

Agenda Item 5.5: Disturbance to small cetaceans due to seismic surveys

Information on Seismic Activities by Germany

Submitted by: Germany



NOTE:
IN THE INTERESTS OF ECONOMY, DELEGATES ARE KINDLY REMINDED TO BRING
THEIR OWN COPIES OF THESE DOCUMENTS TO THE MEETING

- This paper not to be cited without prior reference to the author -

Working paper
presented to the 11th Meeting of the Advisory Committee to ASCOBANS
(Jastrzebia Góra / Poland, 27 - 29 April 2004)

Information on Seismic Activities by Germany

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At the 7th Meeting of the Advisory Committee to ASCOBANS (Bruges / Belgium, 13 - 16 March 2000) it was decided that collection of data on seismic activities in the Agreement area should continue. The Meeting agreed that ideally line-kilometre of „high energy“ seismic information, per 1° x 1° rectangle (or similar) for each month and year since 1997 in the ASCOBANS area was a minimum. If information on the size/power of gun and use of observers was easily obtainable, that information should be sought also (see Report of the Meeting, chapter 5.2 „Disturbance by seismic surveys“).

Subsequently there was some uncertainty if line-kilometre was the appropriate unit of measurement.

After appropriate clarification the 4th Meeting of the Parties to ASCOBANS (Esbjerg / Denmark, 19 - 22 August 2003) invited Parties and Range States to report on high energy seismic surveys per one degree by one degree rectangle using shot point density (see Proceedings of the Meeting, annex 8 „Report of Working Group II, Work Plan 2004-2006 and future direction of ASCOBANS“ and annex 13 „Resolution No. 5, Effects of Noise and of Vessels“).

Germany had reported before preliminarily on the basis of line-kilometre as unit of measurement to the 9th and 10th Meeting of the Advisory Committee to ASCOBANS (see Document AC9/Doc. 9 (P), Dist. 10 May 2002, Preliminary Information on Seismic Activities, and Document AC10/Doc. 15 (P), Dist. 10 March 2003, Improved Information on Seismic Activities). The United Kingdom had reported before to the 10th Advisory Committee Meeting already based on a calculation of shot point density (see Document AC10/Doc. 30 (P), Dist. 26 March 2003, Progress report from UK by the Joint Nature Conservation Committee (JNCC) on the implementation of resolution 4 to develop a monitoring system that will enable adaptive management of seismic survey activities).

The paper on the seismic activity by Germany presented here is also oriented towards reporting in terms of shot point density.

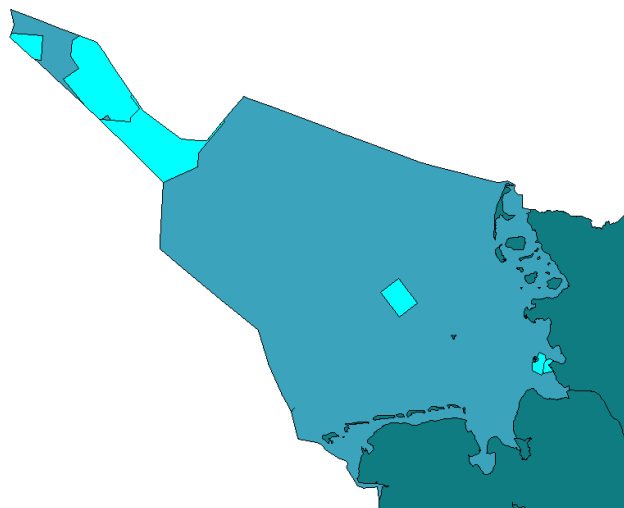
This report is based upon the digital data of the „Niedersächsisches Landesamt für Bodenforschung“ (NLfB) stored by the information system of the NLfB-Division Hydrocarbon Geology („Kohlenwasserstoff-Fachinformationssystem“: KW-FIS). Analogue data sets could not be included because the time available was too short. The data were restricted to the national borders of Germany (partly EEZ). In the period considered (1997 - 2003) there were no measurements known for the Baltic Sea.

During 1997 - 2003 the following **3D-seismic measurements** were carried out:

3D-seismic measurements	Begin	End	Area [km²]
Heide-Büsum 1997	15.09.1997	30.11.1997	65,575
Deutsche Nordsee A5 2000	01.06.2000	31.07.2000	203,512
Heide-Büsum 2001	06.03.2001	27.04.2001	75,522
German North Sea Consortium-3D Seismik 2001	29.04.2001	20.08.2001	1579,994
German North Sea Block J 2001	11.10.2001	21.11.2001	286,604
Entenschnabel 2002	21.04.2002	17.09.2002	1434,748
		Sum:	3645,954

Annual summary of the 3D-measurements:

Year	Area measured [km²]
1997	65,575
1998	0,000
1999	0,000
2000	203,512
2001	1942,120
2002	1434,748
2003	0,000
Sum:	3645,954

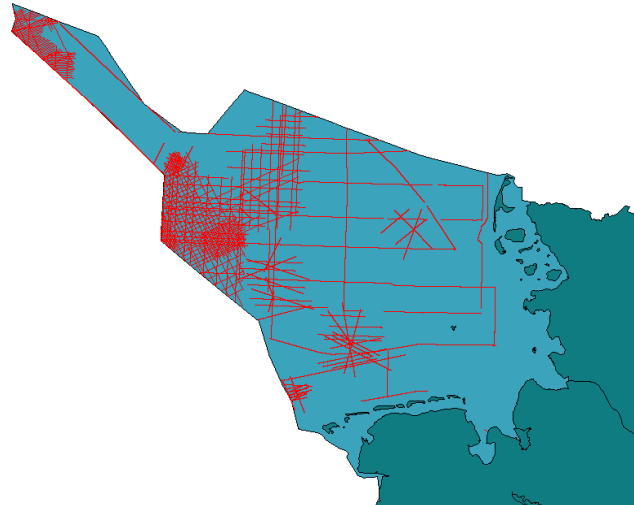


During 1997 - 2003 the following **2D-seismic measurements** were carried out. A survey usually consists of several profile tracks.

