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Report to the Herring Committee on Mechanical Processing of Herring Data

by

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Summary

At the Herring Committee meeting 1961 is was recommended that the present use of mechanical data processing be reviewed with reference to the possibilities of international coordination of systems.

As it turned out, already Denmark, Germany and Norway make use of mechanical data processing and the amount of material so treated makes any changes of codes or adoption of new systems rather inconvenient.

The use of the different codes or systems does not, however, exclude all possibilities of a combined treatment of punch card materials from different laboratories. At comparatively low costs the different designs may be reproduced in a common form possibly programated with higher level processing (i.e. electronic computers) in view. The most serious obstacle seems to be the differences in subdivisions of fishing areas into statistical rectangles and the different enumeration of these.

As an aid to herring workers planning the introduction of MDP we thought it useful to include in this report all information received concerning the general design of punch cards and the codes in current use.

The present situation

In order to obtain information on present or contemplated future use of MDP a questionaire was circulated to member countries, asking particulars concerning systems, codes etc. According to the answers received the present situation is as follows:

Belgium: No plans of adopting MDP in near future.

Denmark: IBM system in use. Recent material punched. Older material - back to 1951 - is being transferred to punch cards.

Finland: Has planned the introduction of the IBM system. Program worked out, but actual punching not started as yet.

Germany: IBM system in use. All post war material punched.

Iceland: Marginal punch cards in current use. No plans of adopting MDP in near future.

Netherlands: Contemplates the use of MDP. Not reached the planning stage. The IBM system most likely to be adopted.

Norway: IBM in use. All biological material collected since 1942 is punched. Older material - at least back to 1932 - will be transferred to punch cards as fast as present work allows. Also data on recovered herring from the Icelandic-Norwegian tagging experiments, initiated in 1948, have been transferred to IBM punch cards (abt. 20.000 cards).

Scotland: MDP to be introduced in nearest future. Starting with 1962 and going back all herring biological data will be punched. System: 60-columns "Power Samas" but likely to be exchanged with 80-columns ICT in 2-3 years time. Planning almost completed.

Sweden: No plans of adopting MDP in near future.

So, at present, 3 countries are already using mechanical data processing, 2 countries are on the verge of introducing it, while one country is contemplating the possibility. With one exception IBM is the commonly adopted system and the following notes refer to the IBM punch card and equipment.

The punch card design.

The great merits of mechanical data processing are the ease and speed with which a comprehensive material can be sorted out according to the characters and data involved and the possibility of making use of electronic computers for such time consuming tasks as analysis of variance and regression.

A few remarks concerning the punch card itself may be appropriate. As shown by the attached specimen the IBM card has 80 columns in which punching may take place. In each column are twelve punching positions of which "11" and "12" are situated in the blank space at the upper part of the card, "12" being the uppermost position of the column. Digits are recorded by punching a single hole in the corresponding position in the column desired and usually the card is printed so as to make each item of information ("field" or "word") readily identifiable. In the sorting machine one column at the time is sorted into the respective digits and by counting works the number of occurrences of each digit in a stack of cards is immediately obtained.

For most routine work only the sorting out of the material will be needed and in designing the punch card one will be interested in including as many data as possible. This principle is illustrated by the lay out of the Danish, Finnish, Norwegian and Scottish punch cards as shown in tables 1, 3, 6-7.

