Mariculture Committee

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REPORT OF THE

STUDY GROUP ON STATISTICAL ANALYSIS OF FISH DISEASE DATA IN MARINE FISH STOCKS

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1 OPENING OF THE MEETING

A. D. Vethaak opened the meeting of the Study Group on Statistical Analysis of Fish Disease Data in Marine Fish Stocks (SGFDDS) at 09.15 hrs on Thursday 6 February 1997. The Chairman welcomed all participants, especially S. des Clers and W. Wosniok. Apologies was received from T. Lang who was unable to attend the meeting. A complete list of participants is contained in Annex 1.

The Chairman read and clarified the terms of reference for the meeting which are also presented in Annex 3. He also pointed out to the participants the new status as a Study Group rather than a Subgroup of the Working Group on Pathology and Diseases of Marine Organisms (WGPDMO).

2 ADOPTION OF AGENDA

A. D. Vethaak presented a draft agenda to the meeting which was based on the terms of reference and the status of ongoing tasks mentioned in the 1996 report of the Subgroup on Statistical Analysis of Fish Disease Data in Marina Fish Stocks [ICES CM 1996/F:3].

One further item of relevance to the meeting was raised regarding the outcome of the ICES Special Meeting on the Use of Liver Pathology of Flatfish for Monitoring Biological Effects of Contaminants (SMLIPA) which will be dealt with under any other business.

3 STATUS OF DATA SUBMISSION

J. R. Larsen, ICES Environment Data Scientist, had compiled the data and processed it for statistical analysis. He presented the available data to the Study Group.

Data had been submitted by Denmark (DFU, 1984–1993), England (CEFAS, Weymouth, 1991–1996), Germany (Cuxhaven, 19811992, 1994–1996), the Netherlands (Rijkswaterstaat, 1991–1995), and Scotland (Aberdeen, 1991–1996). The data covered approximately 80,000 records and 350,000 fish over sixteen years and an area from 49° N to 70° N and 23° W to 11° E. Due to practical problems, the Netherlands had not submitted new data in addition to those submitted for the 1996 meeting. The data were collected over a sixteen-year period from 132 stations or 116 ICES rectangles as illustrated in Figures 1a and 1b.

It was noted that the dataset submitted at the time of the meeting was not complete. New data from the Netherlands was not submitted because of practical problems. It was further mentioned that other ICES Member Countries were still in the process of submitting their data.

The 1996 meeting of the SGFDDS had recommended that data be submitted by 31 December 1996. However, only an insignificant amount of the total data set had arrived at the ICES Secretariat prior to this deadline. A significant amount of data arrived in late January and the beginning of February 1997, making the planning of the work very difficult for the Secretariat. Moreover, a number of the datasets arrived in such condition that they required additional interaction between the data originators and the ICES Secretariat prior to processing.

During the processing of the data, a number of obvious errors were identified, but due to the late arrival of the data, these could not be corrected. Some of the datasets were coded so that the pooling of hauls into sampling stations could be done automatically. For some hauls this was not possible and the pooling was done by the Secretariat in an *ad hoc* fashion on the basis of visual inspection of the haul positions. The resulting dataset covered a total of 130 stations and 116 ICES rectangles.

Prior to the meeting, the ICES Secretariat had produced summaries and graphics of the available data on (restricted) World Wide Web pages. SGFDDS praised the ICES Secretariat for this initiative and discussed if all or part of the report should be made available in a similar way.

Figure 1a. Distribution of stations by longitude and latitude for which fish disease data were submitted.

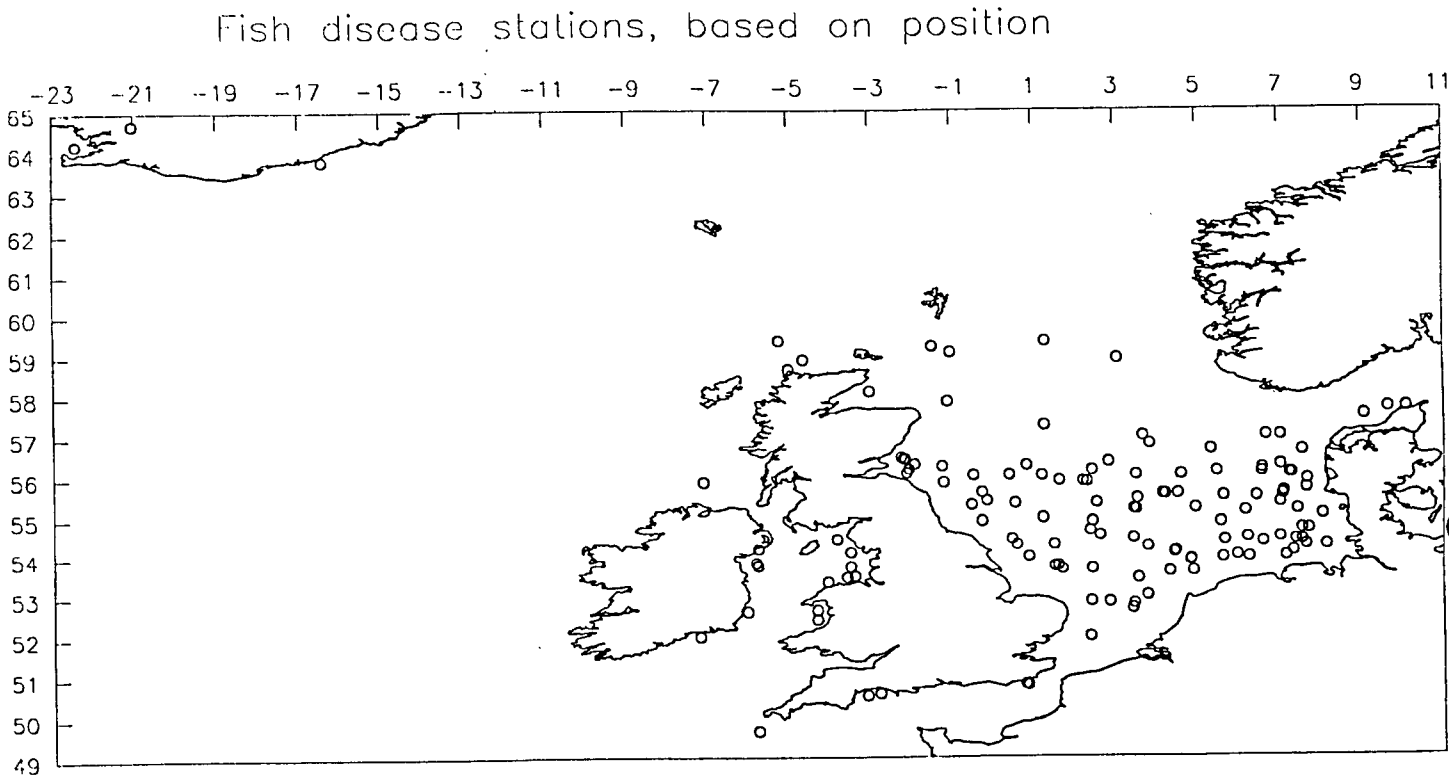
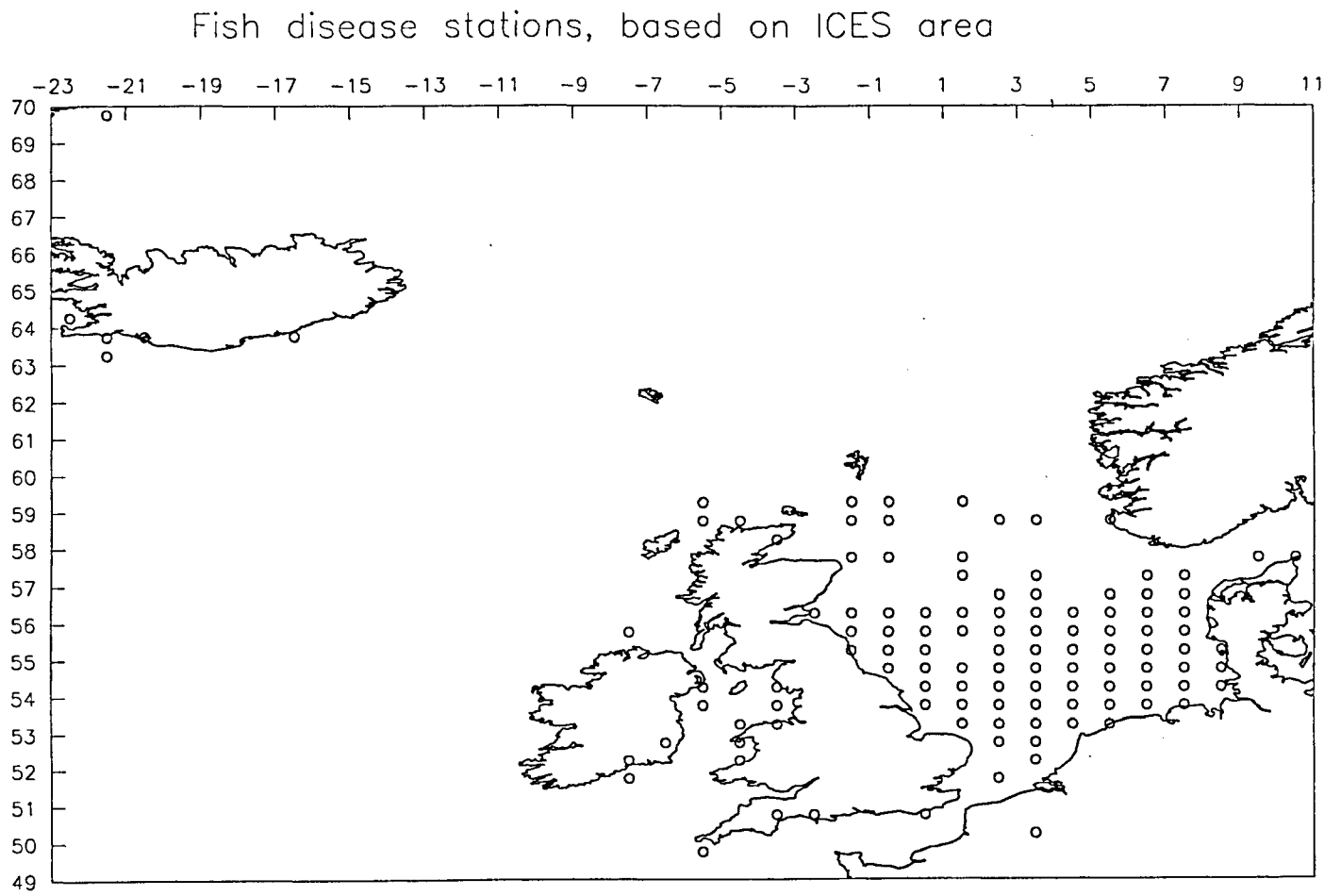


Figure 1b. Distribution of stations by ICES rectangles for which fish disease data were submitted.



4 DATA PRESENTATION AND STATISTICAL ANALYSES

4.1 Data Presentation

All data submitted so far concerns dab. Four diseases are retained: lymphocystis, epidermal papilloma, skin ulcers, and liver nodules. For the purpose of data analyses, the data are cross-tabulated for each disease as numbers of fish examined and numbers of diseased fish, per year, month, station or ICES rectangle, size group, and sex.

The numbers of different stations in the database are summarised by month and year for lymphocystis in Table 1. Over the time period studied, annual disease surveys have taken place mainly in January or May/June depending on the laboratory. Very few data have been collected in the last six months of the year. It was therefore decided to restrict analysis to the data collected during the first six months of the year and to omit any variation due to seasonality.

Table 1. The numbers of different stations in the database for lymphocystis in dab, summarised by month and year.

Year / Month	1	2	3	4	5	6	7	8	9	10	11	12	Total
1981	9	0	0	0	5	0	0	0	0	11	0	0	25
1982	19	0	0	0	0	21	0	0	0	0	0	0	40
1983	21	0	0	0	24	0	0	0	0	0	0	0	45
1984	15	0	0	0	40	0	0	0	0	0	0	7	62
1985	20	0	0	0	29	0	0	0	0	0	0	0	49
1986	27	0	0	0	41	6	0	0	0	0	0	0	74
1987	26	0	0	0	15	30	0	0	0	0	0	0	71
1988	19	0	0	0	19	7	0	0	0	0	0	0	45
1989	9	0	0	0	21	7	0	0	1	0	0	0	38
1990	15	0	0	1	26	0	0	0	0	0	0	0	42
1991	15	2	0	2	14	8	2	0	0	1	0	0	44
1992	15	0	2	17	1	13	4	0	0	0	0	0	52
1993	0	2	2	0	5	4	0	0	0	0	0	0	13
1994	12	4	1	1	2	10	5	0	0	0	0	0	35
1995	9	9	0	0	0	14	8	0	0	0	0	0	40
1996	20	0	0	0	21	0	0	0	0	0	0	0	41
	251	17	5	21	263	120	19	0	1	12	0	7	716

Most data submitted to ICES have a station identifier as well as latitude and longitude coordinates. Each station pools a series of neighbouring hauls sampled during a single cruise. Some hauls, although taken as a series within a station, may end up in different ICES rectangles (half degree latitude x one degree longitude). This is illustrated in Table 2, which gives the ICES rectangle code of each station and the number of years for which data has been reported.

The Study Group decided to present the data in two forms, with hauls grouped by stations and hauls grouped by ICES rectangles, and perform some analyses on both in order to discuss possible differences and to select one spatial coding for future analyses.

Analyses of temporal trends for each disease were performed on the data grouped by ICES rectangle. The numbers of years for which data were reported in each rectangle are given in Table 3.

4.2 Statistical Analyses

4.2.1 Preliminary analyses

The data available were analysed in a series of intermediate steps in order to propose a standard protocol for the separate analyses of spatial patterns and temporal trends. The methodology used was as proposed by the sub-group in 1993, and implemented at ICES in 1996 using the SAS software. From each multi-dimensional table of cross-tabulated data, or contingency table of examined and diseased fish, transformed prevalence rates are obtained and analysed using Generalised Linear Models (GLMs).

The sub-group agreed on the need for simple protocol, suitable for the large volume of international data at hand. Analyses were performed in a first instance to select a temporal and spatial coding in order to produce a standard data set.

Differences between monthly and quarterly groupings of the data were first investigated. It was concluded that most fish-disease cruises reported to ICES had been designed as annual surveys, to be compared on an annual level, and therefore that a split between months or quarters made little sense. Thus the data was pooled by year, but using only the first six months of the year in order to omit any variation due to seasonality (i.e. 677/716 or 94.5% of data available see Table 1).

On the data pooled by year, differences between stations and ICES rectangles were then analysed. Few differences, which were due to doing errors were corrected. Eventually, only the ICES rectangle coding was adopted for several reasons. First, it is a spatial scale which is more in line with the purpose of the analysis. It pools together fine differences, such as between hauls and between stations, which are more relevant to the laboratory submitting the data than at an international level. Second, some countries submitting data did not use a station grouping. In that case, the station coding was artificial and likely more prone to errors during recoding than a simple translation of the latitude and longitude coordinates into ICES rectangles. Third, although during recoding of individual haul positions, some stations were split up into several adjacent rectangles, the resulting number of ICES rectangles (116) was equivalent, if slightly less than the original number of stations (132). Last, the ICES rectangles codes are more illustrative as their names readily identifies their proximity.

A further series of analyses was performed to examine the relative importance of the different dimensions in the data or main effects, i.e. year, ICES rectangle, sex and size, and interaction effects between these such as sex by year, or size by rectangle, or size by sex. It became obvious that, on the multi-annual extended geographical scale of interest, the multiple sources of data were bound to produce systematic imbalance in the sampling design, both between years, and spatially between ICES rectangle. Therefore, it was likely that interaction terms which could be statistically significant would not carry any biological meaning other than various accidents in the sampling design. For example, a significant interaction between years and rectangles points appeared between the time periods 1981-1989 and 1990-1996 when many of the data reported are in different areas. It was concluded that interaction terms should be left aside, but that the data would be split up in order to reduce the variability linked to changes in sampling design. Therefore analyses of spatial patterns in disease sign distribution were performed on the period 1990 to 1996. Similarly, analyses of temporal trends were limited to ICES rectangles which had been sampled for at least eight times over the 16 years span between 1981 and 1996 (28 rectangles).

Table 2. Station code with corresponding ICES rectangle.

Station code	ICES rectangle	Station code	ICES rectangle	Station code	ICES rectangle
al__56.0	41E7	bf56_01.	41F1	bfN33	41E7
al__56.1	41E7	bf56_02.	41F2	bfN34	46E8
al__56.2	41E7	bf56_02.	42F2	bfN34	46E9
al__58.0	45E6	bf56_03.	41F3	bfN34	47E8
al__59.1	47E8	bf56_04.	41F4	bfN34	47E9
bf001	37F7	bf56_05.	41F5	bfN35	40F2
bf001	38F7	bf56_05.	42F5	bfN37	41F0
bf004	38F2	bf56_06.	41F6	bfN42	36F5
bf044	39F3	bf56_06.	42F6	bfN42	37F5
bf202	36F4	bf56_07.	41F7	bfN42	37F6
bf52_02.	34F2	bf57_03.	43F3	bfN43	39F4
bf52_03.	34F3	bf57_06.	43F6	bfN43	40F4
bf53_00.	36F0	bf57_07.	43F7	bfN44	39F3
bf53_01.	35F1	bfE01	36E4	bfN45	38F1
bf53_01.	36F1	bfE02	34E3	bfN46	39E8
bf53_02.	35F2	bfG01	46E5	bfN46	39E9
bf53_02.	36F2	bfG02	46E4	bfN77	43F1
bf53_03.	35F3	bfG02	46F5	bfws1	37F7
bf53_03.	36F3	bfG04	40E2	bfws2	37F6
bf53_04.	35F4	bfG05	37E6	bfws2	38F6
bf53_04.	36F4	bfG06	28E4	bfws3	38F5
bf53_05.	36F5	bfG07	30E6	bfws4	39F4
bf53_06.	36F6	bfG07	30E7	bfws5	40F4
bf53_07.	36F7	bfG08	30F0	df000001	41F6
bf54_-00	38E9	bfI16	56D3	df000002	44F9
bf54_00.	37F0	bfI19	55C8	df000003	39F6
bf54_00.	38F0	bfI19	56C8	df000004	38F7
bf54_01.	37F1	bfI19	56C9	df000005	37F7
bf54_01.	38F1	bfI19	68C8	df000006	37F7
bf54_02.	37F2	bfI20	57C7	df000007	44F9
bf54_02.	38F2	bfN01	37F7	df000008	44G0
bf54_03.	37F3	bfN01	38F7	df000009	40F7
bf54_03.	38F3	bfN02	29F3	df000010	34F7
bf54_04.	37F4	bfN02	37F3	df000011	41F7
bf54_04.	38F4	bfN02	37F4	df000012	39F7
bf54_05.	37F5	bfN02	38F4	df000013	41F7
bf54_05.	38F5	bfN03	34F3	df000014	40F7
bf54_06.	37F6	bfN03	35F3	df000015	42F7
bf54_06.	38F6	bfN03	35F4	dg000001	33F3
bf54_07.	37F7	bfN04	37F2	dg000001	34F3
bf54_07.	38F7	bfN04	38F2	dg000002	35F5
bf54_08.	37F8	bfN05	39E9	dg000002	36F4
bf54_08.	38F8	bfN05	39F0	do_30E7	30E7
bf55_-00	39E9	bfN06	41E7	do_30F0	30F0
bf55_-00	40E9	bfN06	41E8	do_32E2	32E2
bf55_-01	40E8	bfN06	41F1	do_32E2	33E2
bf55_00.	39F0	bfN07	44E8	do_32F2	32F2
bf55_00.	40F0	bfN07	44E9	do_33E5	33E5
bf55_01.	40F1	bfN07	44F1	do_33E5	34E5
bf55_02.	39F2	bfN08	47F1	do_34E5	34E5
bf55_02.	40F2	bfN09	46F2	do_34F2	34F2
bf55_03.	39F3	bfN09	46F3	do_35E5	35E5
bf55_03.	40F3	bfN10	42F3	do_35E6	35E6
bf55_04.	39F4	bfN10	42F5	do_36E4	36E4
bf55_04.	40F4	bfN11	40F6	do_36E6	35E6

Table 2. Station code with corresponding ICES rectangle.