2D-seismic measurements	Year	Length [km]
pog 97	1997	973,089
HJLM 97	1997	709,731
GH 97	1997	397,570
L4L5 98	1998	188,111
GH 98	1998	94,780
G 98	1998	712,699
BC 98	1998	211,284
Blöcke D,E,H	1998	2857
OLBG 00	2000	1,902
G 2000	2000	1225,480
NSO-01	2001	120,572
Nopec 2001	2001	?
G 2002	2002	2866,324
BGR-03-AUR	2003	2112,714
	Sum:	12471,255

Annual summary of the 2D-measurements:

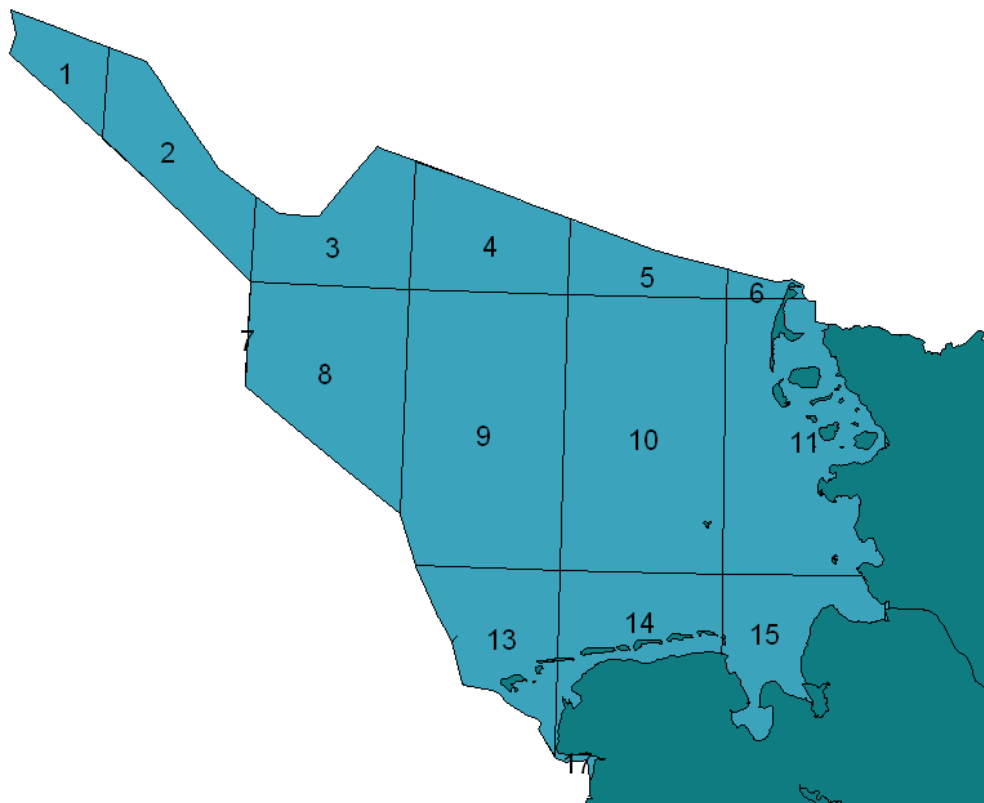
Year	Length measured [km]
1997	2080,389
1998	4063,874
1999	0,000
2000	1227,382
2001	120,572
2002	2866,324
2003	2112,714
Sum:	12471,255



Corresponding to the geographic reference system a grid was constructed with one degree by one degree rectangles. This grid was superimposed to the borders of the North Sea area assigned to Germany. The resulting structure was the basis for the subsequent analysis.

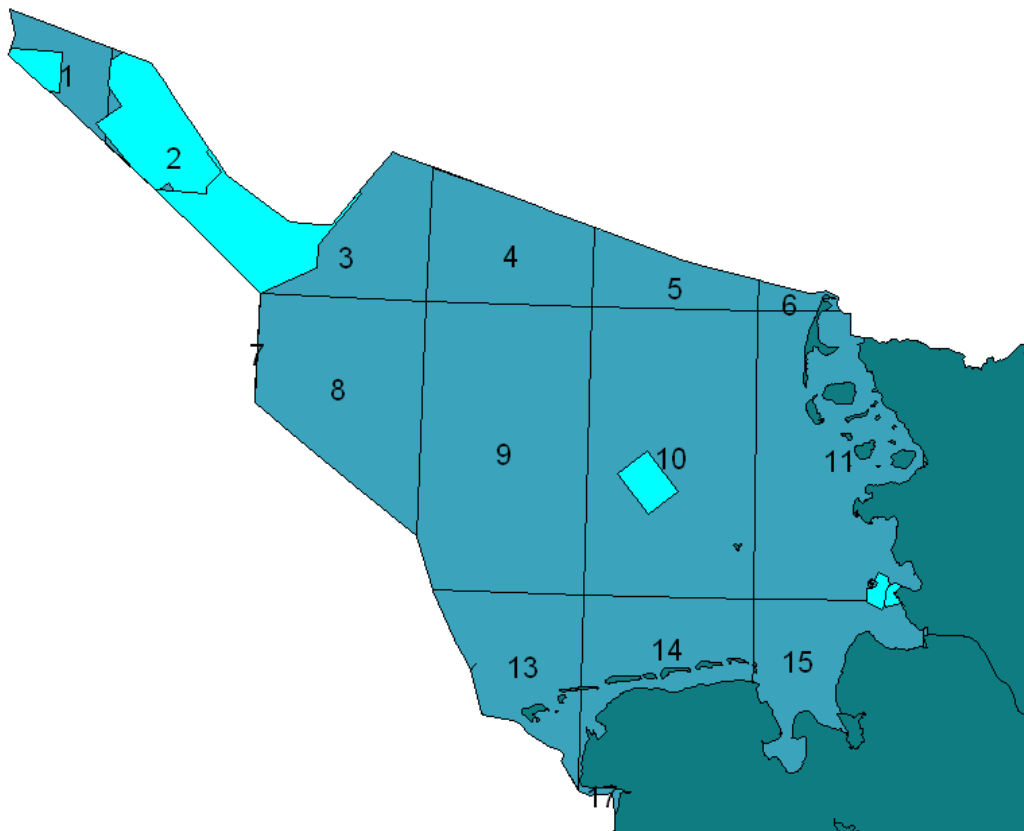
Analogous to the contribution by the UK to ASCOBANS mentioned above (Document AC10/Doc. 30 (P)) only the actual water surface was taken into account (without the islands).

An overview of the $1^\circ \times 1^\circ$ rectangles and their numbering is given in the subsequent figure.