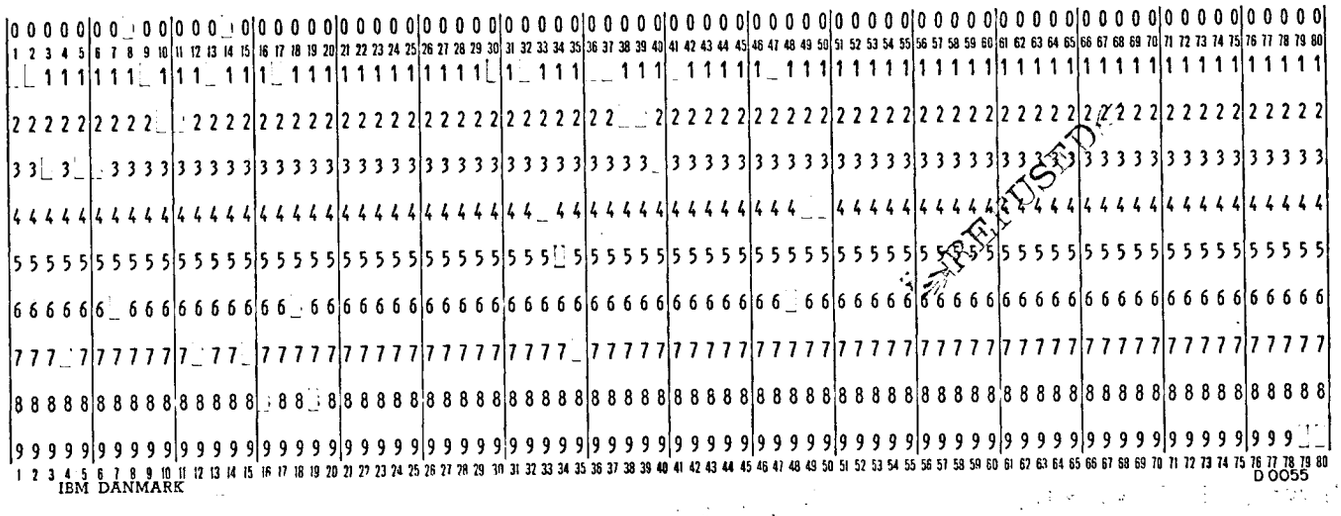
The German punch card (table 4) is designed especially with the use of the electronic computer, IBM 650, in view. The data are divided into two groups, the "sorter data" and the "computer data". The former group is only meant for routine sorting and comprises: Sex, maturity, otolith type, fishing area and method, year, decade, sample and card number.

The computer data are: Age, length, L_1, VS, K_2, gill rakers and pectoral fin rays.

The punch card is designed as a 10-word statistical card. The first word is a program word and comprises 10 columns containing information for the computer that a 10-word card is to be processed. The remaining columns (11-80) are divided into 10 words of 7 columns each.

The computer data occupy the first 7 words so that each word only contains one information. The sorter data are collected in words 8-10 (columns 60-80).

This design of the punch card makes possible a simple and perspicuous program with no needs for comprehensive rearrangements of columns except in cases, where it is desirable to include some of the sorter data in the electronic processing.


IBM DANMARK
D 0055

The former systems, where as many facts as possible are crowded into the punch card, can also be transmitted directly to electronic computers. Some IBM data processing systems are able to work with words of different lengths so that the design of the punch card itself is of secondary importance. If, however, a combined treatment of differently designed cards is undertaken, it will be the most convenient to transform each separate design into a common one. This is very easily done as regards the use of different columns by different workers. In a so-called Reproducer the information from one set of cards can be transferred to a new set, the sequence of columns being changed as desired.

The Coding.

While the use of different columns for the same item of information does not hamper a combined treatment, differences in the coding of the same information are apt to result in rather comprehensive programming work. The different coding systems, presented in the present paper (tables 2, 5 and 8), show that most characters likely to become subjects to combined processing are recorded in a straight numerical form and do not present any problems. In some cases there are minor divergences as for example "no information" being recorded by punching "0" (German code) and "12" (Danish code). These minor differences, however, are rather easily eliminated in a reproduced set of cards containing the desired information in a common code. More inconvenient are the different subdivisions of areas as presented in figures 1-4. These show the main regions and subunits used by Denmark, Germany, Norway and Scotland. Because of the limited space, the enumeration of the statistical unit areas have been omitted, but to state an example, the international statistical rectangle 17 F (between latitudes 59° 00' and 59° 30'N and longitudes 1°00' and 2°00'E) is coded as differently as:

Denmark:	2 435	2 455	(using 15 x 15 n.m. rectangles)
	2 436	2 456	
Germany:	228		
Norway:	42 38		
Scotland:	1 47		

This makes it necessary to decide upon an international coding system of area to be used in cases of combined processing. The method by which to transfer the respective national codes to the one in common must depend on the circumstances. Possibly it will prove advantageous to work out, once for all, a program for converting the national code of each rectangle to the corresponding international code index.