Station code	ICES rectangle	Station code	ICES rectangle	Station code	ICES rectangle
bf55_05.	39F5	bfN11	40F7	do_36E6	36E6
bf55_05.	40F5	bfN12	41F2	do_36F1	36F1
bf55_06.	39F6	bfN12	42F2	do_37E4	37E4
bf55_06.	40F6	bfN14	47E4	do_37E6	35E6
bf55_07.	39F7	bfN21	37F4	do_37E6	37E6
bf55_07.	40F7	bfN22	36F1	do_37E7	37E6
bf55_08.	39F8	bfN23	42F5	do_37F0	36F0
bf56_-00	41E9	bfN24	36F4	do_37F0	37F0
bf56_-01	41E8	bfN31	40F2	do_37F0	38F0
bf56_00.	41F0	bfN32	41E7		

4.2.2 Standard protocols

It was agreed that the emphasis be placed on annual differences at the ICES rectangle level. For each of the three disease signs - lymphocystis, epidermal papilloma and skin ulcers - the tables analysed group examined and affected fish by year, ICES rectangle, sex and size. For liver nodules the main effects considered are year and ICES rectangle as only females of the larger size group were systematically examined.

4.2.3 Results

A standard protocol for the data presentation and statistical analyses has now been developed, but data submission is still incomplete (see § 3). Consequently, an overall interpretation of the data is still restricted. The results obtained so far are illustrated for lymphocystis in Figures 2 and 3. The overall (for both sexes, three size groups and 29 ICES rectangles) predicted long term trend in disease prevalence is given in Figure 2, for rectangles where data have been reported over at least eight years. These are therefore restricted to data submitted by Germany or Denmark, apart from three stations from Scotland regrouped in rectangle 41E7 which were also sampled by Germany over a period of eight years. Once data submission is more comprehensive, it will be interesting to perform further analyses using a shorter time span criteria, maybe of six years, to include more data.

For lymphocystis a general upward trend is clearly visible in the 1980s (Figure 2), followed by a downward trend from 1989, and appears to be a general feature in most of the 28 rectangles. Each line on the graph corresponds to one rectangle which can be recognised to some extent by the different start and end date of reported data. For example the two lines of very low prevalence are from Danish data submitted over the time period 1984 to 1993 (rectangles 43F9 and 44F9). However, sampling discontinuity in the middle of a time series, such as for the data currently reported by Germany or the Netherlands, are not easily visible due to the type of graph. Graphical outputs could easily be improved in the future.

Spatial differences in predicted prevalence of lymphocystis in ICES rectangles sampled between 1990 and 1996 (cf. Table 3) are illustrated in Figure 3 for females in the medium size range. More data have been included in the analysis, producing important differences in sampling design, such as stations sampled north of 60 degrees North reported in 1992, those west of 4 degrees West reported from 1994, or the accidental absence of data from Germany in 1993. However, the spatial dimension of the decreasing trend between 1990 and 1996 can be seen on the ICES rectangles sampled throughout the period and concentrating on the 1990, 1992 and 1994 maps. For these rectangles (see Figure 1b) the decrease corresponds to an overall effect as opposed to a high magnitude decrease over a restricted area. This result will have to be confirmed once the submitted data set is complete, and may be more powerfully illustrated by selecting stations used in the spatial analysis in a similar way to those selected for the analysis of temporal trends. However, the possibility of standardised analyses of disease signs data has now been clearly illustrated, and is operational at the ICES Secretariat.

The standard GLM method has also been applied to analyse temporal and spatial trends in epidermal papilloma and skin ulcers in dab. Results are illustrated in Figure 4-7. Results for liver nodules were extremely variable and are not presented at this stage.

5 STATUS OF ON-GOING TASKS

5.1 Update Information on Age-Length Relationships for Dab

There has been no progress on the update of age-length relationships for dab, due to the lack of immediate availability of new data. It is recognized that it is unlikely that age-length keys will be incorporated in the existing fish disease dataset.

Table 3. The ICES rectangle (*) and the number of years for which data has been reported.

*	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Total
37F7	1	1	1	1	1	1	1	1	1	1	1	1	.	1	1	1	15
38F2	1	1	1	1	1	1	1	1	1	1	1	1	.	1	1	1	15
34F3	1	1	.	.	.	1	1	1	1	1	1	1	1	1	1	1	13
37F0	1	1	1	1	1	.	1	1	.	.	1	.	1	1	1	1	12
37F2	1	1	.	.	1	1	.	1	1	1	1	1	.	1	1	1	12
38F7	1	1	1	1	1	1	1	1	1	1	1	1	.	.	.	.	12
39F6	1	1	1	1	1	1	1	1	1	1	1	1	.	.	.	.	12
39F7	1	1	1	1	1	1	1	1	1	1	1	1	.	.	.	.	12
40F7	.	.	.	1	1	1	1	1	1	1	1	1	.	1	1	1	12
41F6	.	1	1	1	1	1	1	1	1	1	1	1	1	.	.	.	12
35F3	.	1	.	1	.	1	1	1	1	1	1	.	.	1	1	1	11
36F1	.	.	1	1	1	1	1	1	.	.	1	1	.	1	1	1	11
37F6	1	1	1	1	1	1	1	1	.	1	1	1	.	.	.	.	11
37F3	.	.	.	.	1	1	1	1	1	1	1	1	.	1	.	1	10
39F0	.	1	1	1	1	.	.	1	1	1	1	.	.	.	1	1	10
41F7	.	.	.	1	1	1	1	1	1	1	1	1	1	.	.	.	10
37F4	.	.	.	.	.	1	1	1	1	1	1	1	.	1	.	1	9
39E9	.	.	.	1	.	1	.	1	1	1	1	1	.	.	1	1	9
39F3	.	1	1	1	1	1	1	1	.	.	1	1	.	.	.	.	9
41E8	.	.	.	.	.	.	1	1	1	1	1	1	.	1	1	1	9
44F9	.	.	.	1	1	1	1	1	.	1	1	1	1	.	.	.	9
36F4	.	.	.	.	.	1	1	1	.	.	1		1	.	1	1	7
37F1	1	1	1	1	1	1	1	1	.	.	.	.	.	.	.	.	8
37F5	1	1	1	1	1	1	.	.	.	.	1	1	.	.	.	.	8
38F6	1	1	1	1	1	1	1	.	.	1	.	.	.	.	.	.	8
40F4	.	1	.	1	1	1	1	.	.	1	1	1	.	.	.	.	8
41E7	.	.	.	.	.	.	.	.	1	1	1	1	1	1	1	1	8
42F7	.	.	.	.	1	1	1	1	1	1	1	1	.	.	.	.	8
44G0	.	.	.	1	1	1	1	1	.	.	1	1	1	.	.	.	8
36F2	.	1	1	1	1	1	1	1	.	.	.	.	.	.	.	.	7
38F0	1	.	1	.	1	1	1	1	.	.	1	.	.	.	.	.	7
39F5	1	1	1	1	1	1	1	.	.	.	.	.	.	.	.	.	7
40F6	.	.	1	1	1	1	1	1	.	.	.	.	.	1	.	.	7
44E8	.	.	.	.	.	.	.	.	1	1	1	1	.	1	1	1	7
47E8	.	.	.	.	.	.	.	.	1	1	.	1	1	1	1	1	7
37F8	1	1	1	1	1	1	.	.	.	.	.	.	.	.	.	.	6
38F5	1	1	1	1	.	1	.	.	.	1	.	.	.	.	.	.	6
39F4	.	1	.	.	1	1	.	.	.	1	1	1	.	.	.	.	6
42F3	.	.	.	.	.	.	.	.	1	1	1	1	.	1	.	1	6
30F0	.	.	.	.	.	.	.	.	.	.	.	1	1	1	1	1	5
36F0	.	1	1	1	.	1	.	.	.	.	1	.	.	.	.	.	5
36F5	.	.	1	.	.	1	1	.	.	.	1	1	.	.	.	.	5
38F1	1	1	.	.	.	1	.	.	.	.	1	1	.	.	.	.	5
40E8	.	.	.	1	1	1	1	1	.	.	.	.	.	.	.	.	5
40F3	.	1	1	1	.	1	1	.	.	.	.	.	.	.	.	.	5
45E6	.	.	.	.	.	.	.	.	.	.	.	1	1	1	1	1	5
47F1	.	.	.	.	.	.	.	1	1	1	.	1	.	.	.	1	5
35E6	.	.	.	.	.	.	.	.	.	.	.	1	.	1	1	1	4
35F2	.	1	1	1	.	1	.	.	.	.	.	.	.	.	.	.	4
36F7	.	1	1	1	.	1	.	.	.	.	.	.	.	.	.	.	4
38F3	.	1	.	1	1	.	1	.	.	.	.	.	.	.	.	.	4

Table 3. Continued.

*	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Total
40E9	.	.	.	1	1	.	1	1	.	.	.	.	.	.	.	.	4
40F1	.	1	1	1	.	1	.	.	.	.	.	.	.	.	.	.	4
41F0	.	.	1	.	.	1	1	.	1	.	.	.	.	.	.	.	4
41F2	.	.	1	1	.	.	1	.	.	.	.	1	.	.	.	.	4
41F5	.	1	1	1	1	.	.	.	.	.	.	.	.	.	.	.	4
44E9	.	.	.	.	.	.	.	1	1	.	.	.	.	1	1	.	4
30E6	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	3
34E3	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	3
36E4	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	3
36F3	.	1	1	.	.	.	.	1	.	.	.	.	.	.	.	.	3
37E6	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	.	3
38F8	1	1	.	1		.	.	.	.	.	.	.	.	.	.	.	3
40E2	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	3
40F0	.	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	3
40F2	.	.	.	1	.	.	.	.	1	1		.	.	.	.	.	3
40F5	.	.	.	1	1	1		.	.	.	.	.	.	.	.	.	3
41F1	.	.	.	.	.	1	1	.	.	1	.	.	.	.	.	.	3
41F3	.	.	1	1	.	1	.	.	.	.	.	.	.	.	.	.	3
41F4	.	.	1	.	.	1	1	.	.	.	.	.	.	.	.	.	3
42F5	.	1	.	.	.	.	.	1	.	.	.	.	.	.	1	.	3
46E4	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	.	3
46E5	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	.	3
30E7	.	.	.	.	.	.	.	.	.	.	.	.	.	1		1	2
34E5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	2
34F2	.	1		.	.	.	.	.	.	.	.	1	.	.	.	.	2
35F4	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	2
36F6	1	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	2
37E4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	2
38E9	.	.	.	1	.	1	.	.	.	.	.	.	.	.	.	.	2
39F8	.	.	.	1	.	.	1	.	.	.	.	.	.	.	.	.	2
41E9	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	2
42F2	.	.	.	.	.	.	1	.	.	.	.	1	.	.	.	.	2
46E8	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	2
46F3	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	2
28E4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1
29F3	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	1
32E2	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1
32F2	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	1
33E2	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1
33E5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1
33F3	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1
35E5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1
35F1.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	1
35F5	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1
36E6	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1
38F4	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1
39E8	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1
39F2	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
42F6	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
43F1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1
43F3	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1
43F6	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1
43F7	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1

Table 3. Continued.

*	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Total
44F1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1
46E9	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1
46F2	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	1
46F5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1
47E4	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1
47E9	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	1
55C8	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	1
56C8	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	1
56C9	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	1
56D3	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	1
57C7	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	1
68C8	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	1

Therefore, it was not felt valuable to put more effort in updating the age-length relationship for dab. However, it is strongly recommended that fish disease studies should always include information on the age structure of the populations studied.

5.2 Compile a List of Relevant Institutes and Libraries Which Could be Interested to Receive Information about ICES Publications on Fish Diseases

S. Mellergaard received address lists from the United Kingdom, Sweden, and France and these lists were given to the ICES Technical Editor.

5.3 Advise on Statistical Design for Analysis of Disease Prevalence Data as well as on the Choice of Appropriate Target Species and Disease Conditions for an Intended Disease Monitoring Programme in the Southern Gulf of St. Lawrence

The following information was provided: ICES Training Guide for Fish Diseases and Parasites in the North Atlantic (*ICES Techniques in Marine Environmental Sciences* No. 19), and *ICES Cooperative Research Report* Nos. 140 and 166, on the methodology of fish disease surveys. It was suggested that further advice on the selection of suitable target species in the Canadian waters should be sought primarily by contacting the USA members involved in the USA biomonitoring programme conducted since 1984 in order to ensure compatibility. The forthcoming WGPDMO meeting, which will take place in the USA, will be a further opportunity to improve the involvement and familiarity of members of the United States and Canada with the work relating to the ICES Fish Disease Databank carried out by WGPDMO .

6 ANY OTHER BUSINESS

A request was received from North American colleagues to incorporate additional fish species and diseases in the ICES Disease Data Entry Program. In order to avoid 'contamination' of the ICES Fish Disease Data Bank and for quality assurance purposes the inclusion of new species and fish diseases should only be done after consultation with WGPDMO.

The Special Meeting on the Use of Liver Pathology of Flatfish for Monitoring Biological Effects of Contaminants recommended that data obtained from studies on liver pathology and related biomarkers be submitted to ICES and, further, that WGPDMO together with the ICES Secretariat should explore ways to incorporate the data into the ICES Environmental Data Bank for subsequent data analysis.

7 RECOMMENDATIONS

The Study Group on Statistical Analysis of Fish Disease Data in Marine Fish Stocks recommends that WGPDMO include in its term of reference for its 1998 meeting to:

a) synthesize the analysis undertaken intersessionally by members of WGPDMO and the ICES Secretariat on the fish disease data, including newly submitted data, contained in the ICES Fish Disease Data Bank.

Justification

During the past few years a routine for maintaining a fish disease data bank in the ICES Secretariat has been established, and regular submissions to this data bank are organised via members of WGPDMO from all ICES Member Countries. Procedures and analysis required by WGPDMO are now established and can be continued and maintained by intersessional contact between the ICES Secretariat and selected members of the WGPDMO.

b) ensure that the inclusion of new species and fish diseases in the ICES Fish Disease Data Bank should not be done before consultation with WGPDMO in order to ensure quality assurance and to prevent 'contamination' of the system.

8 ADOPTION OF THE REPORT AND CLOSING OF THE MEETING

The Study Group adopted the final draft report. The Chairman thanked the participants for their contributions and closed the meeting at 18.30 hrs on 7 February 1997.

Figure 2. Temporal trend for lymphocystis prevalence predicted by a GLM for year + ICES rectangle + sex + size, in 28 rectangles between 1981 and 1996 for which data has been reported over eight years or more.

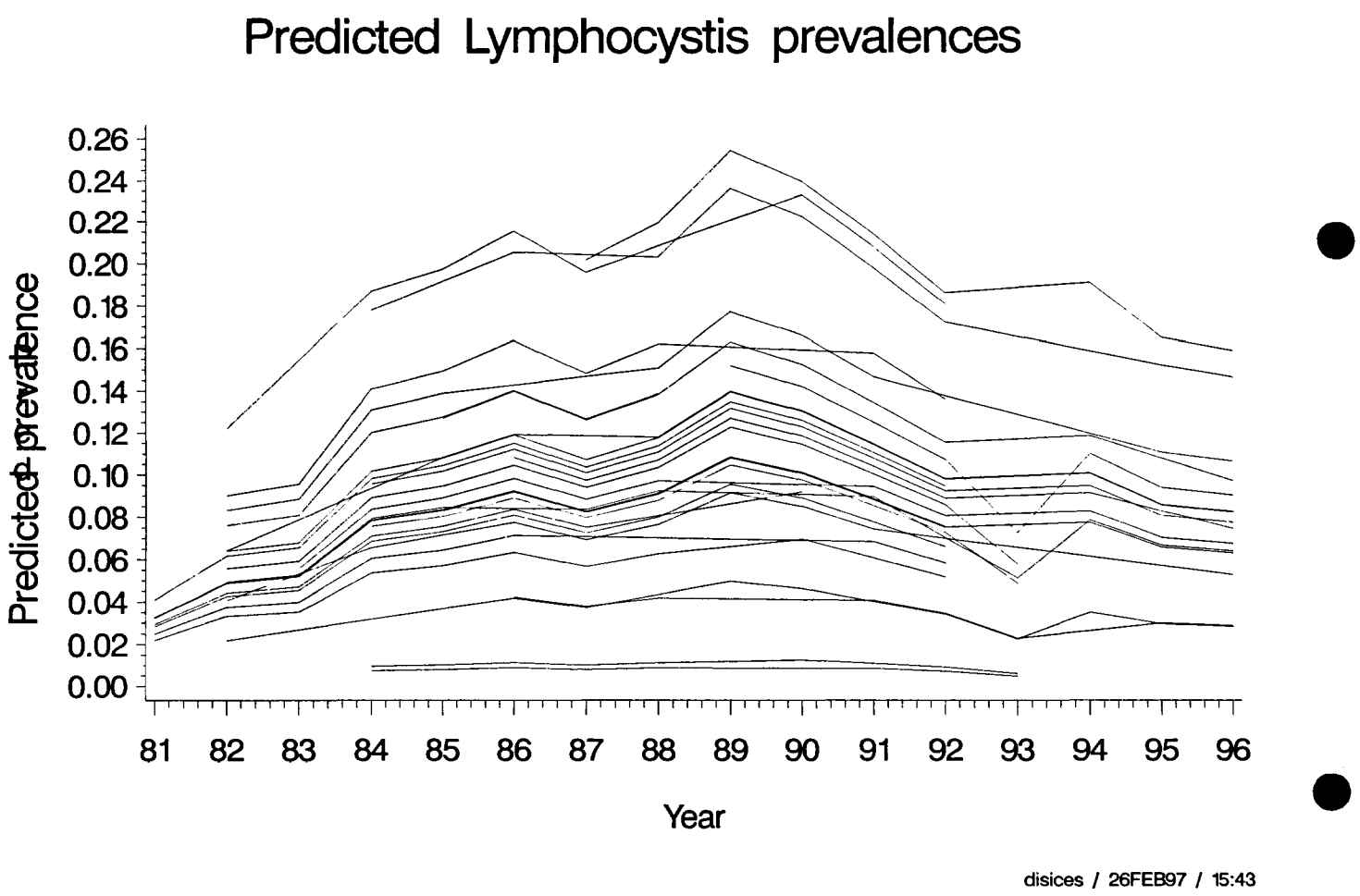


Figure 3a. Predicted prevalence of lymphocystis in medium-sized female dab in 1990.