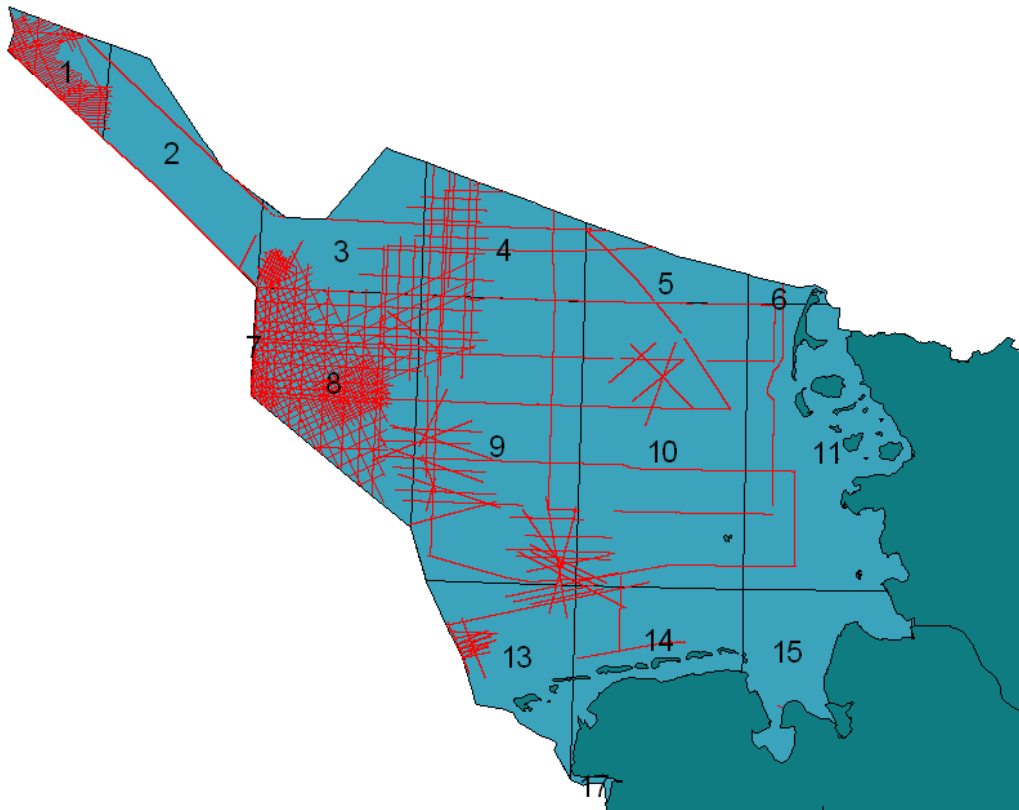
The following table and figure give the areas measured of the **3D-seismic measurements** in the 1° x 1° rectangles and periods as well as the totals.:

3D-seismic measurements					
Rectangle	1997-2003 [km ²]	2002 [km ²]	2001 [km ²]	2000 [km ²]	1997 [km ²]
1	225,645		22,134	203,512	
2	2448,264	890,404	1557,861		
3	544,334	544,334			
4	0,000				
5	0,000				
6	0,000				
7	0,009	0,009			
8	0,001	0,001			
9	0,000				
10	286,604		286,604		
11	103,966		57,728		46,239
12	0,000				
13	0,000				
14	0,000				
15	37,130		17,794		19,336
16	0,000				
17	0,000				
Sum:	3645,954	1434,748	1942,120	203,512	65,575



The following table and figure give the length measured of the **2D-seismic measurements** in the 1° x 1° rectangles and periods as well as the totals. Surveys by Maersk 1998 and Nopec 2001 could not be taken into account due to missing data.

2D-seismic measurements								
Rectangle	1997-2003 [km]	2003 [km]	2002 [km]	2001 [km]	2000 [km]	1999 [km]	1998 [km]	1997 [km]
1	1041,405	91,296						950,110
2	199,563	158,760	1,045				16,780	22,979
3	555,445	79,916	113,956		54,552		307,021	
4	667,174	231,410	94,716		89,422		251,626	
5	79,656	79,656						
6	9,167	9,167						
7	4,605		4,167		0,256		0,182	
8	4219,487	316,449	2580,551		1032,870		201,997	87,621
9	1491,620	523,993	71,889		48,381		241,157	606,200
10	659,460	407,376		120,572				131,513
11	214,691	214,691						
12								
13	346,779						188,111	158,668
14	123,300							123,300
15	1,902				1,902			
16								
17								
Sum:	9614,255	2112,714	2866,324	120,572	1227,382	0,000	1206,874	2080,389



For calculation of shot point density the following assumptions were made because necessary information was partly missing:

- **3D-seismic measurements:** The mean shot point distance is 25 m and the inline distance 50 m for all measurements. In addition it is supposed that the distribution of the shot point locations within the present polygon is homogeneous. The resulting shot point density is 800 shot points per km².
- **2D-seismic measurements:** The mean shot point distance is assumed to be 25 m. The resulting shot point density is 40 shot points per km.

These assumptions correspond to the usual procedures and agree with the above mentioned contribution by the UK to ASCOBANS (Document AC10/Doc. 30 (P)).

On the basis of the assumptions made the numbers of shot points in the rectangles for the years and for the whole period of 1997 - 2003 were calculated from the lengths or the areas of the different seismic measurements.

For the calculations of the shot point density the 2D- and 3D-measurements were handled together, i.e. the numbers of shot points within a rectangle determined by the 2D- and 3D-measurements were added for the respective periods.

The shot point density resulted from the relation between the numbers of the shot points and the sizes of the areas considered.

An overview of the seismic measurements, of the shot point densities in the periods examined as well as of the shot point density calculations is given in the attached annex.

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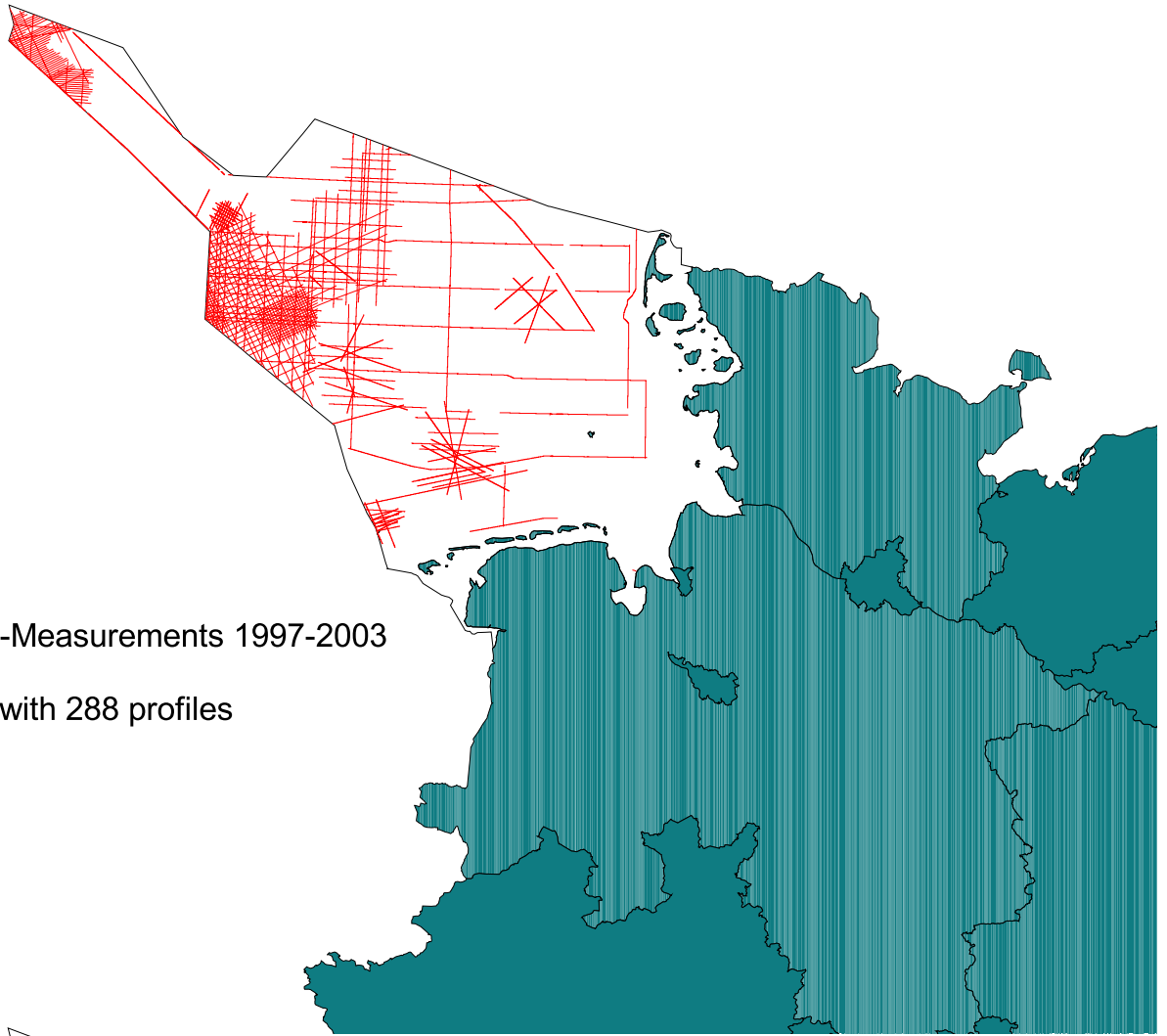
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Annex