Generally speaking, almost any transformation of data is possible in the field of data processing. In order, however, to estimate the work and expenditure involved in preparing and programming a combined processing of material from different sources it may prove useful to carry out a dummy exercise by programming a conjoint operation involving the systems in current use. Apart from elucidating several pertinent problems, this could also provide a basis for later decisions as to whether a combined treatment, in fact, is preferable to separate processing of basic data in a given case.

Column	Field heading	Column	Field heading	
1-2	Code no. (Species)	32-33	Yearclass	
3-4	Sample no.	34	Winter rings	
5-6	Year	35	Spawning type	
7-8	Week no.	36	Otolith type	
9	Region	37-38	t_s (sec. ring)	Otolith measurements
10-12	Statistical rectangle	39-40	t_1	
13	Preservation	41-42	t_2	
14-16	Fish no.	43-44	T	
17-19	Length	45-47	L_s	Scale measurements
20-22	Weight	48-50	L_1	
23	Sex	51-53	L_2	
24	Maturity	54-56	L_3	
25	Fat	57-59	L_4	
26-27	K_2	60-62	L_5	
28-29	VS	63-80	Available	
30-31	Pect. fin rays			

Table 1. Danish lay out of the IBM punch card.

General: No information, punch 12
Doubtful inform., punch 11

Straight numerical: Sample no., year (last two digits only), week no, region, stat.rect., fish no., length, weight, fat, all meristic characters, yearclass (last two digits only), winter rings (0 to 8+), otolith measurements, scale measurements.

Code no (Species): code 99 Herring
89 Sandeel
etc.

Region and statistical rectangle: see fig. 1.

Preservation: code 1 Length fresh, weight fresh
2 Length fresh, weight after preservation
3 Length and weight after preservation.

Sex: code 1 ♂
2 ♀

Spawning group: code 1 springspawner
2 autumnspawner

Otolith type: code 1 Narrow
2 Wide
3 Nw
4 Ns
5 NxW
6 0/gr. no ring
7 0/gr. sec. "

Table 2. Danish coding of punch card data.

Column	Field heading	Column	Field heading
1-2	Country	40-42	Fish no.
3	Species	43-45	Weight
4-5	Area	46-48	Length
6	Locality	49	Sex
7-8	Sample no.	50	Maturity
9-12	Latitude	51-52	Winter rings
13-17	Longitude	53-54	Year class
18	N S E W	55-57	L_1
19-25	Year, month, day	58-60	L_2
26-27	Sample time	61-62	L_{II} - L_n
28-29	Gear	63-77	Not punched
30-33	Weight of catch	78	Available
34-39	Not punched	79-80	Code no.

Table 3. Finnish lay out of the IBM punch card. As actual punching is not started yet, the columns may be rearranged, but all information included above will be retained.

Word	Column	Field heading	Word	Column	Field heading
Program word	1-10	Information to computer that a 10-word card is to be processed	6	46	Word mark ("12")
				47-50	No inform. (0")
				51-52	Gill rakers
1	11	Word mark (punch "12")	7	53	Word mark ("12")
	12-15	No inform.(punch "0")		54-58	No inform. ("0")
	16-17	Age		59	Pect. fin rays
2	18	Word mark ("12")	8	60	Word mark ("12")
	19-21	No inform. ("0")		61	Sex
	22-24	Length		62	Maturity
				63	Otolith type
				64-66	Area
3	25	Word mark ("12")	9	67	Word mark ("12")
	26-28	No inform. ("0")		68	Vessel and gear
	29-31	L_1		69-70	Year
				71-72	Decade (10 days period)
				73	Nationality
4	32	Word mark ("12")	10	74	Word mark ("12")
	33-37	No inform. ("0")		75-77	Sample no.
	38	VS		78-80	Card no.
5	39	Word mark ("12")			
	40-44	No inform. ("0")			
	45	K_2			

Table 4. German lay out of the IBM punch card.