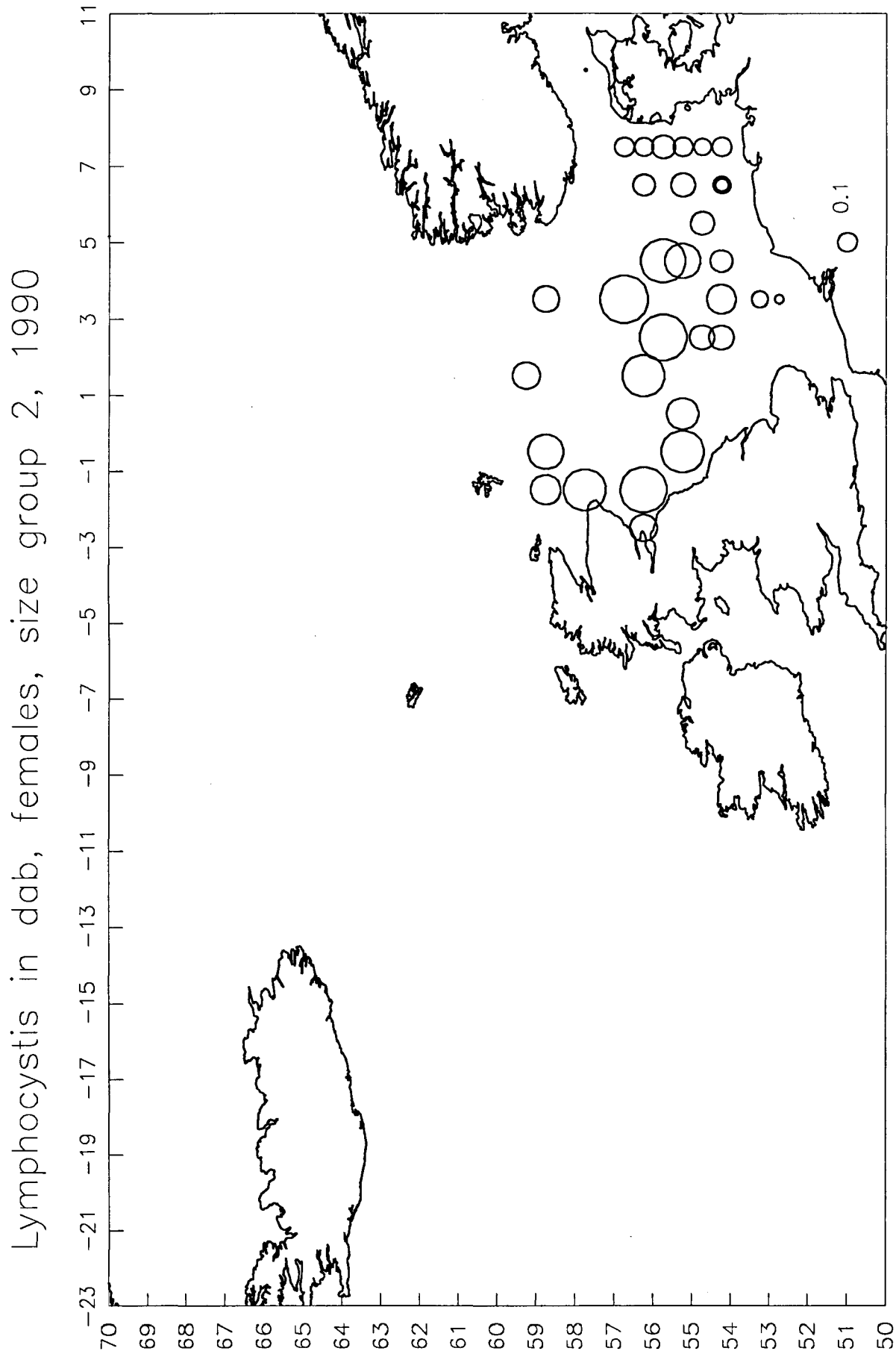


Figure 3b. Predicted prevalence of lymphocystis in medium-sized female dab in 1991.

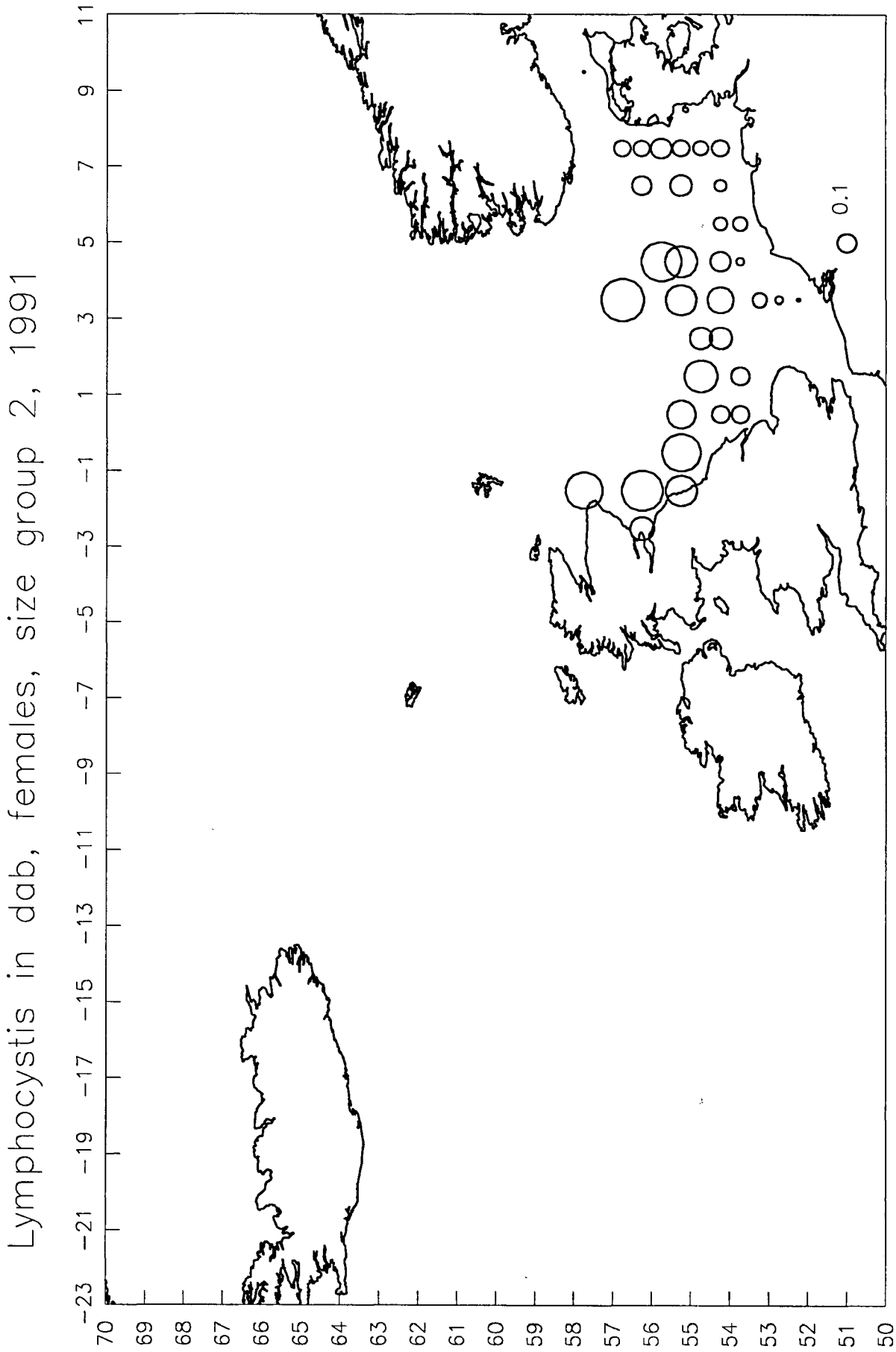


Figure 3c. Predicted prevalence of lymphocystis in medium-sized female dab in 1992.

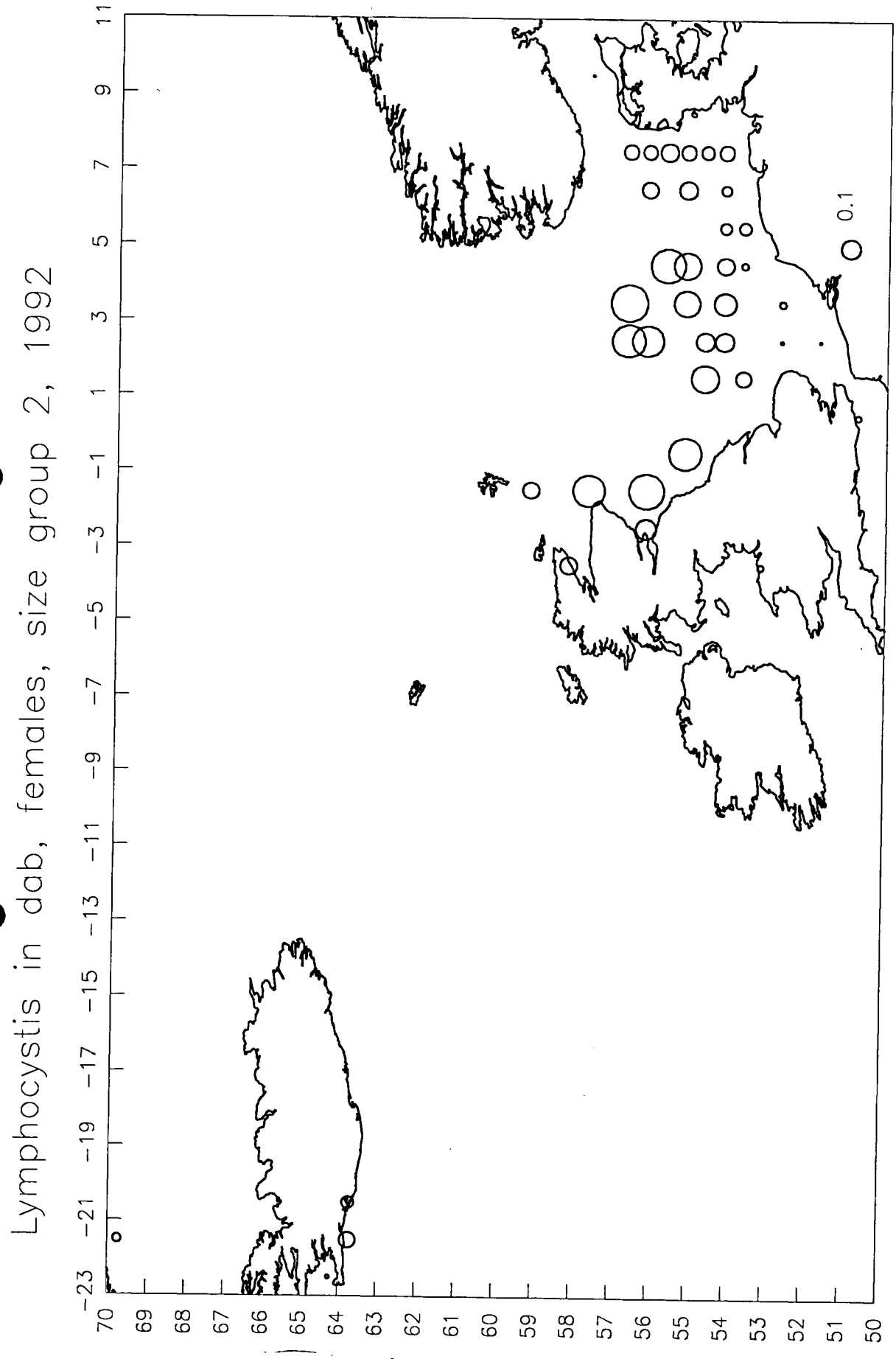


Figure 3d. Predicted prevalence of lymphocystis in medium-sized female dab in 1993.

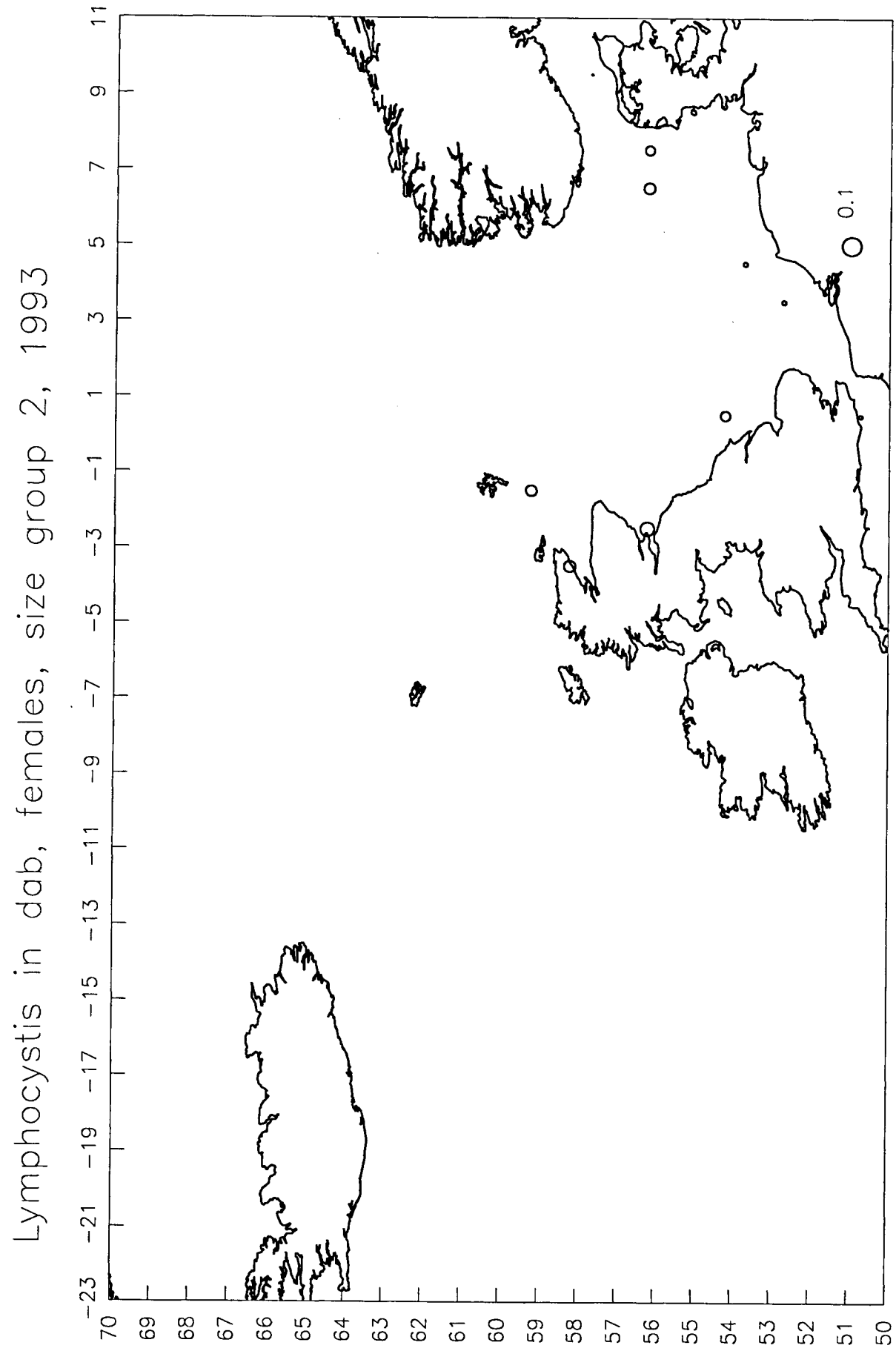


Figure 3e. Predicted prevalence of lymphocystis in medium-sized female dab in 1994.

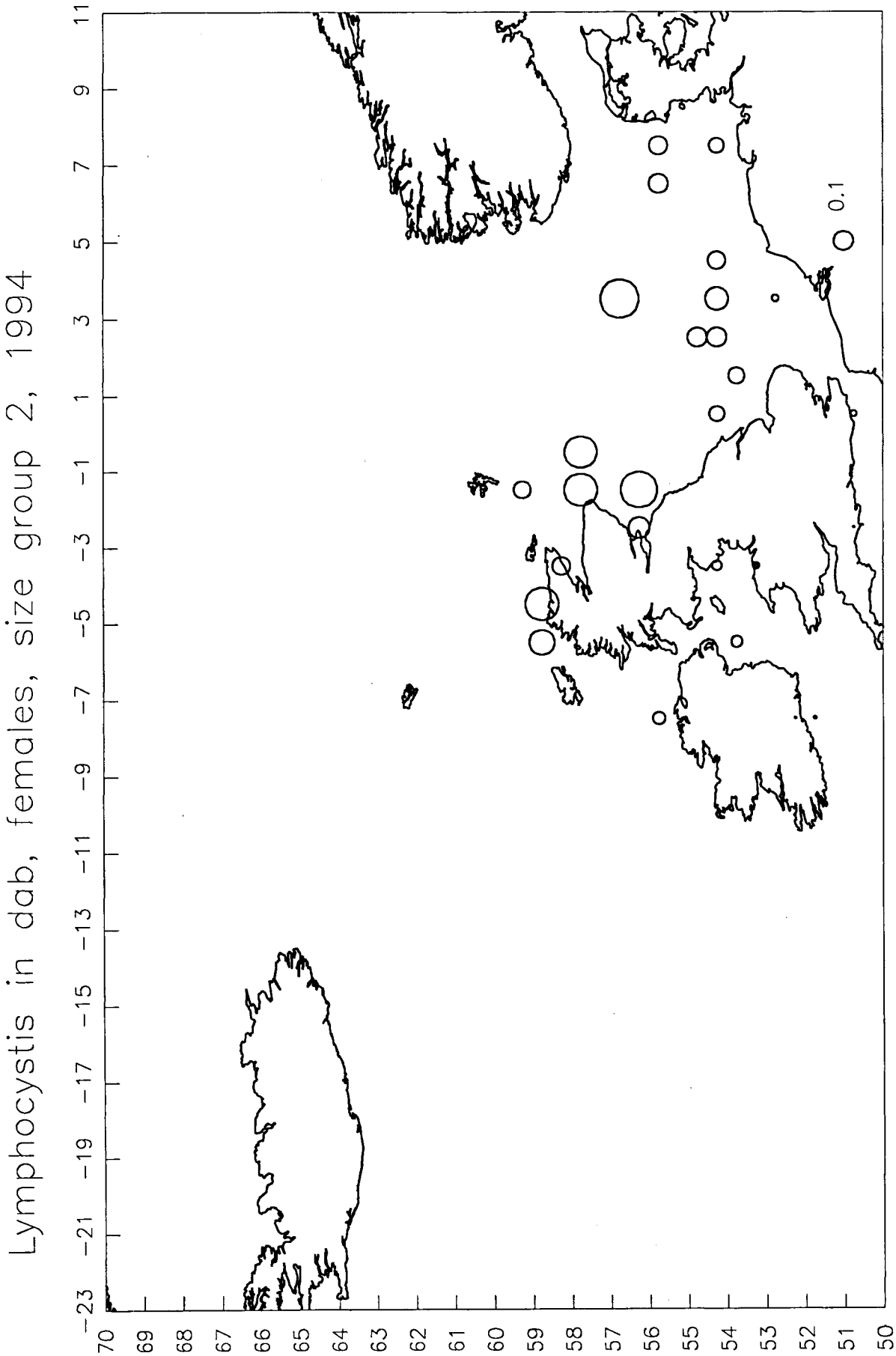


Figure 3f. Predicted prevalence of lymphocystis in medium-sized female dab in 1995.