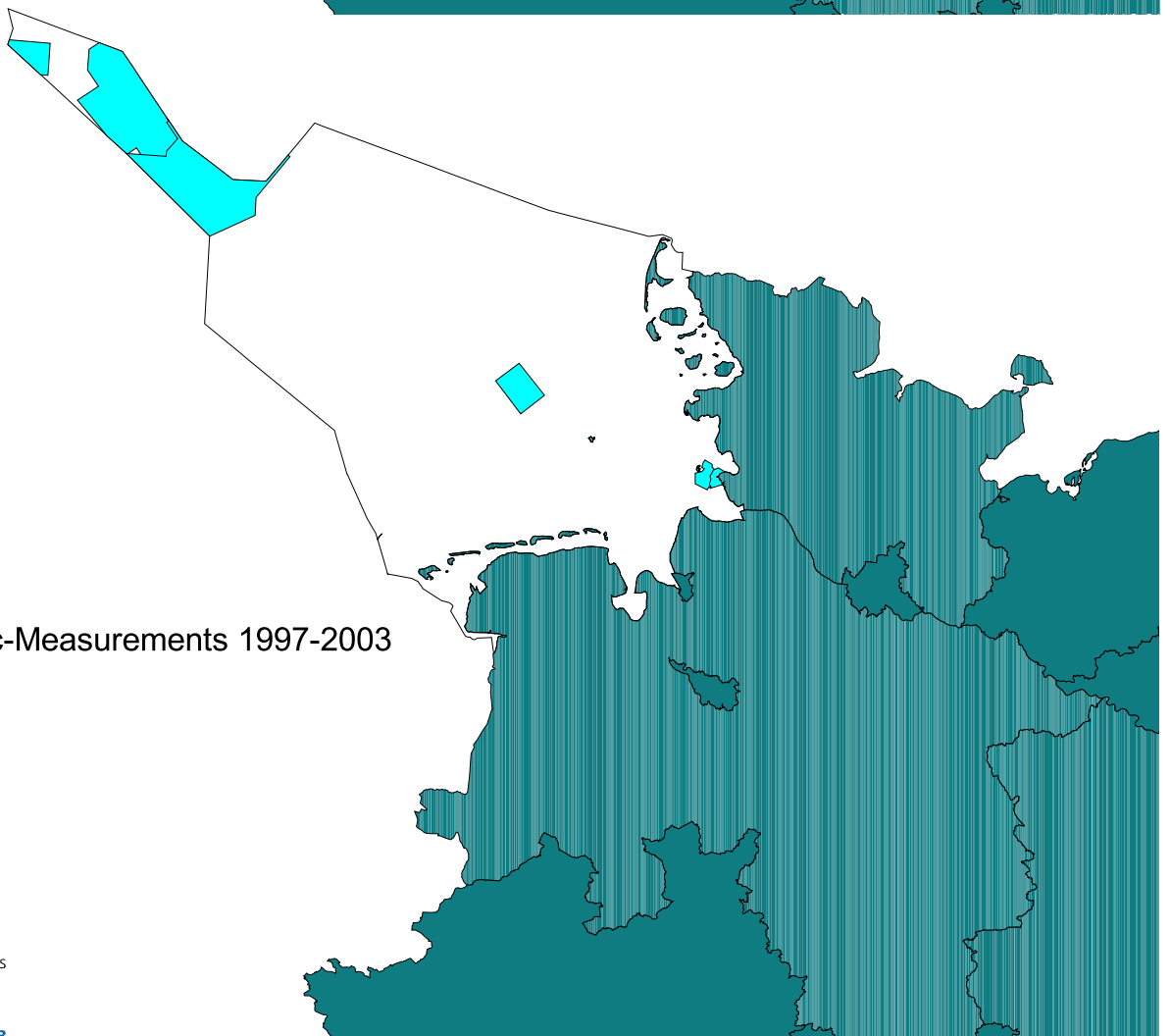
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2D-Seismic-Measurements 1997-2003