Winter rings -	0	1	2	3	4	5	6	7	8	8
Code	00	10	11	12	13	14	15	16	17	18	19

VS -	52	53	54	55	56	57	58	59	60
Code	0	2	3	4	5	6	7	8	9	1

K_2 -	12	13	14	15	16	17	18	19	20
Code	0	2	3	4	5	6	7	8	9	1

Pect. f.r. -	13	14	15	16	17	18	19	20	21
Code	0	3	4	5	6	7	8	9	1	2

Maturity -	I	II	III	IV	V	VI	VII	VII-II
Code	0	1	2	3	4	5	6	7	8

Otolith type -	Narrow	Wide	Spring spawner
Code	0	1	2	3

Nation	Code
Germany	0
Denmark	1
etc.	

Sex -	♂	♀
Code	0	1	2

Vessel and gear:

Code
1 Lugger, drift net
2 Lugger, herring trawl
3 Steamer, herring trawl
4 Steamer, pelagical trawl
5 Cutter, herring trawl
6 Cutter, pelagic trawl
7 Research vessel, herring trawl
8 Research vessel, pelagic trawl
9 Lugger, pelagic trawl

Period: Year divided in 36 decades. 1 decade = 10 days

Month/Dates	1 - 10	11 - 20	21 - 31
I	01	02	03
II	04	05	06
III	07	08	09
IV	10	11	12
V	13	14	15
VI	16	17	18
VII	19	20	21
VIII	22	23	24
IX	25	26	27
X	28	29	30
XI	31	32	33
XII	34	35	36

All marketsamples punched 0 in column 75

All sea samples punched 1 to 9 in column 75

Other characters punched in straight numerical values. Fishing areas, see fig.3.

Table 5. The German coding of information included in the IBM punch card.

Column	Field heading	Column	Field heading
1	Species	26	Maturity
2-3	Year	27	Fat
4-5	Date	28-29	VS
6-7	Month	30	Type
8-10	Sample no.	31	Coastal type scale rings
11-12	Area	32	Oceanic " " "
13-14	Locality	33-34	Spawning rings
15	Gear	35	Spawning age
16-18	No. of card (fish)	36-37	Age
19-21	Length	38	Scale edge
22-24	Weight	39	Readability
25	Sex	40-80	Available

Table 6. Norwegian lay out of the IBM punch card. Biological herring data.

Column	Field heading		Column	Field heading	
1	Species	RELEASE	31-32	Year	RECOVERY
2	Category		33-34	Month	
3-4	Year		35-36	Date	
5-6	Month		37-38	Area	
7-8	Date		39-40	Locality	
9-10	Area		41-42	Gear	
11-12	Locality		43	Recovery	
13-14	Gear		44-45	Country	
15-17	Experiment no.		46-49	Factory,Journal	
18-19	Release no.		50-52	Months in the sea	
20	Method of tagging	TAG	53-54	Days in the sea	
21-22	Type of tag		55-58	Distance travelled	
23	Way of fastening the tag		59-61	Length	FISH
24-30	Tag no.		62-63	Age	
			64	Type	
			65	Coast. rings	
			66	Ocean. rings	
			67-68	Spawning rings	
			69-70	Spawning age	
			71	Scale edge	
			72	Readability	
			73-80	Available	

Table 7. Norwegian lay out of IBM punch card. Herring tagging experiments.

Field no. and heading.