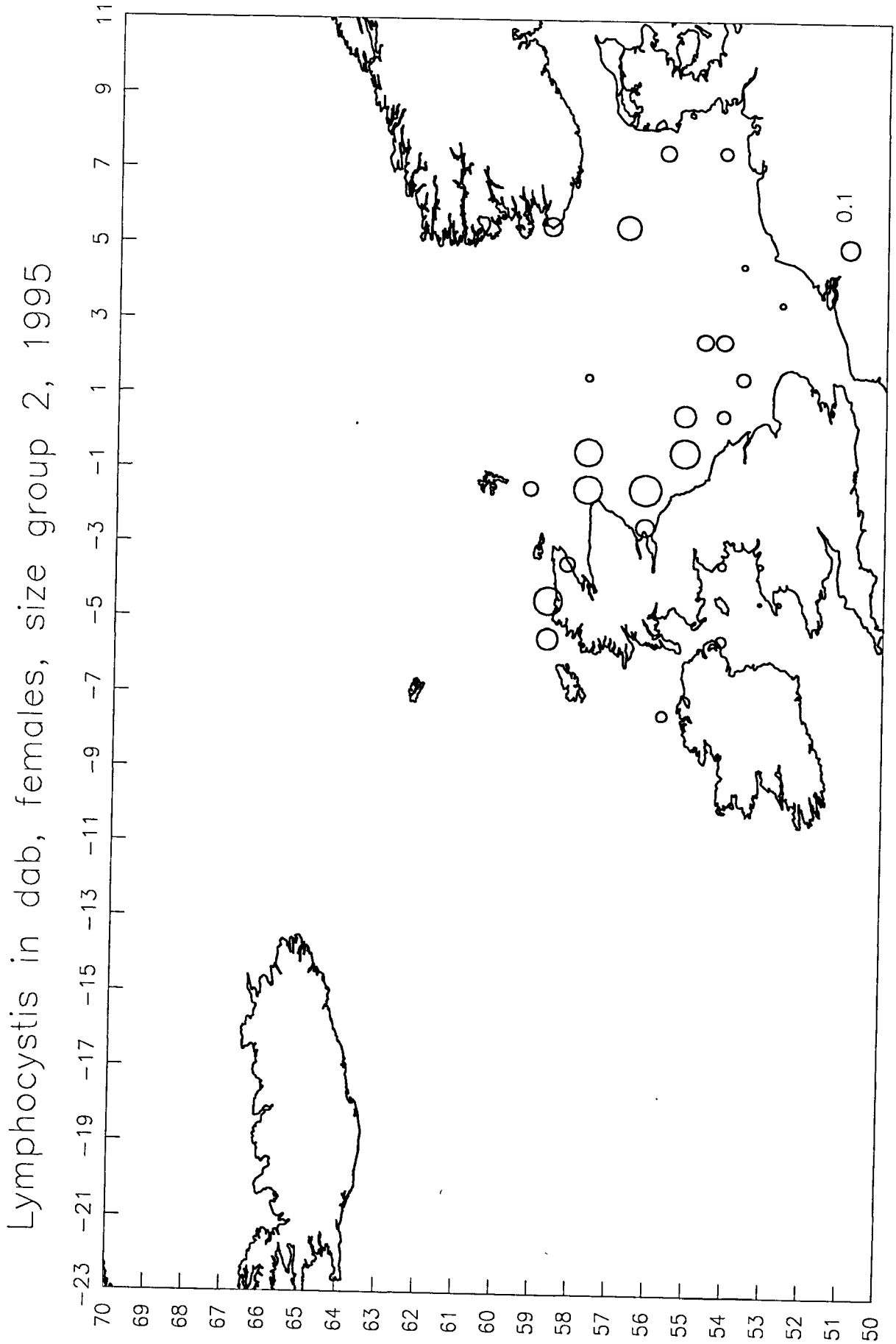


Figure 3g. Predicted prevalence of lymphocystis in medium-sized female dab in 1996.

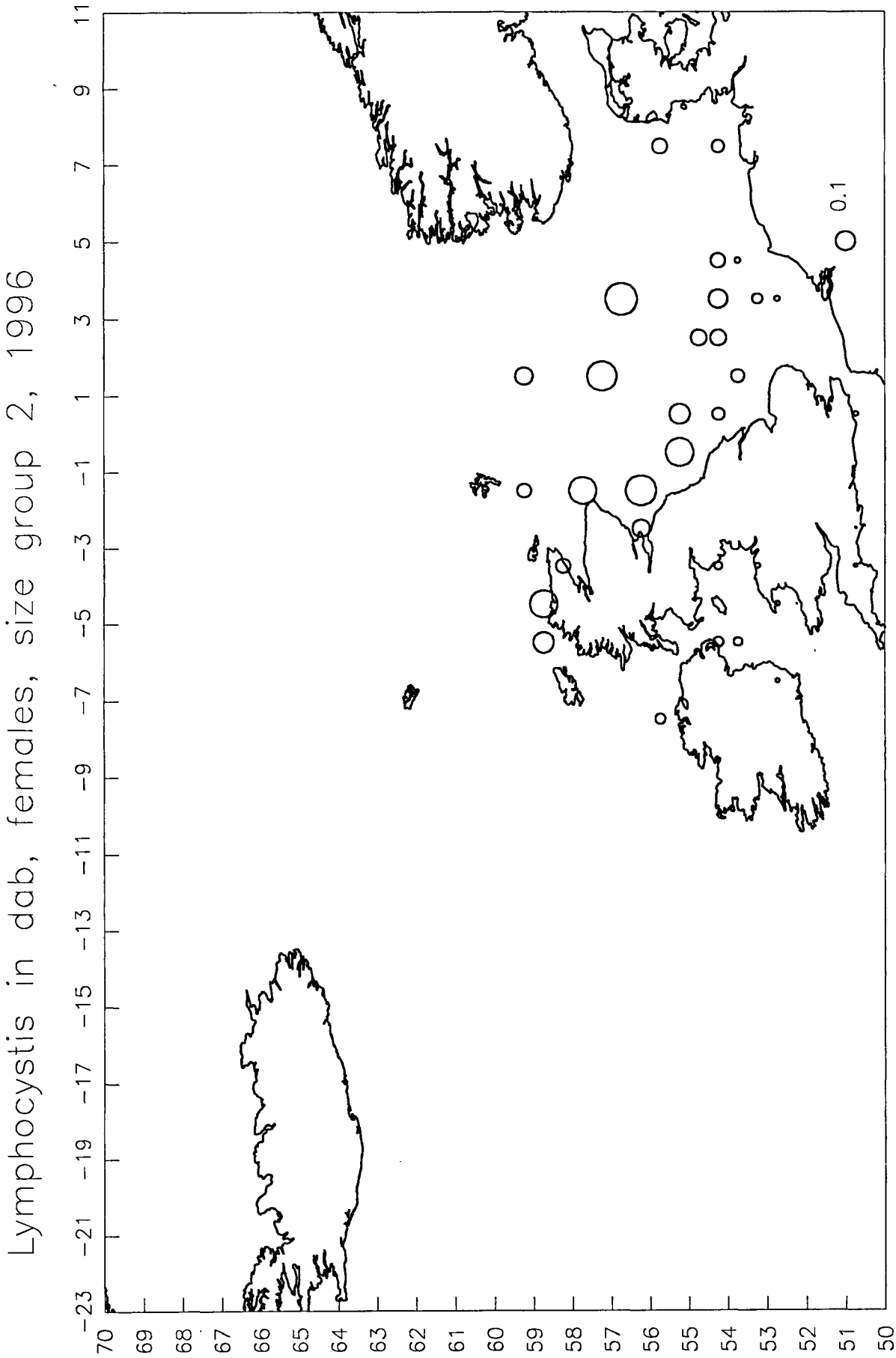


Figure 4. Temporal trend for epidermal papilloma prevalence predicted by a GLM for year + ICES rectangle + sex + size, in 28 rectangles between 1981 and 1996 for which data has been reported over eight years or more.

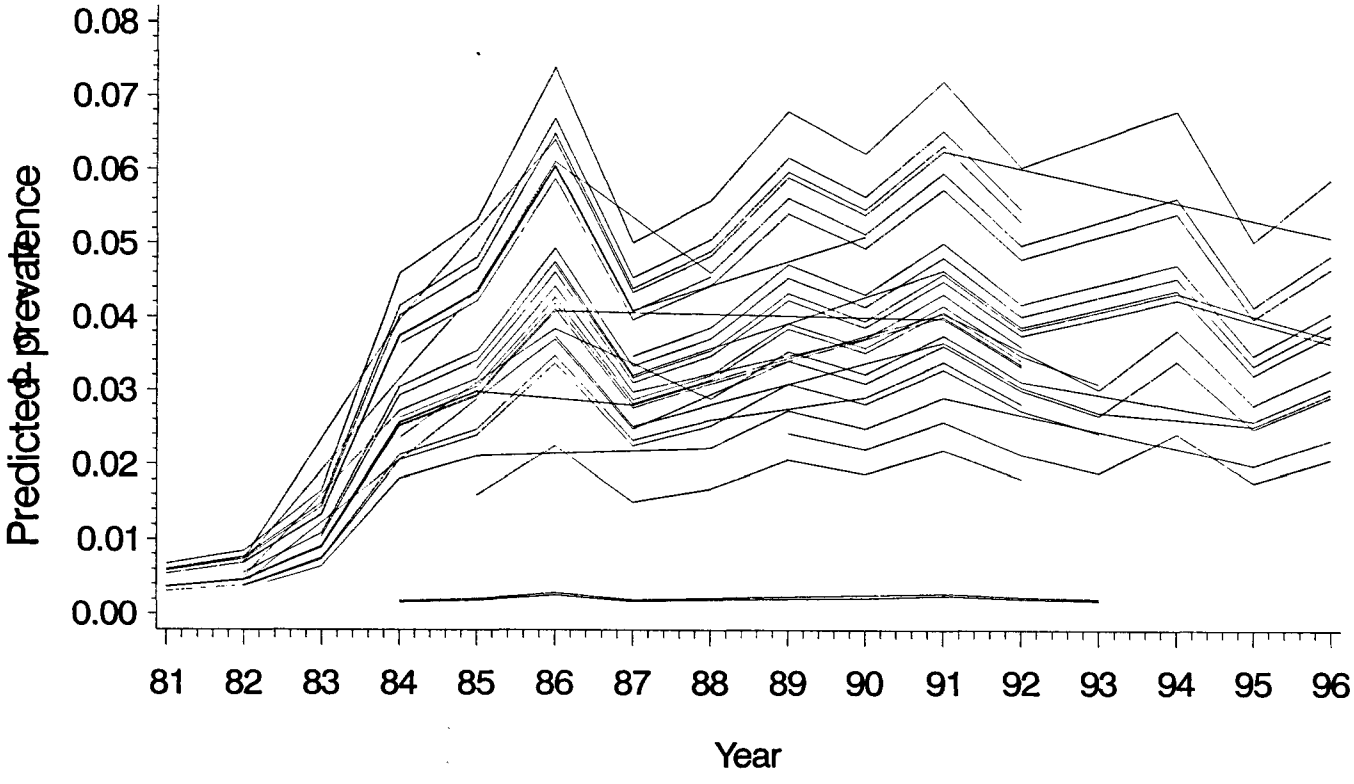


Figure 5a. Predicted prevalence of epidermal papilloma in medium-sized female dab in 1990.

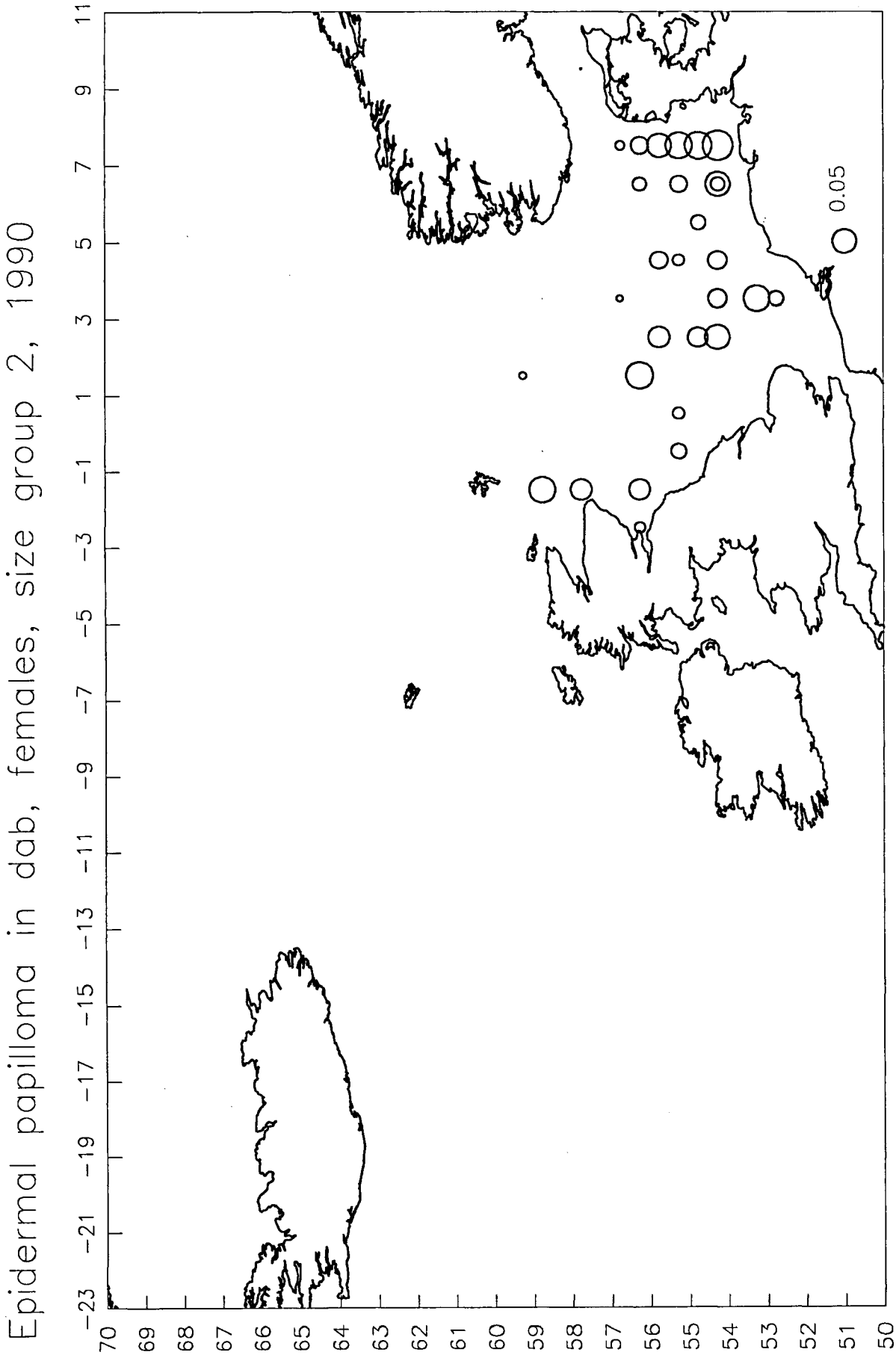


Figure 5b. Predicted prevalence of epidermal papilloma in medium-sized female dab in 1991.

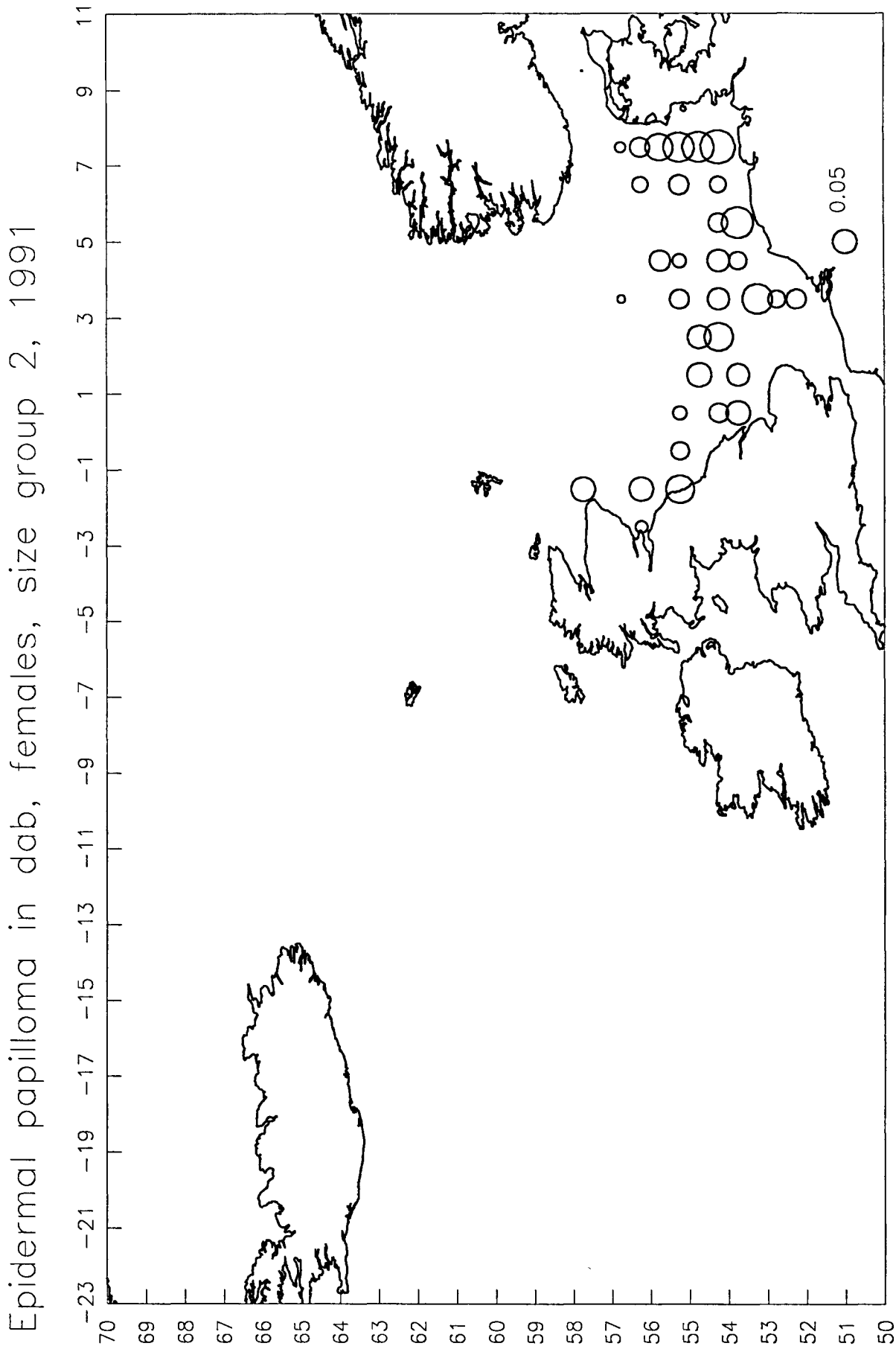


Figure 5c. Predicted prevalence of epidermal papilloma in medium-sized female dab in 1992.