12 surveys with 288 profiles

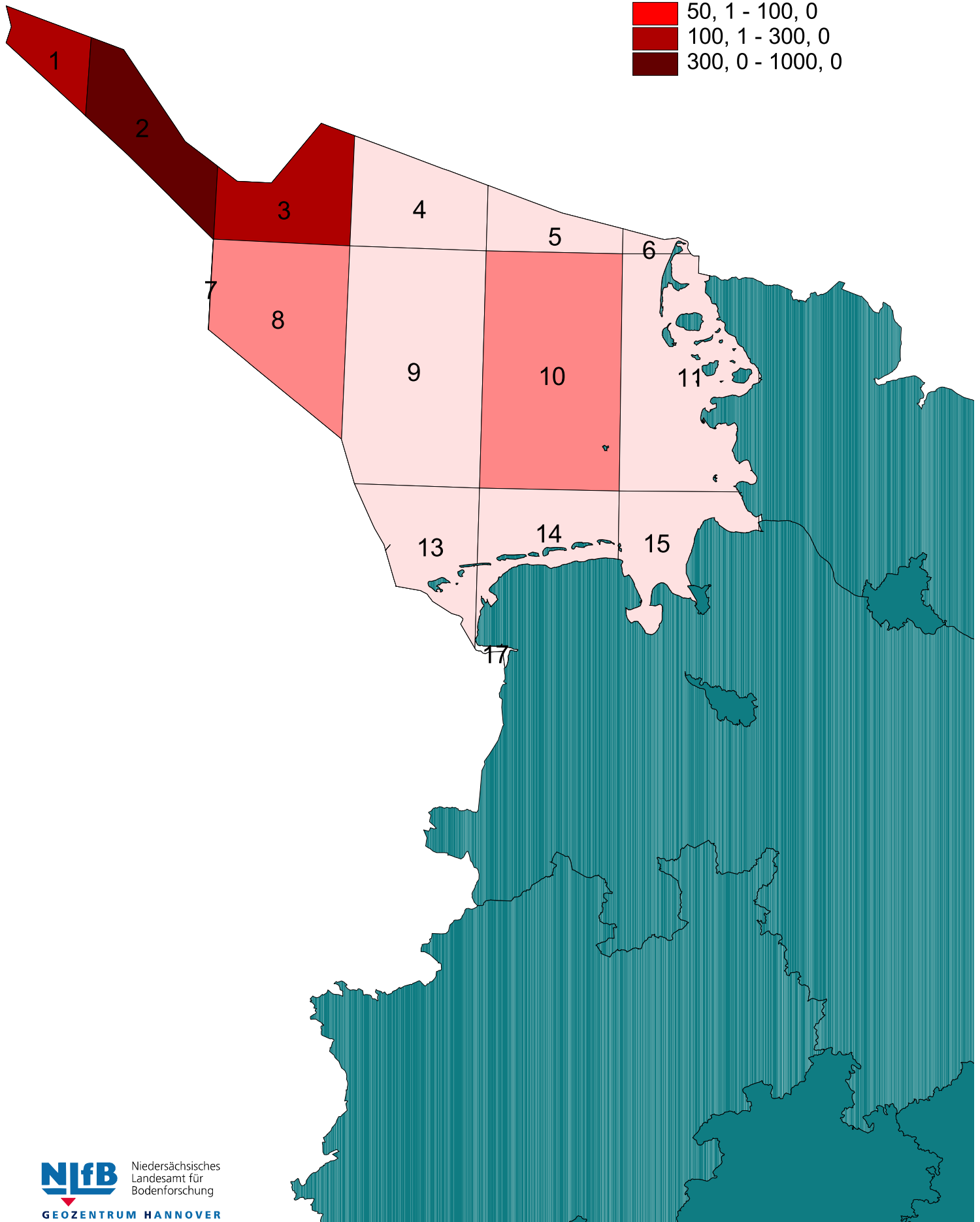
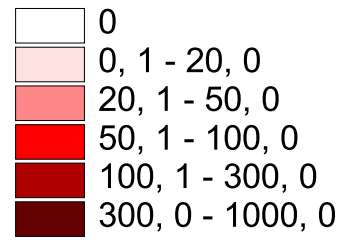


3D-Seismic-Measurements 1997-2003

6 surveys

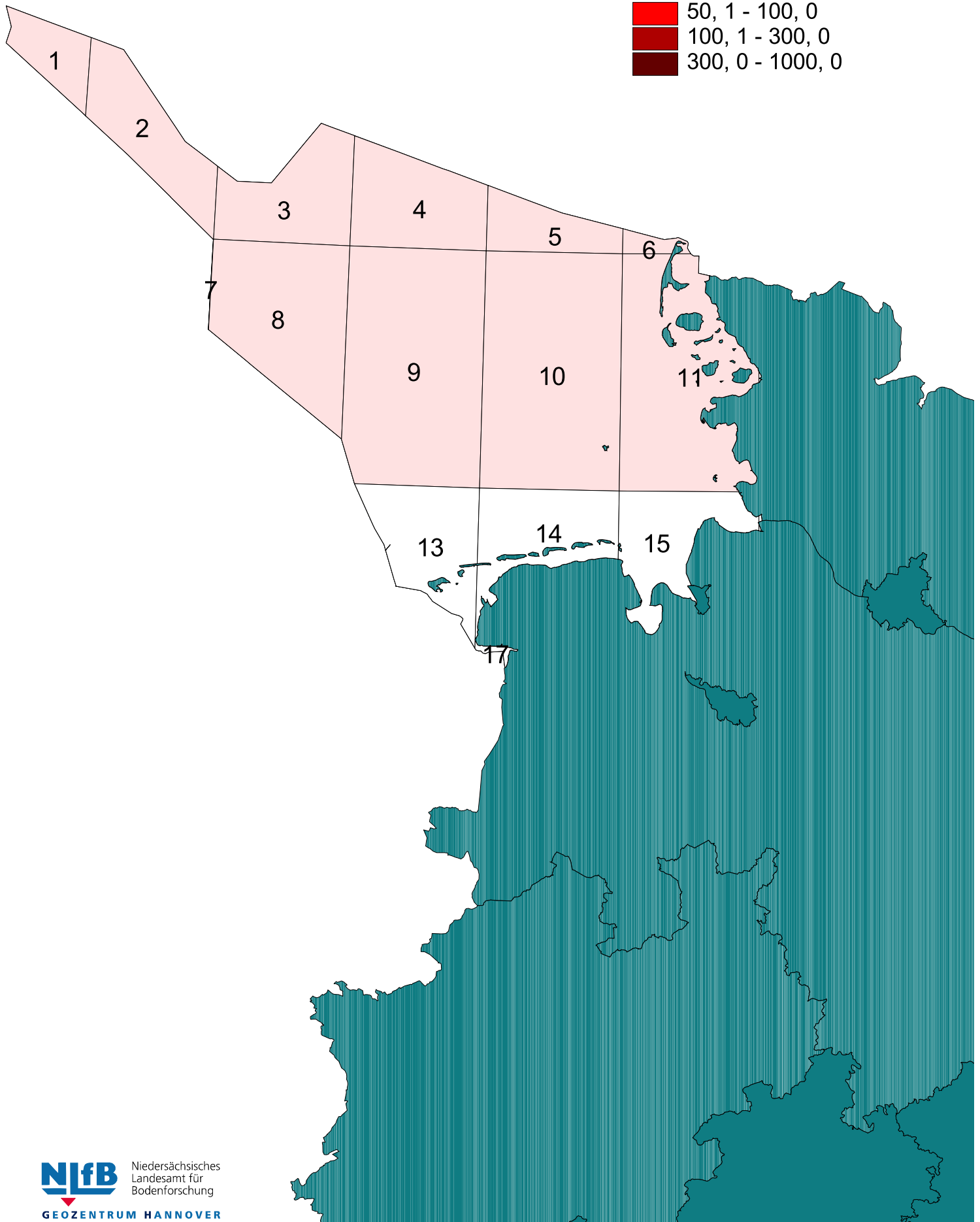
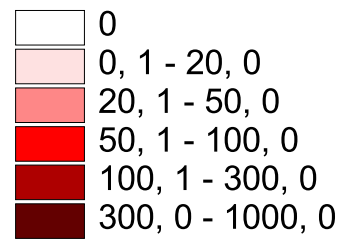
SHOT POINT DENSITY 1997-2003

Density (SP/km²)