1. Date: Day- month- year — Code straight numerical.

2. Port:

Lerwick	Code 01	Leith	Code 32	Oban	Code 15
Fraserburgh	02	Stornoway	11	Ayr	21
Peterhead	03	Ullapool	12	Campbeltown	22
Aberdeen	04	Gareloch	13	Tarbert	23
Inverness	31	Mallaig	14	Girvan	24

Researchvessel:

Explorer	code 41	Clupea	code 43
Scotia	42	Mara	44

3. Statistical rectangle: see fig. 4

4. Gear:

Drift	code 1	Trawl	code 3
Ring	2	Boom	4

5. Length: range: 50-360, code straight numerical.

6. Sex: ♂ code 1, ♀ code 2

7. Maturity: range: I - VIII, code straight numerical.

8. Age: range 1-11, code straight numerical. Doubtful punch 12.
note: In Jan., Feb., March, add one to the number of winter rings.

9. Race:

Autumnspawner	code 1
Springspawner	2
doubtful	3

10. Otolith type:

N, ND	code 1	Doubtful	code 3
W, W/N	2		

11. VS: range 54-60, code straight numerical.

12. K_2: range 12-19, " " " , delete first digit.

13. Pectoral fin ray: range 12-20, code straight numerical, delete first digit.

14. Gill rakers: range 40-55, code straight numerical.

15. Scale measurements L_1 - L_5: code straight numerical.

16. Fecundity: range 7.000-150.000, code straight numerical, delete last three digits.

17. Otolith measurement (1. growth zone): range 6-30, code straight numerical.

Table 8. Scottish information and coding. Power Samas 60-column punch card.

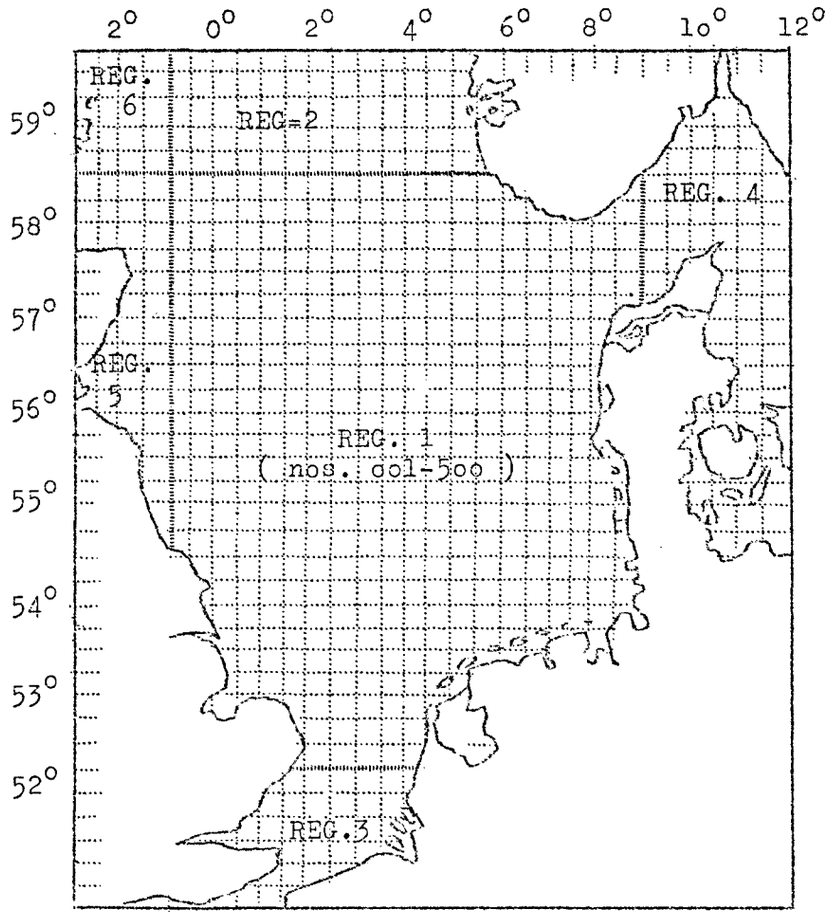


Fig.1 Danish statistical regions and unit areas.

