proposed suffer from a want of appreciation of the statistical philosophy which postulates that observed numbers in nature must be viewed as samples, random or otherwise, from a larger population of numbers. The assumption also that the successive growth increments should fit the curve

$$\Delta y = e^{-(x-m)^2}$$

is too restricted. A more adaptable theory would be preferable, such for instance as that adopted by Klem in No. 3, his methods forming special cases of the application of Robertson, Pearl and Reeds "general law."

(5) Hjort, Lie and Ruud. "Norwegian Pelagic Whaling in the Antarctic."

The main object of this paper is the development of statistical standards for comparing the catches of whales and their product from year to year and from area to area. The standard unit catch per unit of work is determined as a blue whale unit per catcher's day's work, and the standard unit factory product per unit of work as a barrel per catcher's day's work. The results of the seasons 1929—30 and 1930—31 are compared in terms of these units, as are also the different factories of which twenty-nine were engaged, and the five areas into which the authors have divided the whole region for comparative purposes. The factories vary widely in efficiency. There seems a tendency on the part of the better-equipped factories to work new areas. In the oldest area, I, the blue whale, which gives the best result in units, appears to be failing. Though the total catch is highest in both seasons in area III, the catch in units per unit of work is highest in area IV, which is the furthest away from the old area I. This is possibly due to the working of the new areas by the most efficient factories. Charts are given of the areas showing for the two seasons when and where the whales were caught and tables give the data dealt with in the text. The methods developed seem well suited to their purpose, the comparison of whaling product in time and space.

H. J. B.-W.

Newfoundland Fishery Research Commission. Annual Report for 1932. Vol. 2, No. 1. Plymouth, 1933.

The second report of this series is a worthy successor to the first, (reviewed in this journal, Vol. VIII, p. 274). Dr. Harold Thompson and his staff, which is evidently active and well directed, seem already to have a firm grasp of the more important of the problems of the Newfoundland fisheries. Here we must leave aside the first 48 pages, which deal tersely and pointedly with handling, processing and marketing, and attempt only a short description of the more biological work.

The classification of water, a very important preliminary step, stands as given in the review of the previous report, except that coastal water (the freshest) is now given a lower limit of 26 salinity in place of 29 (parts per mille). The distribution of the types of water in the spring and autumn of 1932 is described, with the help of admirable tinted charts, and compared with the autumn conditions of 1931. On the Banks and those parts of the coast which shared bank conditions, 1932 was a better fishing year than 1931. This is ascribed to greater influx of both Arctic and Atlantic water in 1932, producing a relatively large body of "mixed"

water (Bank water) "suitable for the multiplication of marine forms of life". The south-western coast, however, experienced a poor cod and squid fishery. This is thought to have been due to the temperature having been too high.

Plankton was more abundant in 1932 than in 1931. Details are given of observations on the Copelata, as an example. These showed preponderance of Arctic and Boreo-Arctic forms in 1932 and of Boreal forms in 1931. Catches of cod larvae are described and related to spawning areas.

The relation of cod catches to temperature is held to be complicated by differing reactions of cod, according to the temperature in which they have grown up, and according to the season of the year. "There is, however, (or will eventually be) an answer according with season of year and locality". Observations made on the Grand Bank showed good fishing (five hauls) in water of 0.1° to 3.7° C., and poor fishing (six hauls) in water of -1.1° to 0°, in the spring. Autumn observations are also given, and those made at Bay Bulls throughout the season, and this subject is to be studied further. In the meanwhile it is suggested that the shore trap fishermen may decide when to set and lift their traps with the help of the thermometer, and that lines should be set where the best temperature occurs. Provisionally a table is given showing the "best temperatures" for different localities and seasons.

The seasonal runs of squid *(Illex)* are important on the Newfoundland coast. In this case the provisional conclusion is that there is an optimum temperature range. Still more important it seems that squid approach with an influx of Atlantic water, observations of which may form a basis for forecasting the subsequent runs.

Investigations are also described dealing with haddock, salmon and "races" of cod. The salmon runs are related to temperature. In northerly material some salmon were found which had spent seven years of parr life in the rivers. The sclerite counting method, described in the previous report, has led to division of the cod stock into four fairly self-contained areas.

M. G.

Alf Dannevig. "On the Age and Growth of the Cod *(Cadus callarias* L.) from the Norwegian Skagerrack Coast." Rep. Norweg. Fish. and Marine Invest. Vol. IV, No. 1. Bergen, 1933.

We have come to expect interesting papers on cod from Dr. D a n n e v i g and the latest contribution has the same general importance as earlier papers, owing to the emphasis on methods.

The scale and otolith methods are examined critically. The otolith method was clearly found to be preferable, and we may turn first to Fig. 13 where a record is given of seasonal observations of the marginal structure in cod otoliths from the Topdalsfjord. The material is grouped according to the calendar year of life and, thereby, this evidence of the reliability of the method is repeated as regards six ages — but irrespective of the year of collection (5 years). It appears from the figure (a table is not given) that the season of transition from opaque to transparent zones, during which both opaque and transparent margins may be collected, lasts only two months, in July and August. In September and October virtually 100% of otoliths had transparent margins. A small proportion of opaque margins was found in November, and the three months of December to February form another season when both kinds of margin may be found. Then from March to June there were four months when every otolith had an opaque margin. We have here indubitable evidence of the regularity of