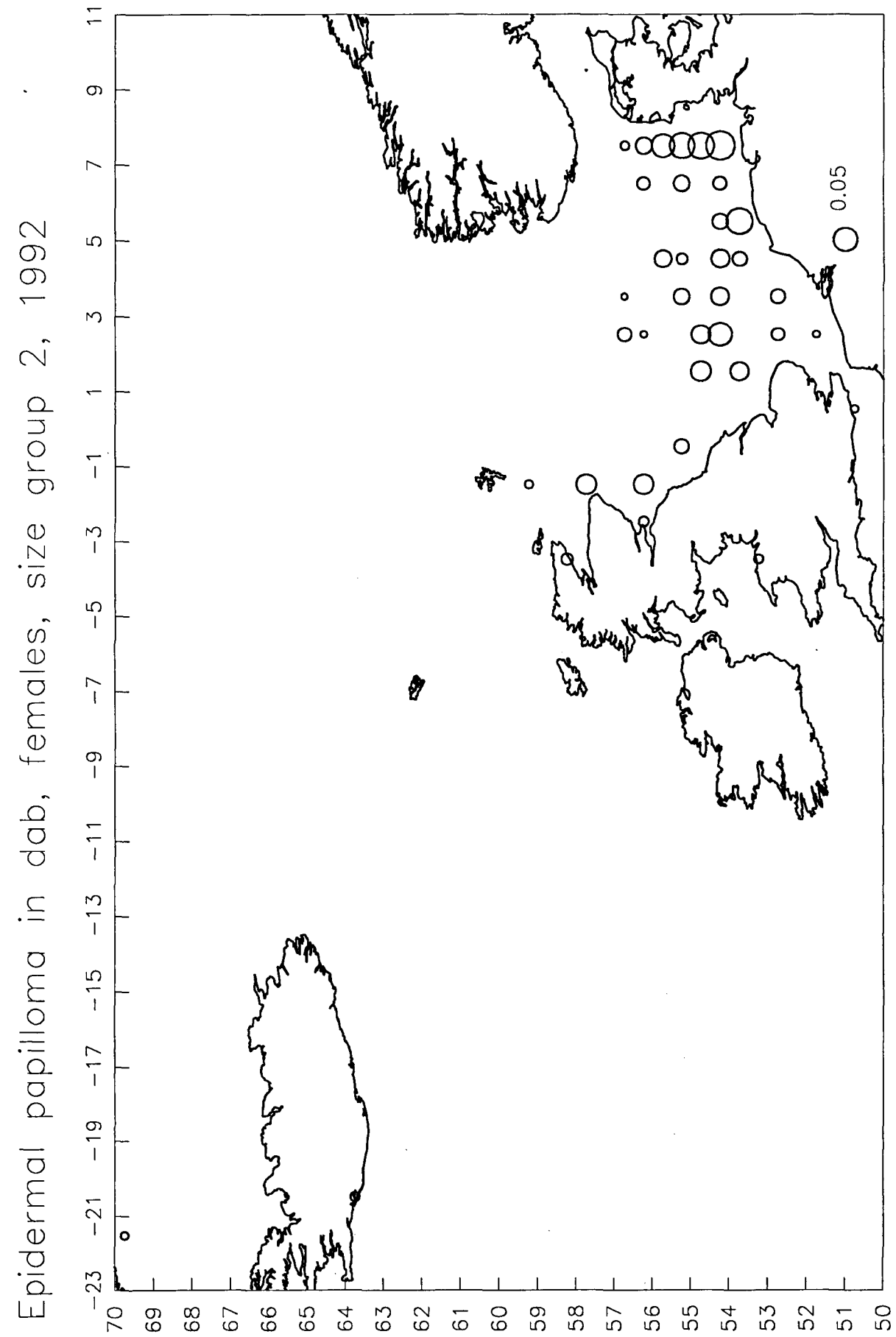


Figure 5d. Predicted prevalence of epidermal papilloma in medium-sized female dab in 1993.

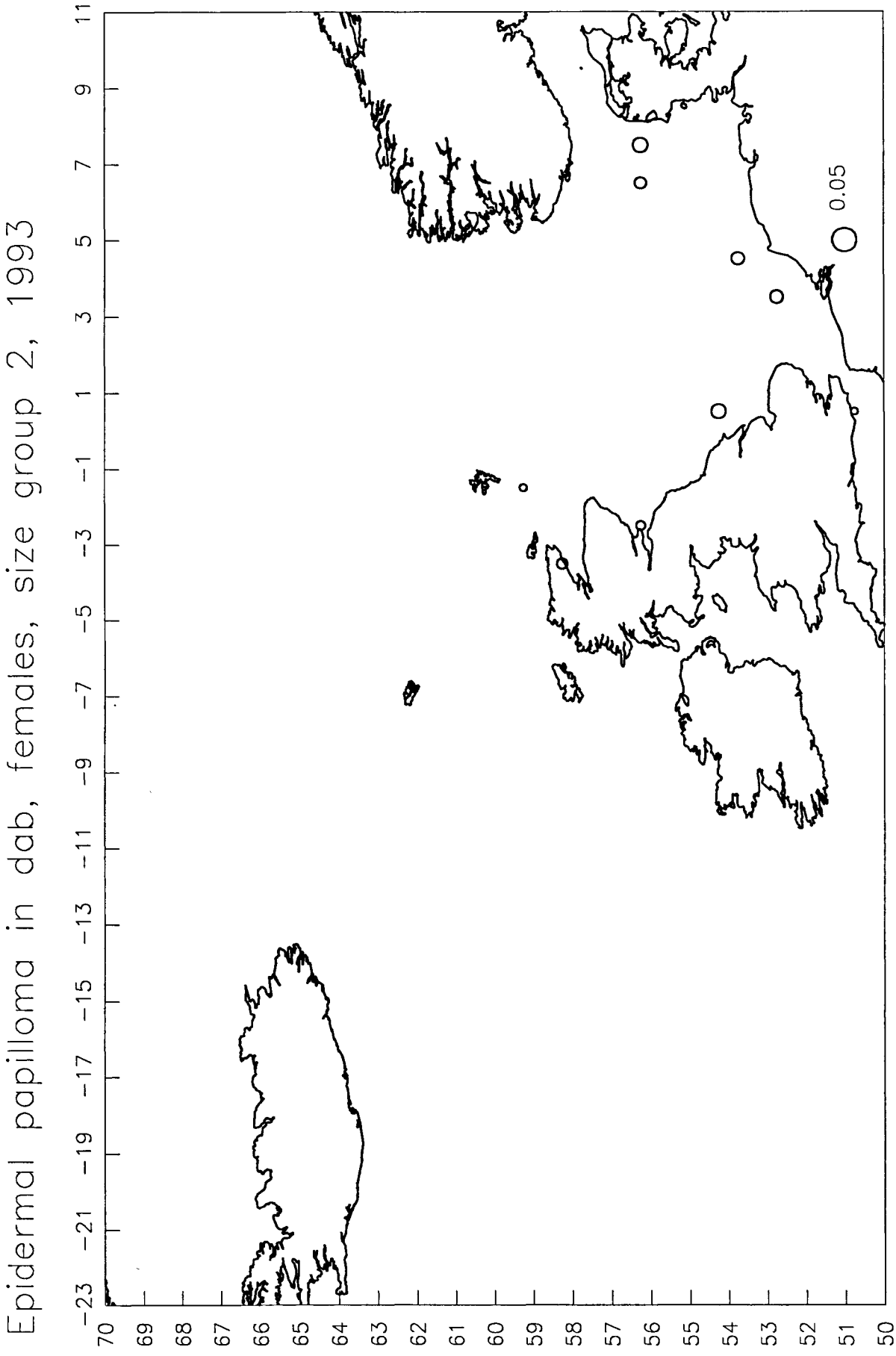


Figure 5e. Predicted prevalence of epidermal papilloma in medium-sized female dab in 1994.

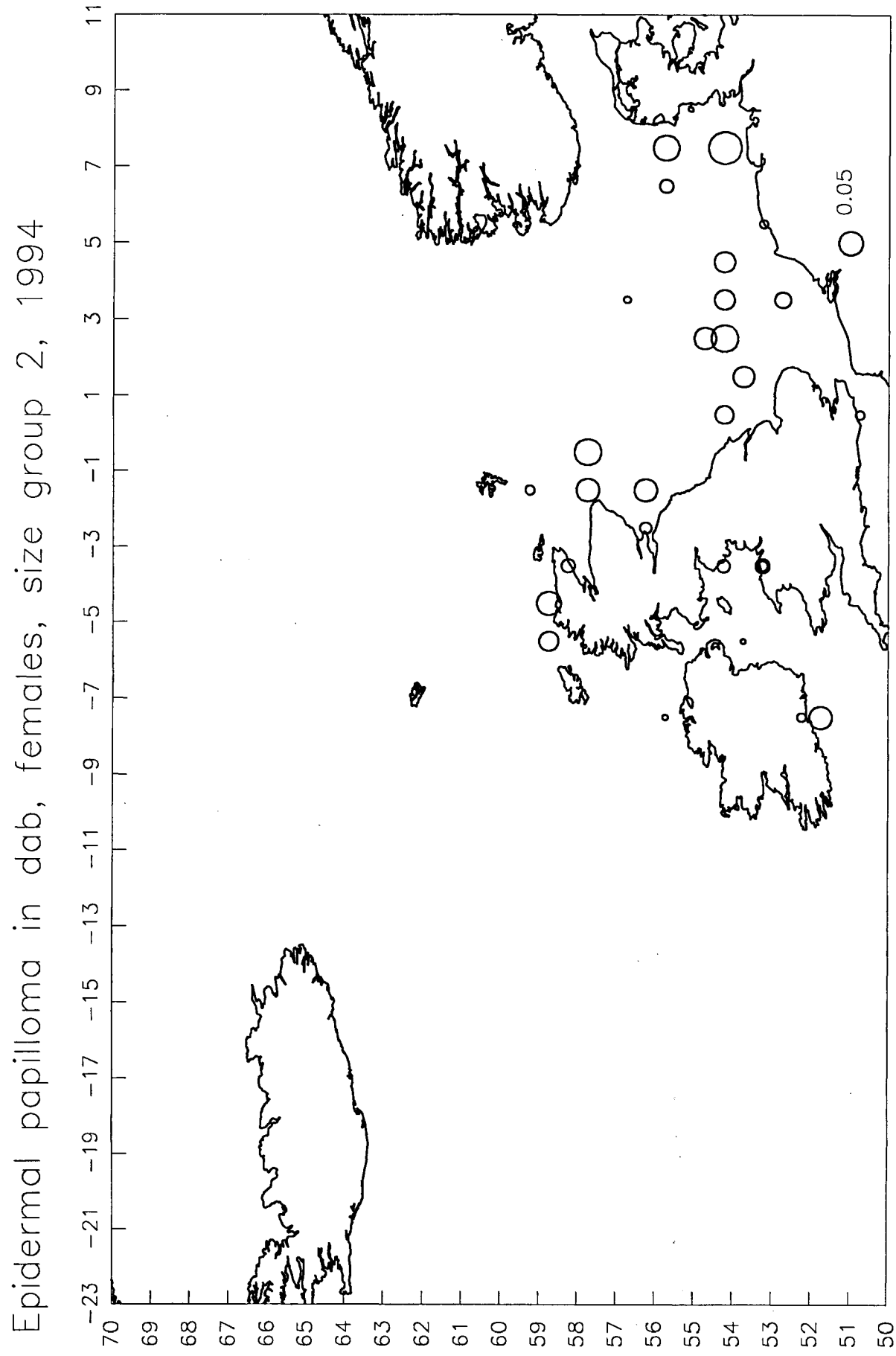


Figure 5f. Predicted prevalence of epidermal papilloma in medium-sized female dab in 1995.

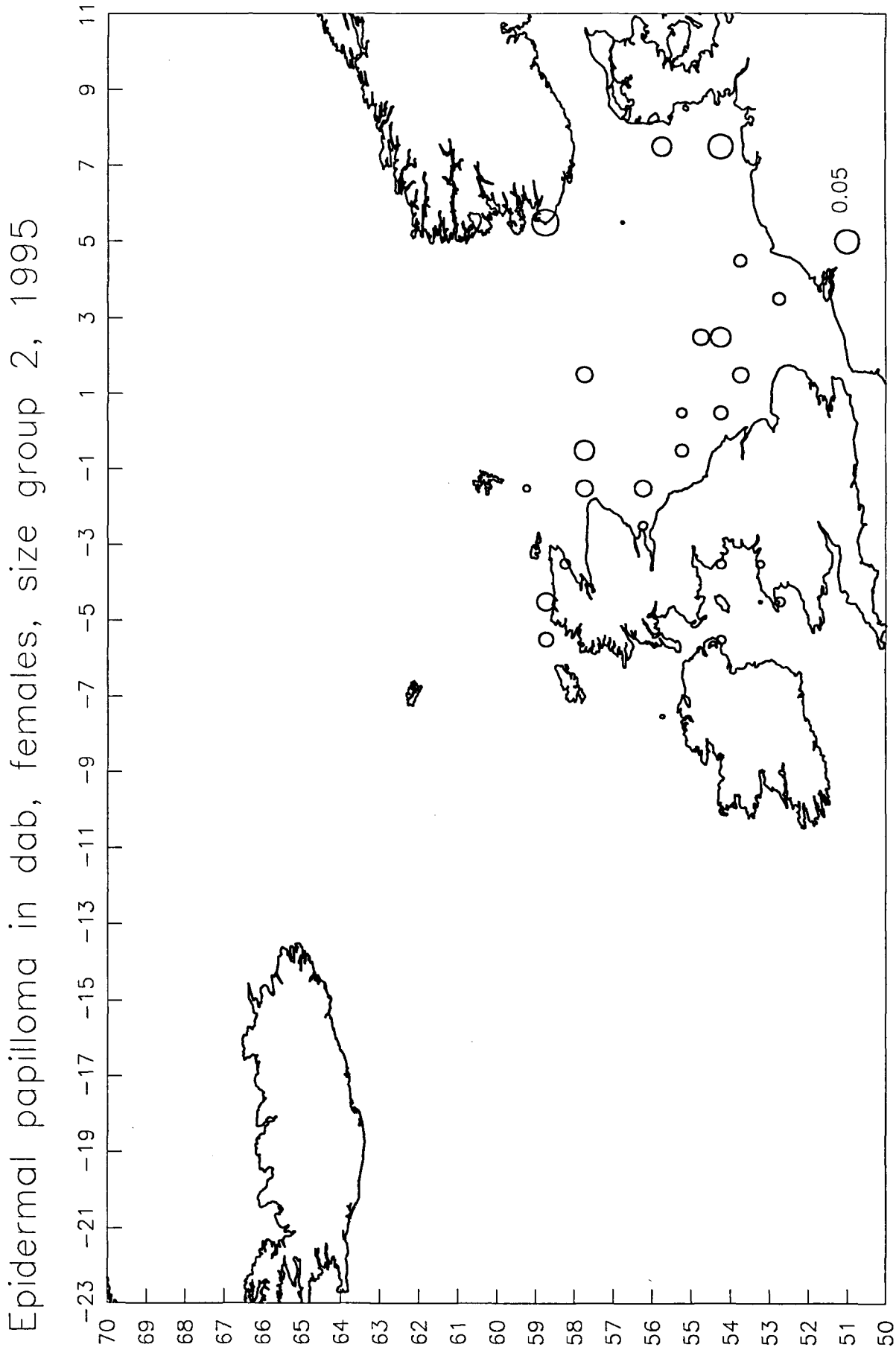


Figure 5g. Predicted prevalence of epidermal papilloma in medium-sized female dab in 1996.

