeds would germinate. The pollen-sterility of F_1 plants is even higher, probably not more than 0·1 per cent. of the possible grains from the pollen mother-cells reaching functional maturity. Many break down in the reduction divisions, and many apparently perfect grains dry up when the anther opens. Nearly all the F_2 plants show an increased fertility. The results are explained in terms similar to Goodspeed and Claussen's hypothesis of reaction systems. In brief, certain chromosome combinations are non-viable or produce offspring in which again only certain recombinations can survive. Prof. East suggests that many cultivated plants have originated from similar crosses in which a high degree of sterility has been followed by greater fertility in certain surviving strains.

Further light has been thrown on the sterility in wheat hybrids by the fact that the different types of wheat fall into three groups, which appear to have multiples of 7 as their chromosome numbers. Dr. Karl Sax (*Genetics*, vol. 6, p. 399) finds that the pollen-grains show a corresponding increase in size, the average relative volumes being 72 for Einkorn, 94 for Emmer wheats, and 114 for *T. vulgare*. This is to be expected with an increase in chromosome-content. The results of many investigations indicate that, in general, there is fertility in crosses within each group where the chromosome numbers are the same, but more or less sterility in crosses between forms belonging to different groups. Dr. Sax finds that in fertile crosses of wheat species the F_1 grains (endosperm) are larger than in the parent—a phenomenon of hybrid vigour—but in crosses which are partly sterile the grains are small and wrinkled. The degree of sterility may be determined by the amount of grain set, or by the amount of aborted pollen. There is much variability in the size of pollen in partly sterile F_1 hybrids, which is probably due to irregular chromosome distributions.

R. R. G.