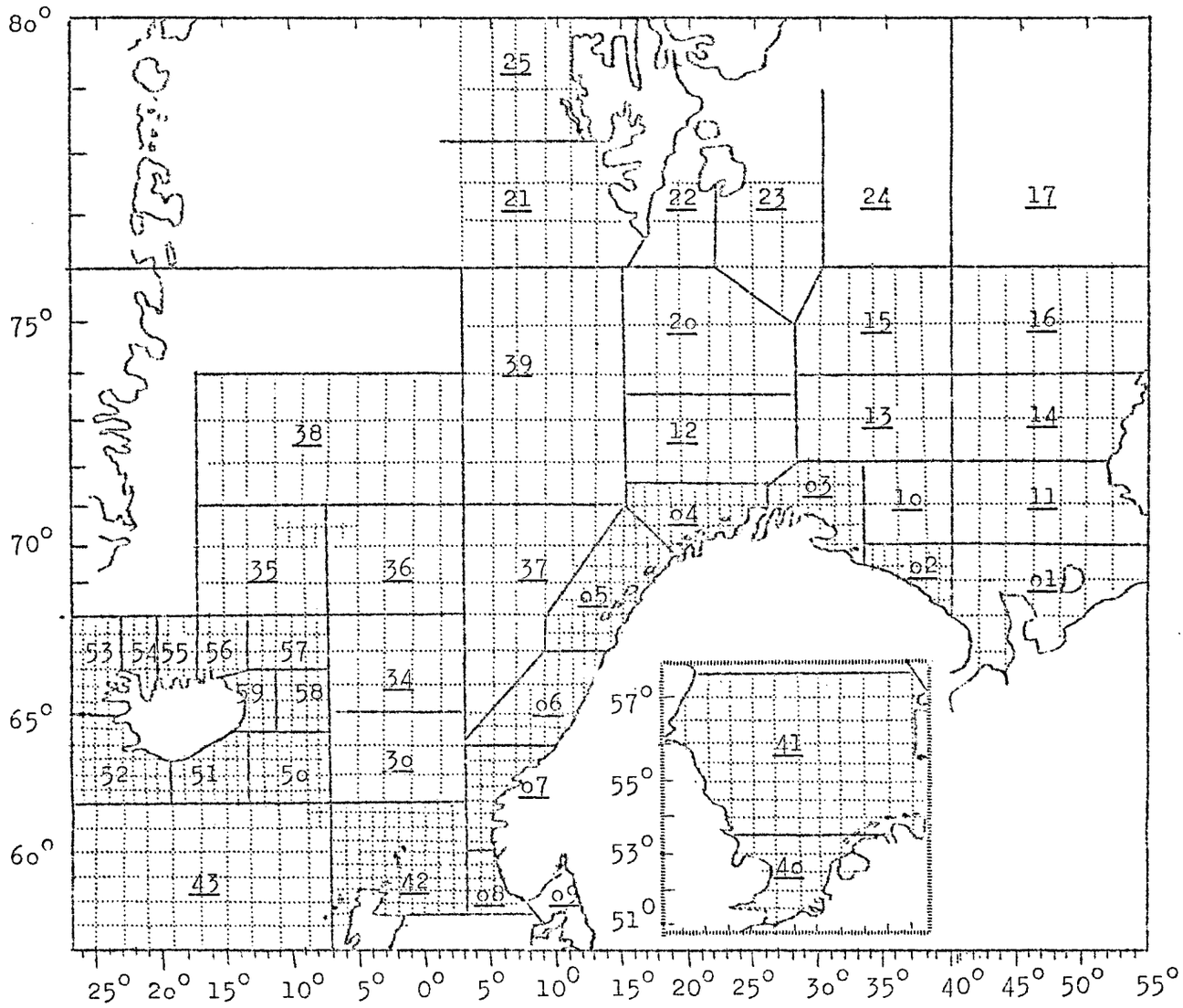


Fig.2 Norwegian statistical regions and subareas.