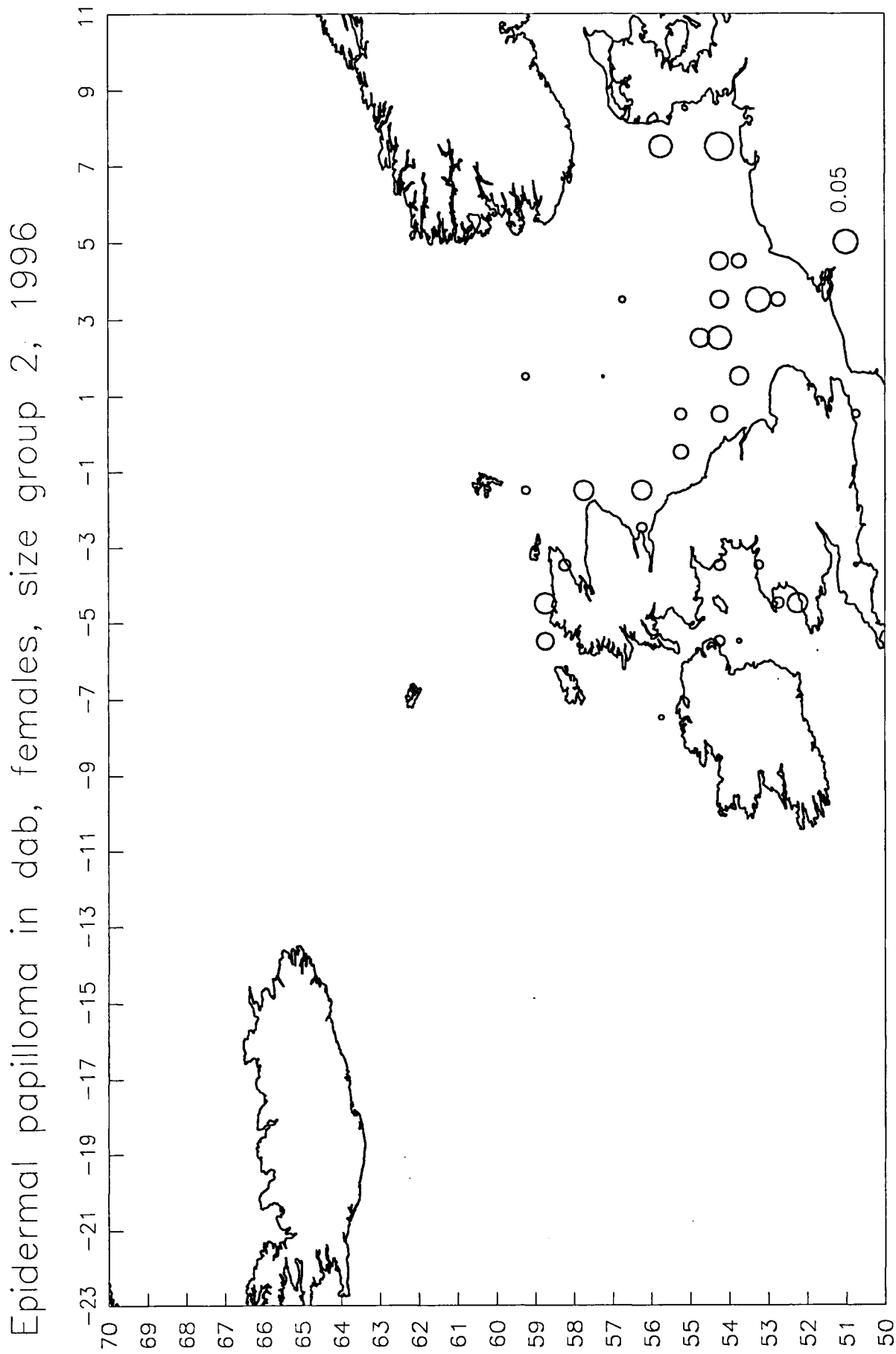


Figure 6. Temporal trend for skin ulcer prevalence predicted by a GLM for year + ICES rectangle + sex + size, in 28 rectangles between 1981 and 1996 for which data has been reported over eight years or more.

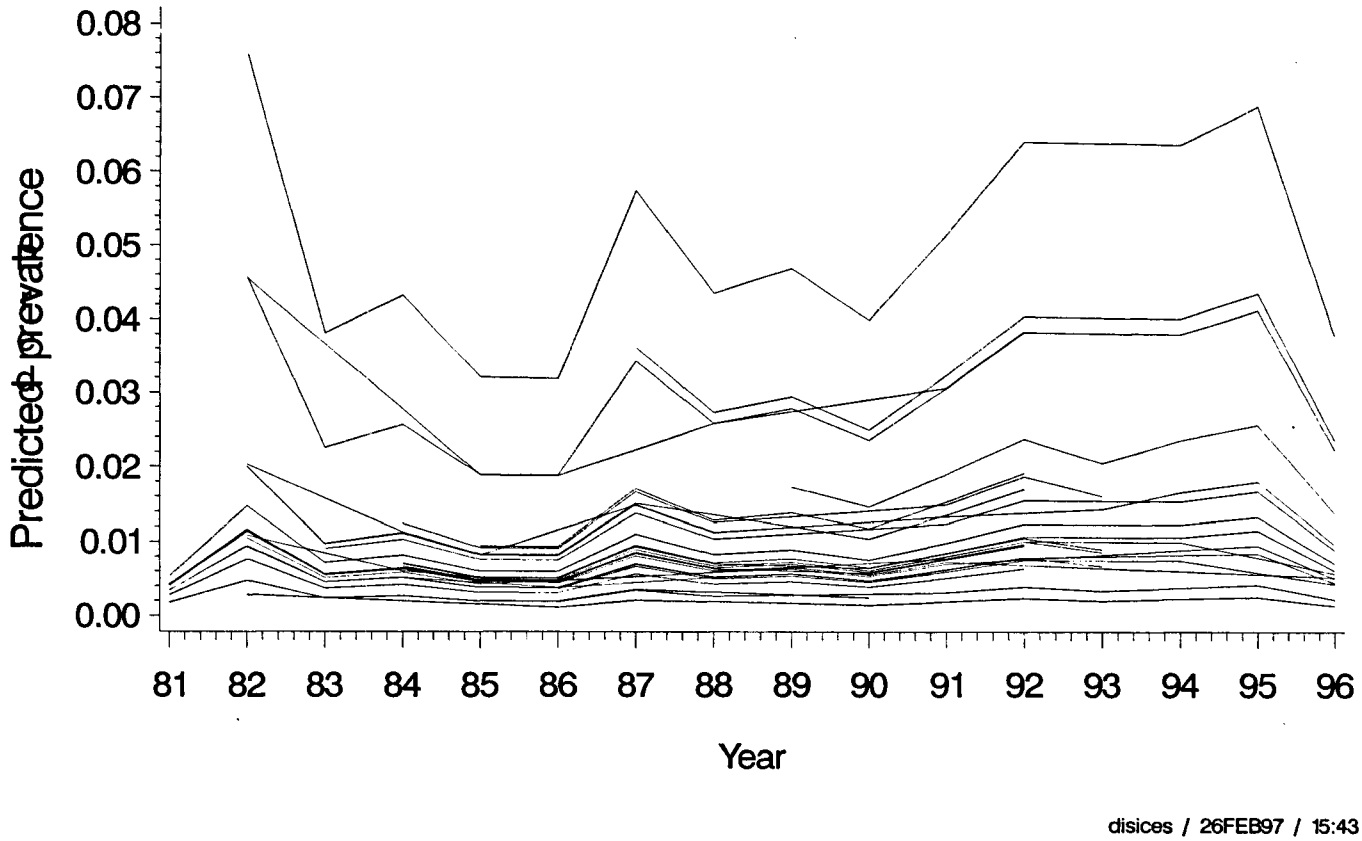


Figure 7a. Predicted prevalence of skin ulcer in medium-sized female dab between 1990.

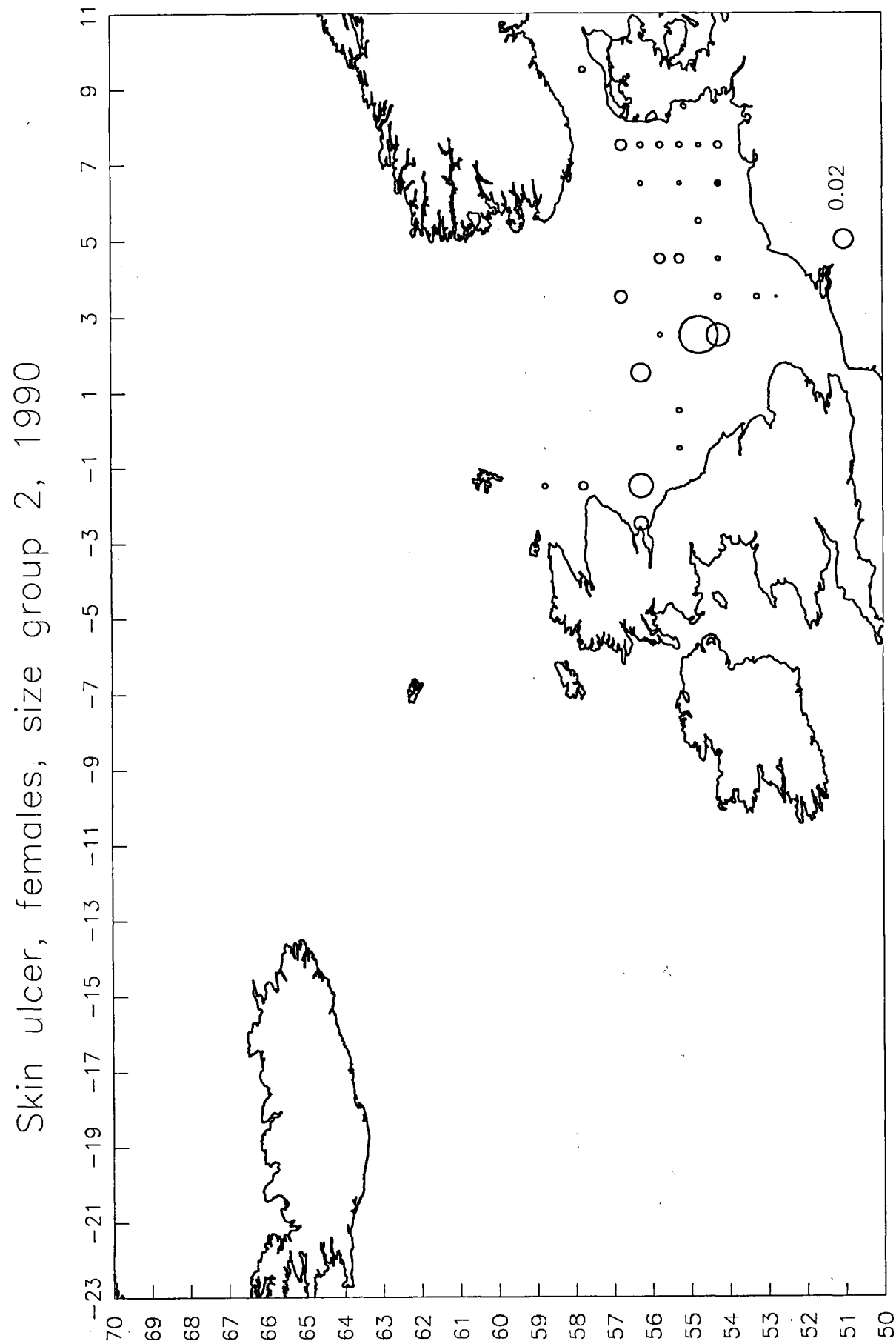


Figure 7b. Predicted prevalence of skin ulcer in medium-sized female dab between 1991.

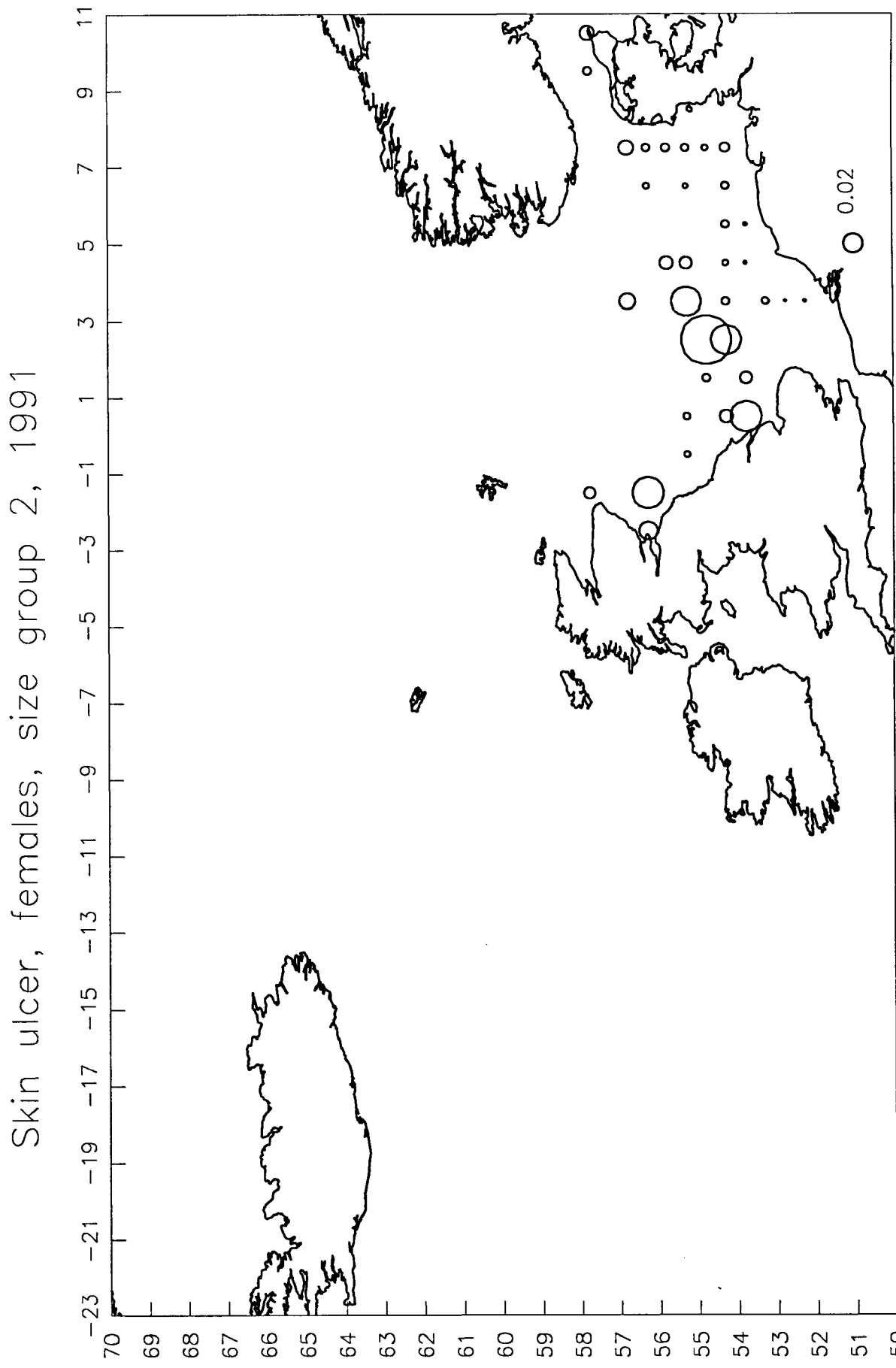


Figure 7c. Predicted prevalence of skin ulcer in medium-sized female dab between 1992.

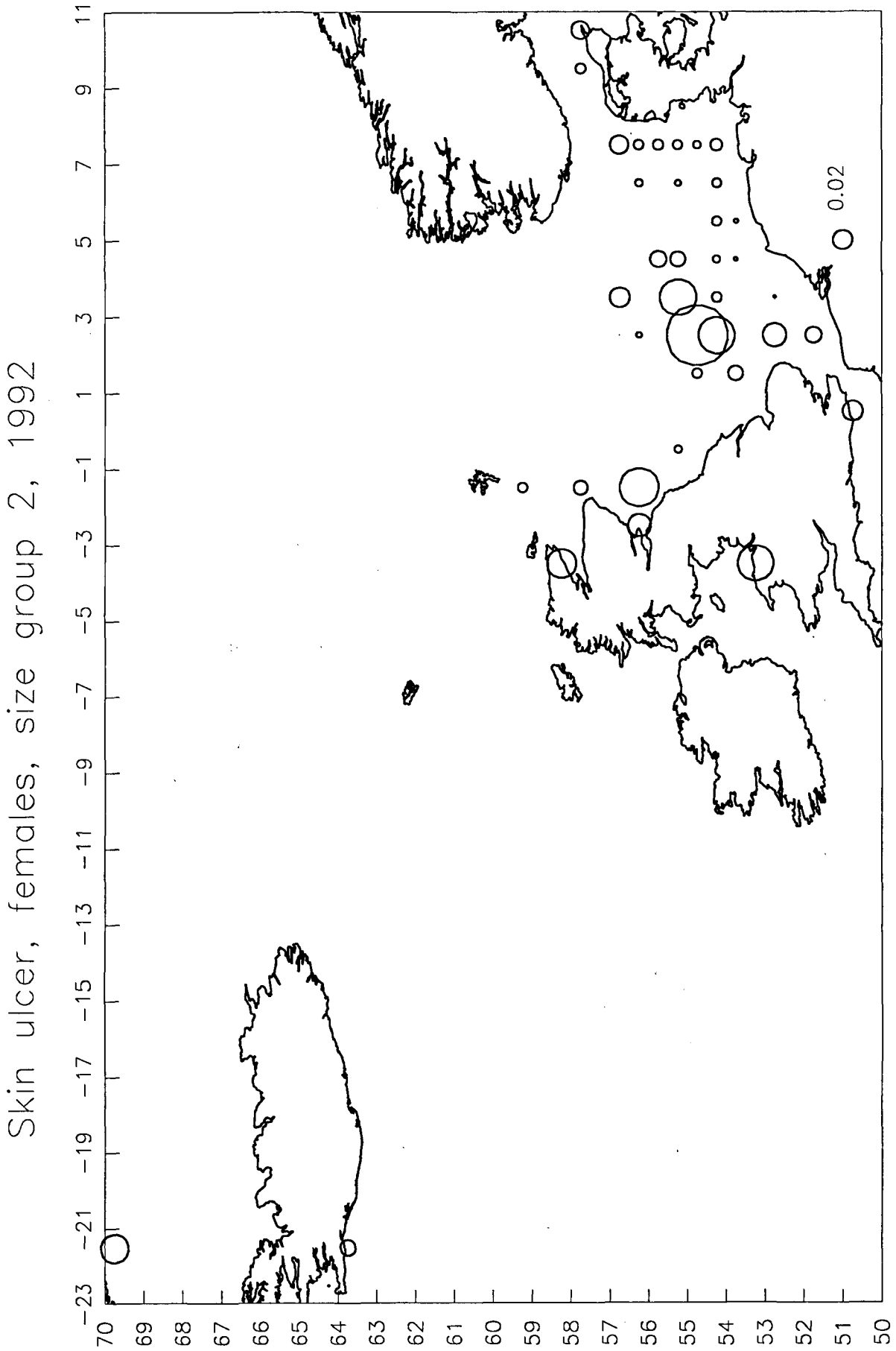


Figure 7d. Predicted prevalence of skin ulcer in medium-sized female dab between 1993.