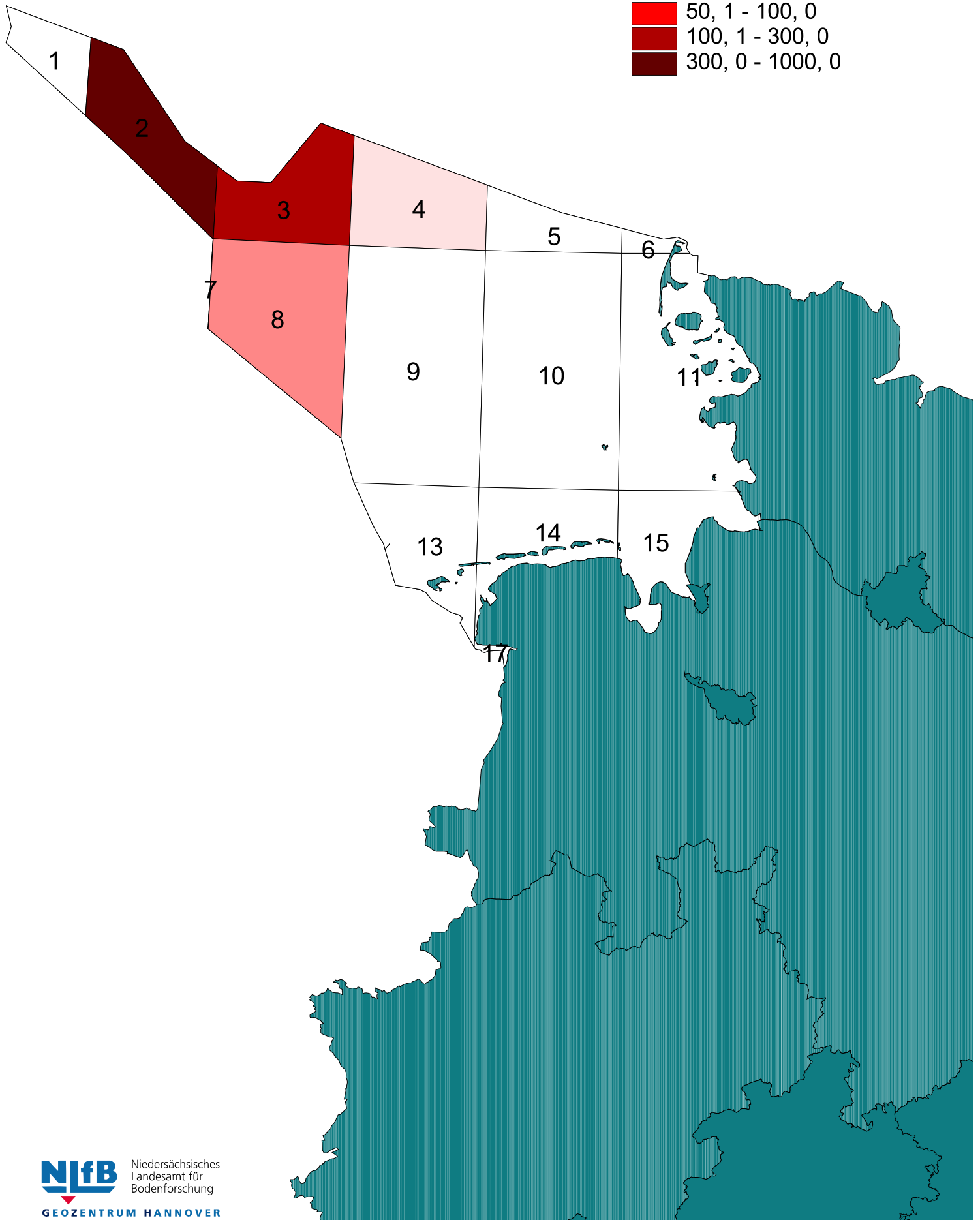
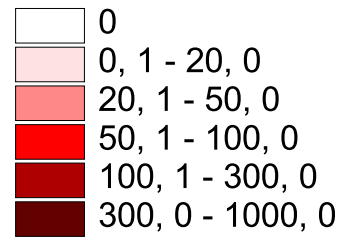
SHOT POINT DENSITY 2003

Density (SP/km²)



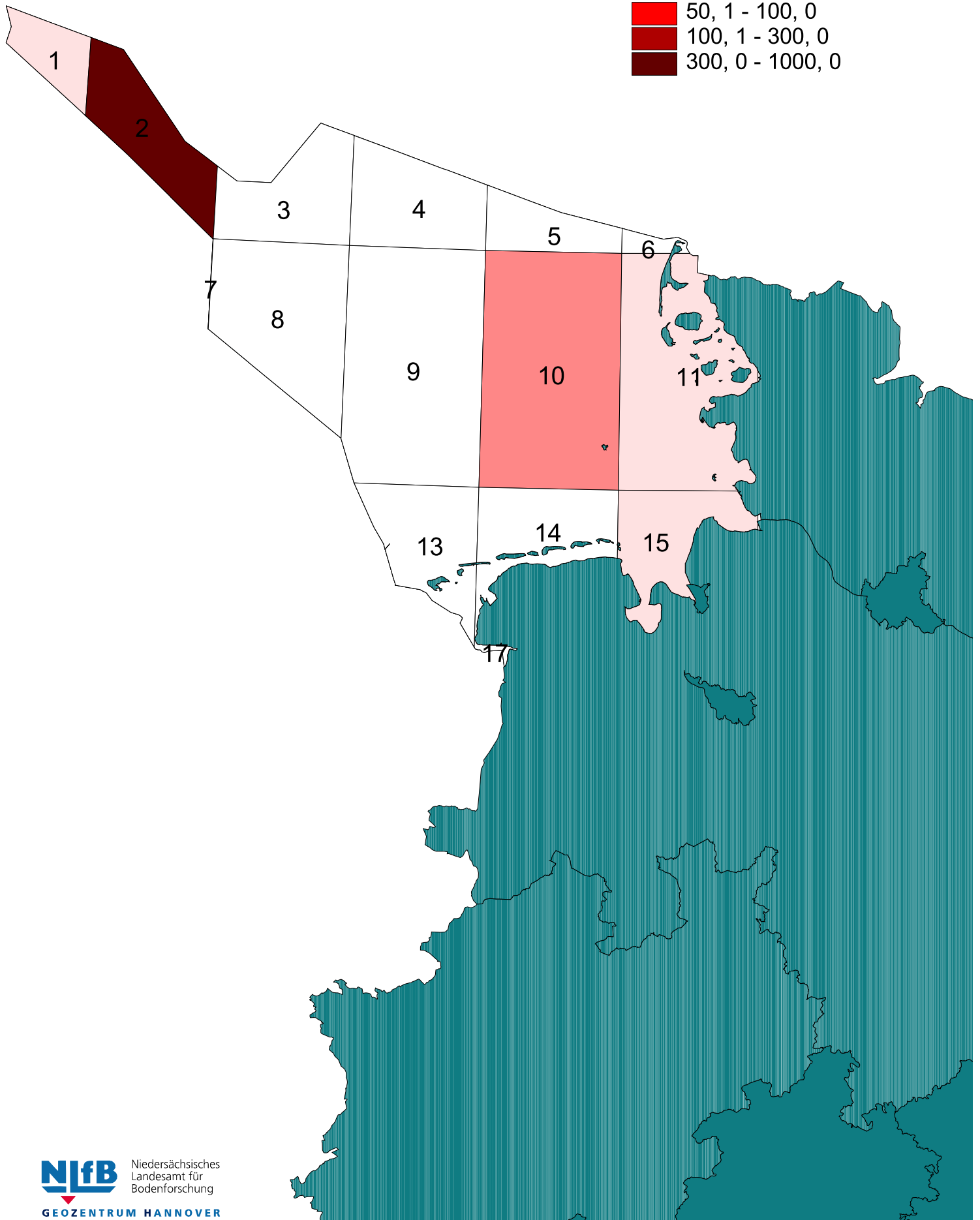
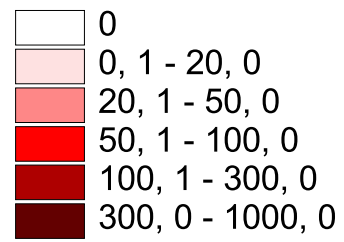
SHOT POINT DENSITY 2002