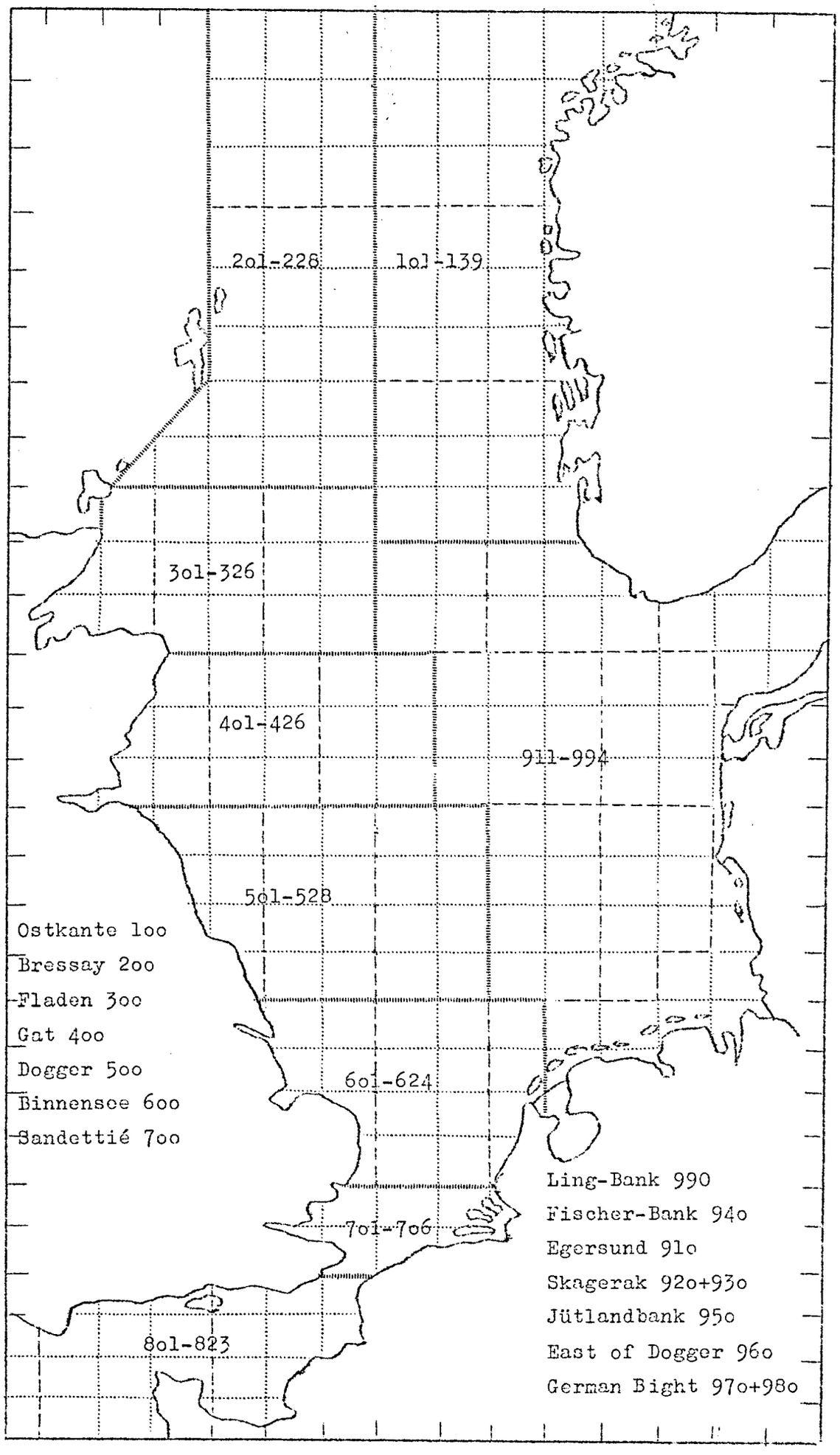


Fig.3 The German statistical regions and subareas.