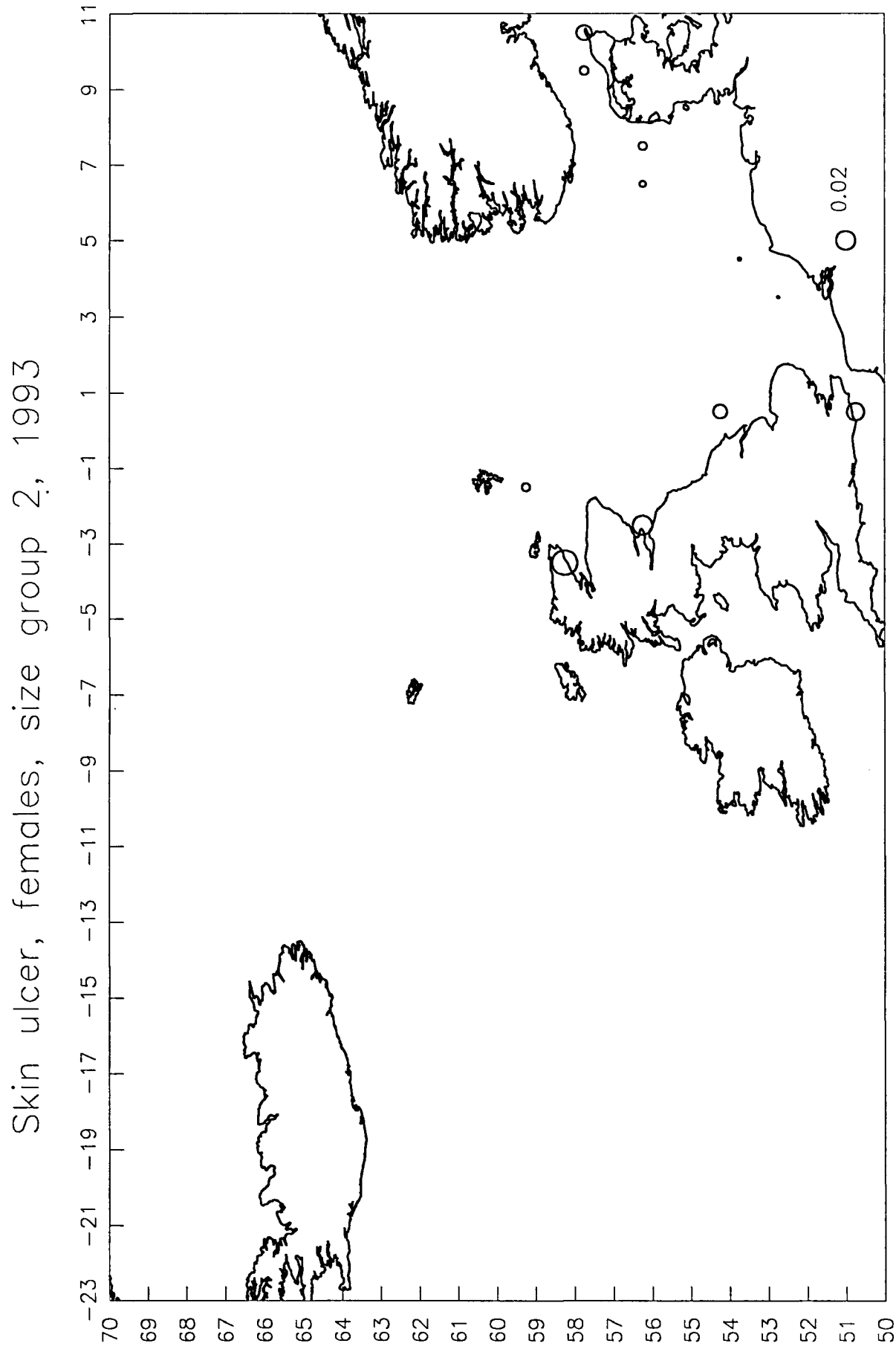


Figure 7e. Predicted prevalence of skin ulcer in medium-sized female dab between 1994.

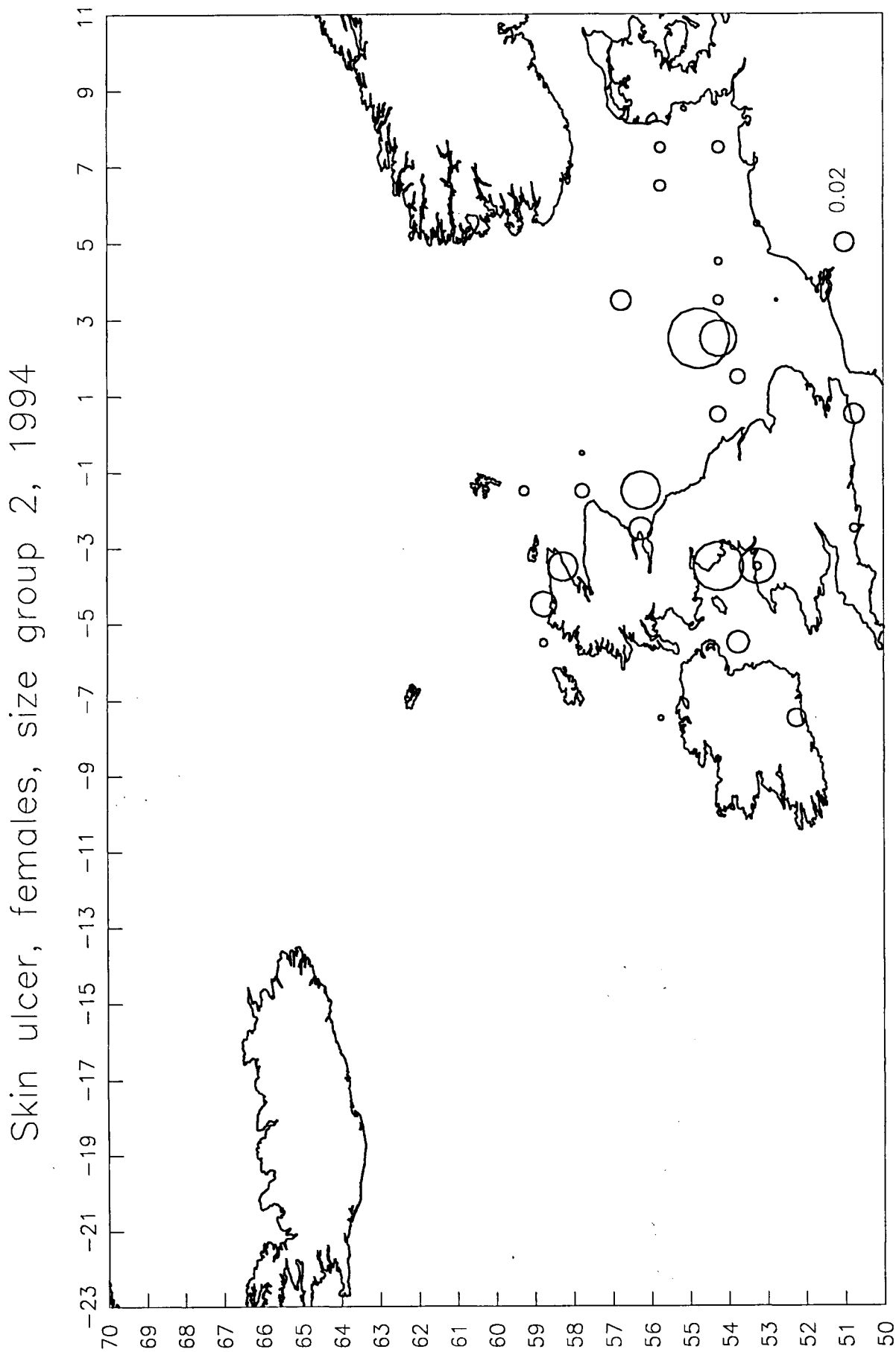


Figure 7f. Predicted prevalence of skin ulcer in medium-sized female dab between 1995.

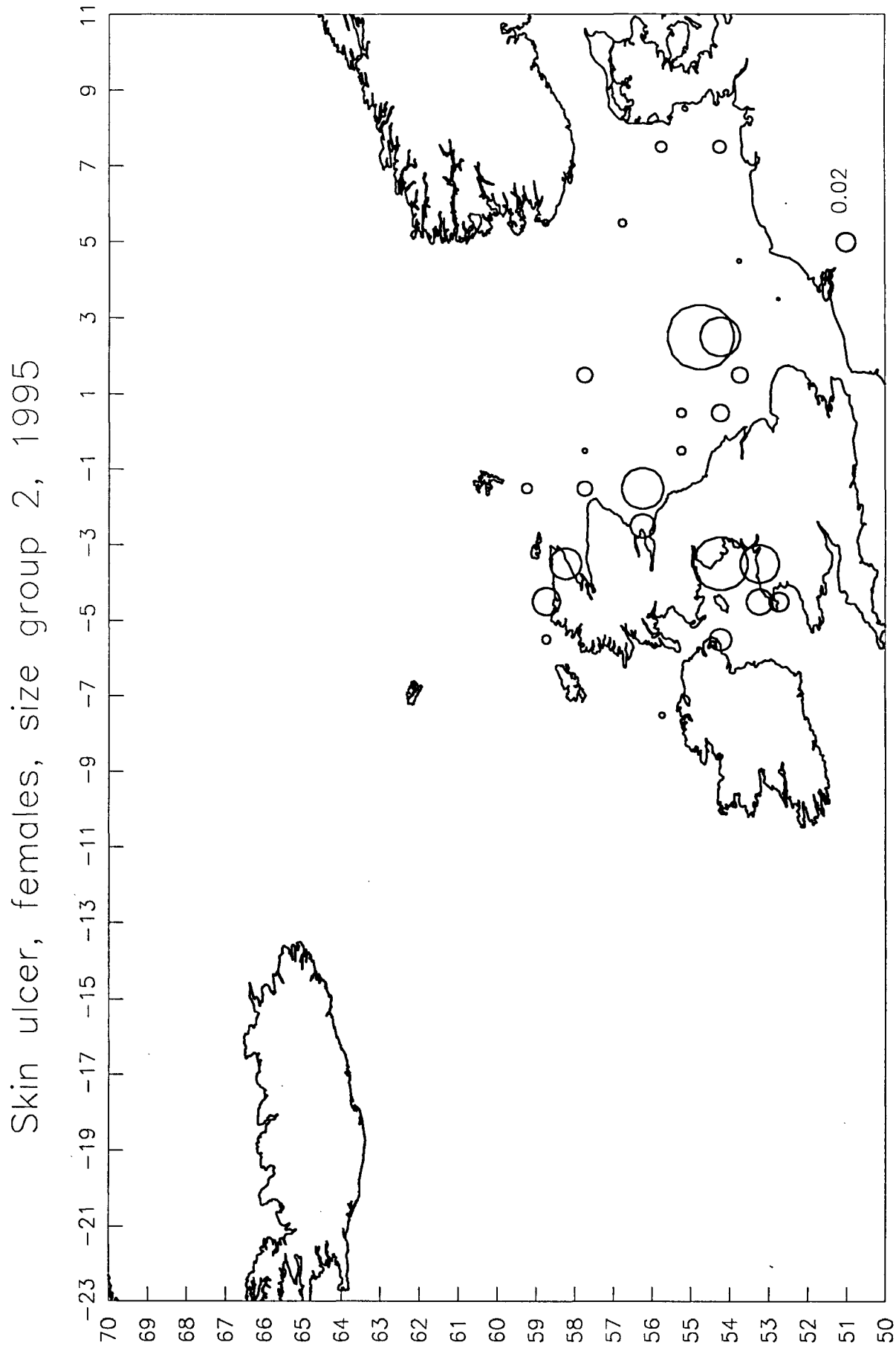
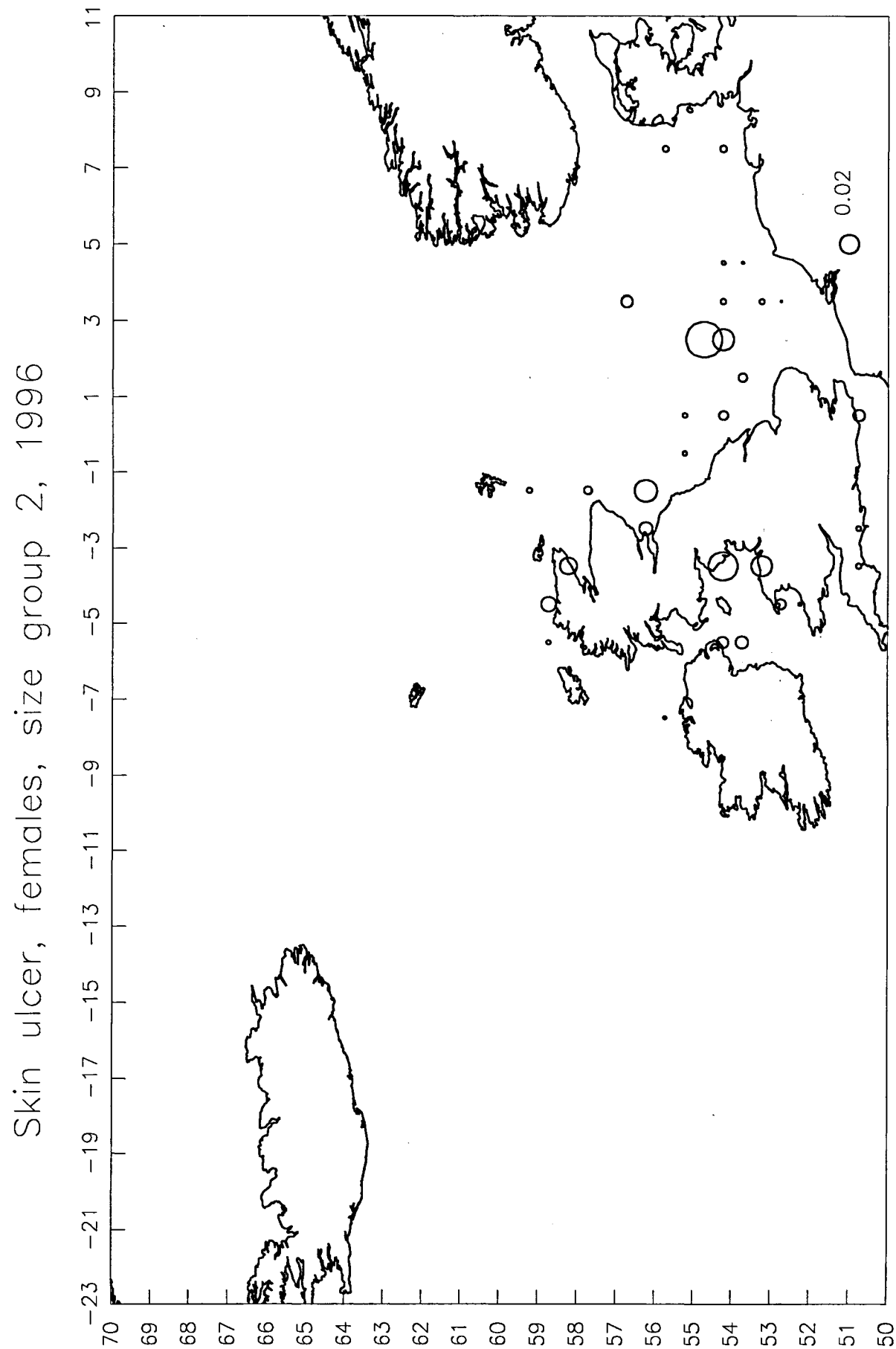


Figure 7g. Predicted prevalence of skin ulcer in medium-sized female dab between 1996.



ANNEX 1

LIST OF PARTICIPANTS

Name	Address	Telephone no.	Fax no.	E-mail
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ANNEX 2

AGENDA

Study Group On Statistical Analysis Of Fish Disease Data In Marine Fish Stocks

ICES Headquarters
6–7 February 1997

1) Opening.
2) Adoption of agenda.
3) Status of data submission.
4) Statistical analysis and data presentation.
5) Status of ongoing tasks.
6) Any other business.
7) Recommendations.
8) Adoption of report and closing.

ANNEX 3

TERMS OF REFERENCE

ICES C.Res. 1996/2:30

A **Study Group on Statistical Analysis of Fish Diseases in Marine Fish Stocks** [SGFDDS] will be established under the chairmanship of Dr A. D. Vethaak (Netherlands) and including Dr S. Mellergaard (Denmark), Dr S. des Clers (UK), Dr T. Lang (Germany) and Dr W. Wosniok (Germany) and will meet at ICES Headquarters from 6–7 February 1997 to:

a) undertake analysis of the extended Fish Disease Database in order to provide data suitable for interpretation by the Working Group on Pathology and Diseases of Marine Organisms (WGPDMO).

The Study Group will report to WGPDMO in March and to the Mariculture Committee at the 1997 Annual Science Conference.