Density (SP/km²)



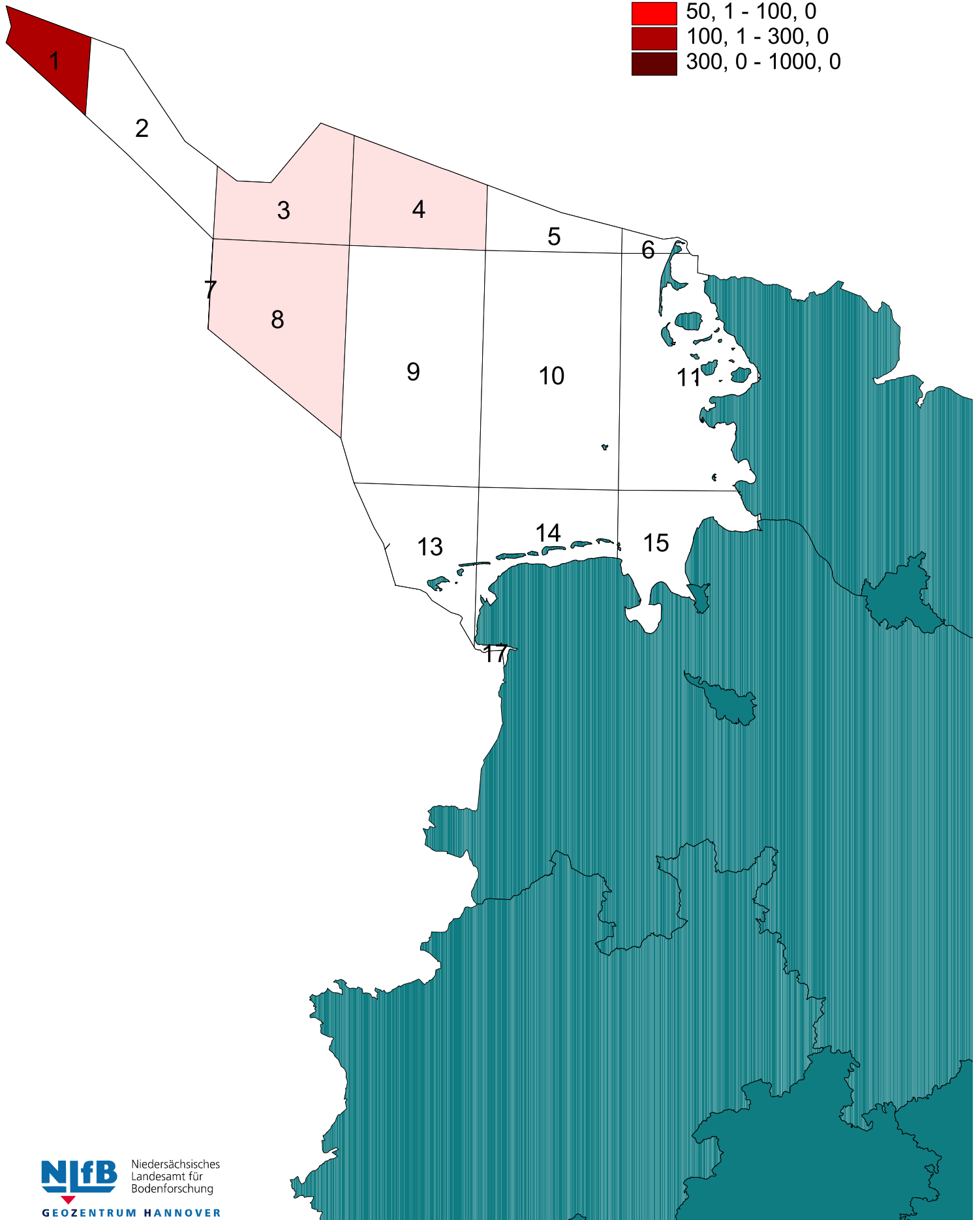
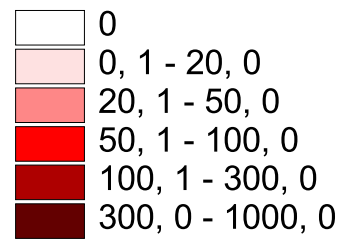
SHOT POINT DENSITY 2001

Density (SP/km²)