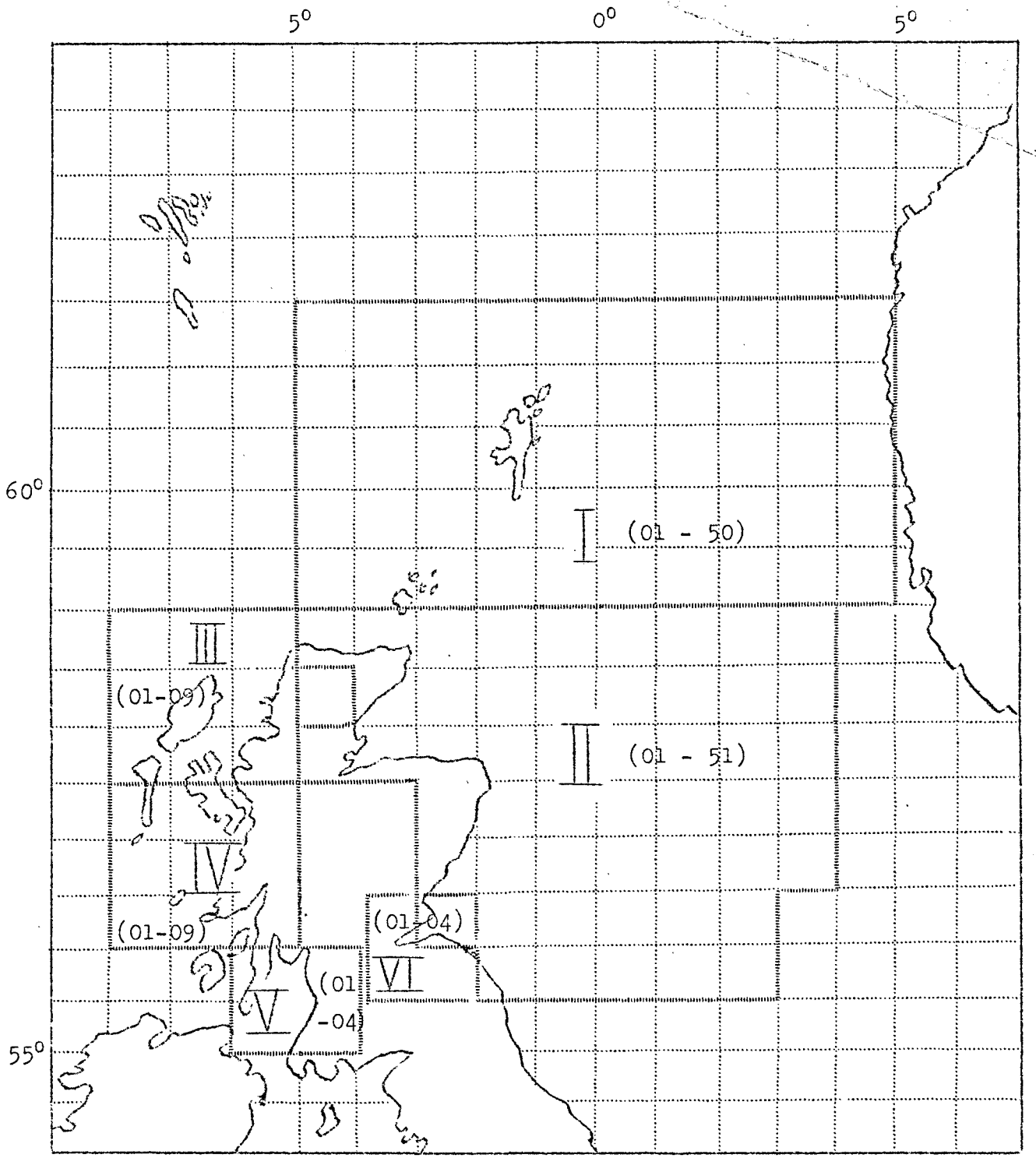


Fig. 4. The Scottish statistical regions and rectangles.