ANNEX 4

SAS PROGRAM USED TO CALCULATE MEAN PREDICTED VALUES AND 95% CONFIDENCE INTERVALS

```
DM output 'CLEAR';       * remove old log and output;
DM log    'CLEAR';

/* ------------------------------------------------------------------------ */
/*                                                                          */
/* lymices3.sas                                                              */
/* modified version of pdmo07.sas                                           */
/* Last change: 26 Feb 97   JRL, WW                                         */
/* Purpose of programme: create overview of fish disease prevalences        */
/*                       (spatial and temporal)                             */
/*                                                                          */
/* Data base: ICES fish diseases data bank, Feb. 1997                       */
/* Target variable: lymphocystis prevalence                                 */
/* geographic units: ICES rectangles                                        */
/*                                                                          */
/* Defines quarter and size group                                           */
/* Creates inventory tables                                                 */
/* Performs logistic analyses (various versions)                            */
/* Produces prevalence estimates with confidence intervals                  */
/* Results are displayed as                                                 */
/*         - plots of temporal trends                                       */
/*         - tables with corresponding values and confidence intervals      */
/*         - maps                                                           */
/* search for REPORT in order to locate the positions in this programme,    */
/* where output for the report is produced                                  */
/*                                                                          */
/* ------------------------------------------------------------------------ */


%LET progname=lymices;

* Two options available: Create stlab according to reporting laboratories
  specifications (done in PDMO05.SAS), or create stlab equal to ICES
  statistical rectangle;

%LET gr=ices; * Could be rlab or ices;

**PTIONS DEVICE=IMGGIF GSFMODE=REPLACE NOPROMPT HSIZE=12CM VSIZE=10CM;
GOPTIONS DEVICE=XCOLOR GSFMODE=REPLACE NOPROMPT HSIZE=12CM VSIZE=10CM;

OPTIONS MPRINT SYMBOLGEN;

OPTIONS LS=70 PS=70 PAGENO=1;

FOOTNOTE "&progname..sas / &sysdate - &systime / gr = &gr";

LIBNAME saslib '/users/jrl/saslib4';

%INCLUDE "datinv1.inc";


/* ------------------------------------------------------------------------ */

%MACRO Init;

DATA temp01; SET
  saslib.dfaluk
  saslib.dfbfcg
  saslib.dfdfhu
  saslib.dfdgwn
  saslib.dfdouk;
  LENGTH ye 8.;

  IF speci='LIMA LIM';

  SELECT;
    WHEN (rlabo IN ('ALUK', 'BFCG')) DO;
      mo=SUBSTR(sdate,3,2);
      ye=SUBSTR(sdate,1,2);
    END;
    WHEN (rlabo IN ('DFHU', 'DGWN', 'DOUK')) DO;
      mo=SUBSTR(sdate,4,2);
      ye=SUBSTR(sdate,7,2);
    END;
  END;

* SELECT;
*   WHEN (mo IN ('02', '03', '04')) quart = 1;
*   WHEN (mo IN ('05', '06', '07')) quart = 2;
*   WHEN (mo IN ('08', '09', '10')) quart = 3;
*   WHEN (mo IN ('11', '12', '01')) quart = 4;
```

```
* END;

  SELECT;
    WHEN (mo IN ('01', '02', '03')) quart = 1;
    WHEN (mo IN ('04', '05', '06')) quart = 2;
    WHEN (mo IN ('07', '08', '09')) quart = 3;
    WHEN (mo IN ('10', '11', '12')) quart = 4;
  END;

  SELECT (rlabo);
    WHEN ('ALUK') DO;
      SELECT;
        WHEN ((LNMEA GE 075 AND LNMEA LE 145) OR (LNMIN GT 0 AND LNMAX LE 15))
          sizeg=1; * <<-14 ;
        WHEN ((LNMEA GE 155 AND LNMEA LE 195) OR (LNMIN GE 15 AND LNMAX LE 20))
          sizeg=2; * 15-19 ;
        WHEN ((LNMEA GE 205 AND LNMEA LE 405) OR (LNMIN GE 20 AND LNMAX LE 36))
          sizeg=3; * 20->> ;
      END;
    END;
    WHEN ('BFCG') DO;
      SELECT;
        WHEN ((LNMEA GE 155 AND LNMEA LE 195) OR (LNMIN GE 150 AND LNMAX LE 199))
          sizeg=2; * 15-19 ;
        WHEN ((LNMEA GE 205 AND LNMEA LE 425) OR (LNMIN GE 200 AND LNMAX LE 369))
          sizeg=3; * 20->> ;
      END;
    END;
    WHEN ('DFHU') DO;
      SELECT;
        WHEN (szecl GE 05 AND szecl LE 14) sizeg=1; * <<-14 ;
        WHEN (szecl GE 15 AND szecl LE 20) sizeg=2; * 15-19 ;
        WHEN (szecl GE 21 AND szecl LE 45) sizeg=3; * 20->> ;
      END;
    END;
    WHEN ('DGWN') DO;
      lymp_cys=lymp_sys;
      SELECT;
        WHEN (szecl GE 01 AND szecl LE 14) sizeg=1; * <<-14 ;
        WHEN (szecl GE 15 AND szecl LE 20) sizeg=2; * 15-19 ;
        WHEN (szecl GE 21 AND szecl LE 37) sizeg=3; * 20->> ;
      END;
    END;
    WHEN ('DOUK') DO;
      SELECT;
        WHEN (szecl GE 01 AND szecl LE 14) sizeg=1; * <<-14 ;
        WHEN ((szecl GE 15 AND szecl LE 20) OR (sizec='15-19' ))
          sizeg=2; * 15-19 ;
        WHEN ((szecl GE 21 AND szecl LE 330) OR
          sizec='20-24' OR sizec='25->>') sizeg=3; * 20->> ;
      END;
    END;
  END;

  LENGTH ch3 $1;

  lofip = INDEX(longi,'.'); * longitude first punktum;
  lon=SUBSTR(longi,1,lofip-1);
  IF SUBSTR(longi,1,1)='-' THEN lon=lon-SUBSTR(longi,lofip+1,2)/60;
  ELSE lon=lon+SUBSTR(longi,lofip+1,2)/60;
  lat=SUBSTR(latit,1,2)+SUBSTR(latit,4,2)/60;

  IF lon GE 0 THEN DO;
    dulo=INT(lon);
    ch3=BYTE(INT(dulo/10)+70);
    ch4=MOD(dulo,10);
  END;
  ELSE DO;
    dulo=INT(lon);
    ch3=BYTE(INT(dulo/10)+69);
    ch4=MOD(dulo,10)+9;
  END;
  dula=INT(2*(lat-36))+1;
  LENGTH numlon 8.;
  LENGTH numlat 8.;
  IF MOD(lat,1)>0.5 THEN numlat=lat-MOD(lat,1)+0.75; * latitude numeric;
  ELSE numlat=lat-MOD(lat,1)+0.25;
  IF lon < 0 THEN numlon=lon-MOD(lon,1)-0.5; * longitude numeric;
  ELSE numlon=lon-MOD(lon,1)+0.5;

%IF &gr=ices %THEN %DO;

  stlab=COMPRESS(dula||ch3||ch4);

%END;
/*
PROC PRINT DATA=temp01;
 VAR latit longi lat lon numlat numlon stlab;
 WHERE rlabo = 'ALUK';
*/
```

```
%MEND Init;

/* ------------------------------------------------------------------------ */

%Init;

/* ------------------------------------------------------------------------ */

%MACRO trend(position);

* Plots temporal trend at a given position;


GOPTIONS RESET=GLOBAL;

GOPTIONS DEVICE=XCOLOR
         FTEXT=SWISS
         GSFMODE=PORT
         NOROTATE
         DISPLAY
         CBACK=LTGRAY;

AXIS1 W=2 C=BLACK
      LABEL=(F=SWISS H=4.0 PCT C=BLUE)
      VALUE=(F=SWISS H=4.0 PCT C=BLUE)
      MAJOR=(W=2 H=1.0 PCT) MINOR=(W=1 H=0.50 PCT N=1)
      ORDER=81 TO 96 BY 1
      ORIGIN=(12, ) PCT
      ;                       * horizontal axis;

AXIS2 W=2 C=BLACK
      LABEL=NONE
      VALUE=(F=SWISS H=4.0 PCT C=BLUE)
      MAJOR=(W=2 H=1.0 PCT) MINOR=(W=1 H=0.50 PCT N=4)
      ORDER=0 TO 0.30 BY 0.05
      ORIGIN=(12, ) PCT
      ;                       * vertical   axis;

SYMBOL1 I=JOIN V=DOT C=RED R=1 L=1;
SYMBOL2 I=JOIN V=NONE C=BLUE R=1 L=3;


PROC GPLOT DATA=final;
     WHERE stlab = "&position"
           and sexco = "F"
           and sizeg = 2              ;
     PLOT pred  * ye = 1
          upper * ye = 2
          lower * ye = 2
          / HAXIS=AXIS1 VAXIS=AXIS2 OVERLAY;
     LABEL ye      = 'Year'
           pred    = 'Predicted Prevalence';
     NOTE H=4 PCT C=BLUE M=(3,30) PCT LANGLE=90
          F=SWISS
          "Predicted prevalence";
     TITLE1 H= 5 PCT C=GREEN F=SWISS
          "Predicted &tardis prevalences at &position";
     TITLE2 H= 5 PCT C=GREEN F=SWISS
          "(Females, size group 2)";
     FOOTNOTE H=2 PCT C=BLUE F=SWISS J=R "Version &sysdate / &systime ";

RUN;
QUIT;

%MEND trend;

/* ------------------------------------------------------------------------ */

/* ------------------------------------------------------------------------ */

%MACRO map(year);

* Plots the spatial prevalence distribution for a given year;


GOPTIONS RESET=GLOBAL;

*GOPTIONS DEVICE=XCOLOR
*         FTEXT=SWISS
*         GSFMODE=PORT
*         NOROTATE
*         DISPLAY
*         CBACK=LTGRAY;

FILENAME lymmap&year "lymmap&year..lj";

GOPTIONS DEVICE=LJIV600M
         FTEXT=SWISS
         HSIZE=18 CM
         VSIZE=13 CM
```

```
        NOROTATE
          DISPLAY
        GSFNAME=lymmap&year
        GSFMODE=REPLACE;


AXIS1 W=2 C=BLACK
      LABEL=(F=SWISS H=4.0 PCT C=BLUE)
      VALUE=(F=SWISS H=4.0 PCT C=BLUE)
      MAJOR=(W=2 H=1.0 PCT) MINOR=(W=1 H=0.50 PCT N=1)
      ORIGIN=(12, ) PCT
      ;                        * horizontal axis;

AXIS2 W=2 C=BLACK
      LABEL=NONE
      VALUE=(F=SWISS H=4.0 PCT C=BLUE)
      MAJOR=(W=2 H=1.0 PCT) MINOR=(W=1 H=0.50 PCT N=4)
      ORIGIN=(12, ) PCT
      ;                        * vertical   axis;

SYMBOL1 I=JOIN V=DOT C=RED R=1 L=1;
SYMBOL2 I=JOIN V=NONE C=BLUE R=1 L=3;


PROC GPLOT DATA=final;
     WHERE ye = &year
           and sexco = "F"
           and sizeg = 2;
     BUBBLE numlat * numlon  = pred
          / HAXIS=AXIS1 VAXIS=AXIS2 NAME="map&year";
     LABEL
           numlon  = 'ICES rectangle: Longitude';
     NOTE H=4 PCT C=BLUE M=(3,30) PCT LANGLE=90
          F=SWISS
          "ICES rectangle: Latitude";
     TITLE1 H= 5 PCT C=GREEN F=SWISS
          "Predicted &tardis prevalences in 19&year";
     TITLE2 H= 5 PCT C=GREEN F=SWISS
          "(Females, size group 2)";
     FOOTNOTE H=2 PCT C=BLUE F=SWISS J=R "Version &sysdate / &systime ";

RUN;
QUIT;

%MEND map;

/* ------------------------------------------------------------------------ */

%MACRO map2(year, sexco, sizeg);

%LET fina=%SUBSTR(&tardis,1,4)%SUBSTR(&tardis,6,3)%LOWCASE(&sexco).&year&sizeg;

DATA _NULL_; SET final;
  FILE "temp1";
  IF ye=&year AND sexco="&sexco" AND sizeg=&sizeg;
  PUT numlat ',' numlon ',' pred ',';

DATA _NULL_;
  FILE "temp2";
  PUT '51,5,0.1,0.1';

RUN;

x "cat temp? | ux2dos > /pcs/pol/person/jrl/sgfdds97/surfer/&fina";

PROC MEANS MIN MAX DATA=final;
  TITLE "&tardis.&sexco..&year.&sizeg";
  VAR numlat numlon;

/*
DATA temp03(KEEP = x y iden size); SET final;
  IF ye=&year AND sexco="&sexco" AND sizeg=&sizeg;
  x=numlon;
  y=numlat;
  iden='e';
  size=2*pred;

%CrMa(final2, &year..gif);
*/
%MEND map2;


/* ------------------------------------------------------------------------ */

%MACRO tover;

* Plots the prevalence trends,
* all stations overlaid in one plot;
```

```
GOPTIONS RESET=GLOBAL;

*GOPTIONS DEVICE=XCOLOR
*         FTEXT=SWISS
*         GSFMODE=PORT
*         NOROTATE
*         DISPLAY
*         CBACK=LTGRAY;

SYMBOL1 I=JOIN V=NONE C=BLACK R=30;

* the following plot should be included in the REPORT;
* (it is already in the draft);

FILENAME lymtover "lymtover.lj";

GOPTIONS DEVICE=LJIV600M
         FTEXT=SWISS
         HSIZE=18 CM
         VSIZE=13 CM
         NOROTATE
           DISPLAY
         GSFNAME=lymtover
         GSFMODE=REPLACE;

PROC GPLOT DATA=overlay;
     PLOT pred  * ye = ilab
          / HAXIS=AXIS1 VAXIS=AXIS2 NOLEGEND NAME='tover';
     LABEL ye       = 'Year';
     NOTE H=4 PCT C=BLUE M=(3,30) PCT LANGLE=90
          F=SWISS
          "Predicted prevalence";
     TITLE H= 5 PCT C=GREEN F=SWISS
           "Predicted &tardis prevalences";
     FOOTNOTE H=2 PCT C=BLUE F=SWISS J=R "Version &sysdate / &systime ";

RUN;
QUIT;


%MEND tover;

/* ------------------------------------------------------------------------ */


/* ------------------------------------------------------------------------ */

%MACRO HLDESC(tardis);

* Macro for high level description

* uses ...
* tardis    target disease
* sizeg     size group (1 - 3)
* ye        year
* stlab     station label (eg dk1 dk2 ...)
* sexco     sex code
* noexa     number examined
* infec     number infected / affected
;

DATA temp02;
     SET temp01(KEEP=&tardis stlab ye sizeg sexco mo quart noexa
                numlat numlon);

     infec=&tardis;

     IF quart IN(1,2) THEN season = 1;
     IF quart IN(3,4) THEN season = 2;

     IF infec NE . AND sexco NE "U";

*ROC FREQ DATA=temp02;
*    TABLES stlab ye sizeg sexco mo season;
*    WEIGHT noexa;
*    TITLE "Margin sums disease=&tardis";

*ROC TABULATE DATA=temp02;
*    CLASS stlab ye season sizeg sexco;
*    VAR noexa infec;
*    TABLE ye*season*stlab*sexco*sizeg,
*          (noexa*F=6. infec*F=6.)
*          / RTSPACE= 50;
*    TITLE "Raw data for disease &tardis";

PROC SORT DATA=temp02;
     BY stlab ye sizeg sexco;

* find intensity of visits at stations;
```

```
PROC SORT DATA=temp02 OUT=stlist NODUPKEY;
     BY stlab ye;

DATA stlist;
     ARRAY yea(*) y81-y96;
     RETAIN y81-y96 novisits;

     SET stlist;
     BY stlab;

     IF FIRST.stlab THEN DO;
       DO i = 1 TO 16;
         yea(i) = .;
         novisits = 0;
       END;
     END;

     yea(ye-80) = 1;
     novisits = novisits + 1;

     IF LAST.stlab THEN DO;
       DROP i;
       OUTPUT;
     END;

PROC SORT DATA=stlist;
     BY DESCENDING novisits stlab;

PROC PRINT DATA=stlist;
     var stlab y81-y96 novisits;
     TITLE 'Years in which stations where visited';

PROC SORT DATA=temp02 OUT=ymlist NODUPKEY;
     BY ye mo  stlab;

PROC FREQ DATA=ymlist;
     TABLE ye*mo / NOCOL NOROW NOPERCENT;
     TITLE 'No of stations per year and month';

PROC MEANS DATA=temp02 NOPRINT;
     WHERE quart IN(1,2);          * quarters thrown away;
     VAR noexa infec;
     ID numlat numlon;
     BY stlab ye sizeg sexco;
     OUTPUT OUT=rawlist SUM=noexa infec;

PROC SORT DATA=stlist;
     BY stlab;

DATA rawlist;
     MERGE rawlist stlist (KEEP=stlab novisits);
     BY stlab;

PROC PRINT DATA=rawlist;
     WHERE noexa le 0 OR infec > noexa;
    VAR stlab ye sizeg sexco noexa infec;
     TITLE 'Raw data for logistic analysis- strange cases only';

DATA rawlist;
     SET rawlist;
     cellno = _N_;     * is later needed as merging key;

DATA raw9096;
     SET rawlist;
     IF ye GE 90;

DATA raw9096;
     SET raw9096;
     cellno = _N_;     * is later needed as merging key;

* Note: This is the production version of the programme.
  The decision about what model terms to include has been
  made on the basis of the subset raw9096.
  Now the whole data set is used to guarantee that statements
  concerning temporal trend displays and spatial maps are coherent.
  To this end, the final model is fitted to the whole data set,
  and for the displays the relevant parts are extracted.
;

PROC GENMOD DATA=rawlist;
     CLASS stlab ye sexco sizeg;
     MODEL infec / noexa = stlab
                           ye
                           sexco
                           sizeg
           / ERROR=BINOMIAL LINK=LOGIT
             OBSTATS;
     MAKE "obstats" OUT=final;
     TITLE 'LOGIT Model: all main effects (the final model)';
```

```
     TITLE2 'Data: only Q1 and Q2';

DATA final;
     SET final;
     cellno = _N_;     *  merging key;

DATA final;
     MERGE final rawlist;     * to add descriptive variables;
     BY cellno;               * this file is to be used to generate maps;

PROC PRINT DATA=final;
     WHERE               sexco = "F" AND sizeg = 2;
     VAR stlab ye       sexco sizeg noexa infec pred upper lower;
     TITLE "Predicted &tardis prevalences in display subset of data";

RUN;

PROC GREPLAY IGOUT=work.gseg NOFS;  * kill all old plots;
     DELETE _ALL_;
RUN;

                              * produce the maps;
                              * for the REPORT;
* %MAP(90);
* %MAP(91);
* %MAP(92);
* %MAP(93);
* %MAP(94);
* %MAP(95);
* %MAP(96);

%MAP2(90,F,2);
%MAP2(91,F,2);
%MAP2(92,F,2);
%MAP2(93,F,2);
%MAP2(94,F,2);
%MAP2(95,F,2);
%MAP2(96,F,2);

* produce trend plots for single stations (those with at least 8 visits);
* These plots were used only during the Subgroup meeting, they are not to
* be included in the final report. Instead, an overlay plot containing
* all rectangles together is used -- cf %TOVER ;

* %TREND(37F7);
* %TREND(38F2);
* %TREND(34F3);
* %TREND(37F0);
* %TREND(37F2);
* %TREND(38F7);
* %TREND(39F6);
* %TREND(39F7);
* %TREND(40F7);
* %TREND(41F6);
* %TREND(35F3);
* %TREND(36F1);
* %TREND(37F6);
* %TREND(37F3);
* %TREND(39F0);
* %TREND(41F7);
* %TREND(37F4);
* %TREND(39E9);
* %TREND(39F3);
* %TREND(41E8);
* %TREND(44F9);
* %TREND(36F4);
* %TREND(37F1);
* %TREND(37F5);
* %TREND(38F6);
* %TREND(40F4);
* %TREND(41E7);
* %TREND(42F7);
* %TREND(44G0);


/* -- Finally produce an overlay plot for trends ----- */
/* -- This is intended to be included in the REPORT, - */
/* -- together with the corresponding table with C.I.s */

DATA overlay;
     ARRAY y{*} y1-y29;
     RETAIN y1-y29 ilab 0;

     SET final;
     BY stlab;

     IF FIRST.stlab THEN DO;
       ilab = ilab + 1;
     END;
     KEEP pred ye ilab stlab upper lower;
```

```
     IF sexco = "F" AND sizeg = 2 AND novisits GE 8 THEN OUTPUT;

PROC TABULATE DATA=overlay;      * This table should be included in the ;
     CLASS stlab ye;             * REPORT;
     VAR pred upper lower;
     TABLE stlab,
           ye*(pred*F=5.3 upper*F=5.3 lower*F=5.3);
     TITLE "Predicted values and confidence limits for &tardis prevalence";

RUN;

*%TOVER;          * produce plot;


/* -- NOTE: the following analyses are for model checking only -- */


PROC GENMOD DATA=raw9096;
     CLASS stlab ye        sexco sizeg;
     MODEL infec / noexa = stlab stlab*ye
                           ye
                           sexco
                           sizeg
           / ERROR=BINOMIAL LINK=LOGIT;
     TITLE 'LOGIT Model 2: all main effects+stlab*ye';
    TITLE2 'Data: only Q1 and Q2,years 90-96';

RUN;

%MEND hldesc;

*  %HLDESC(acan_tho);
*  %HLDESC(clav_ell);
*  %HLDESC(cryp_cot);
*  %HLDESC(epid_pap);
*  %HLDESC(glug_ste);
*  %HLDESC(icht_spp);
*  %HLDESC(lepe_oph);
*  %HLDESC(lern_aeo);
*  %HLDESC(live_nod);
   %HLDESC(lymp_cys);
*  %HLDESC(pseu_tum);
*  %HLDESC(skel_def);
*  %HLDESC(skin_ulc);
*  %HLDESC(step_sto);
*  %HLDESC(visc_gra);
*  %HLDESC(xgil_les);
```