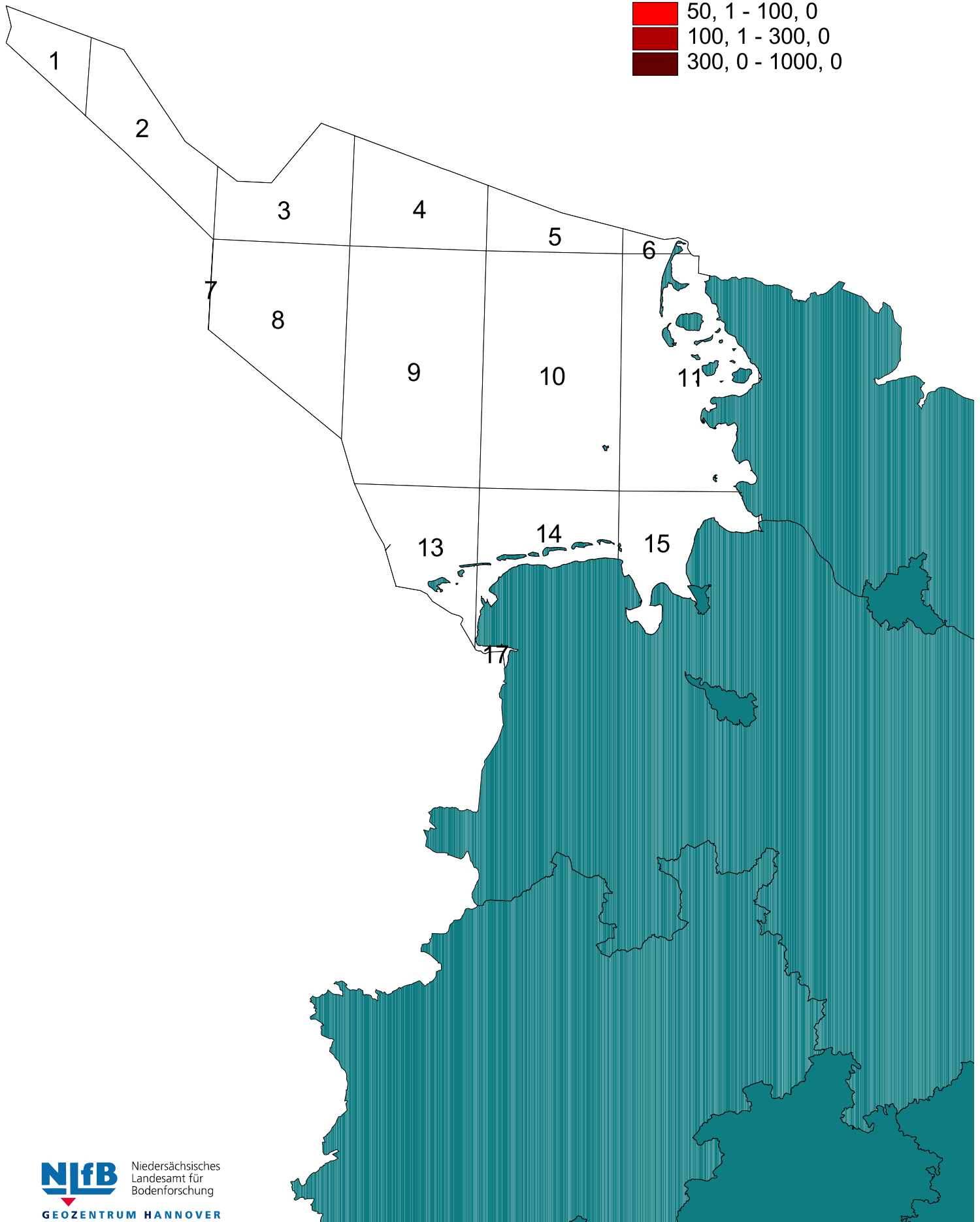
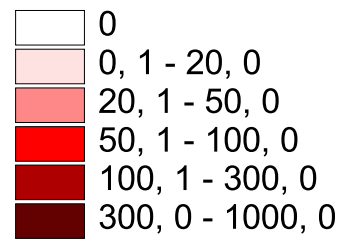
SHOT POINT DENSITY 2000

Density (SP/km²)



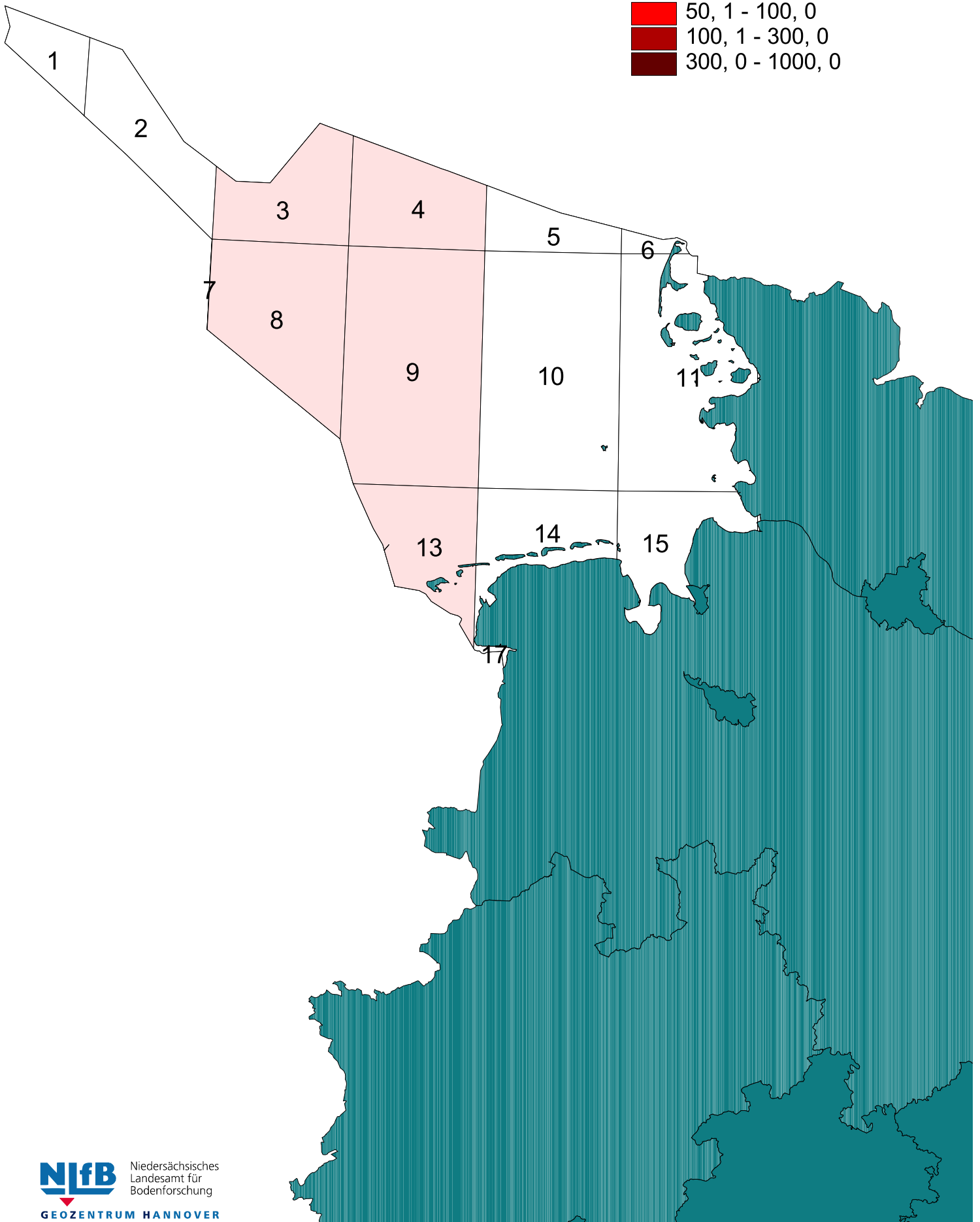
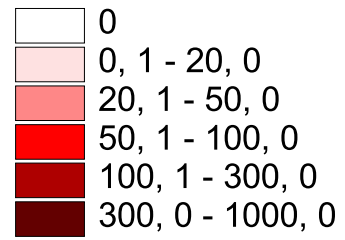
SHOT POINT DENSITY 1999

Density (SP/km²)



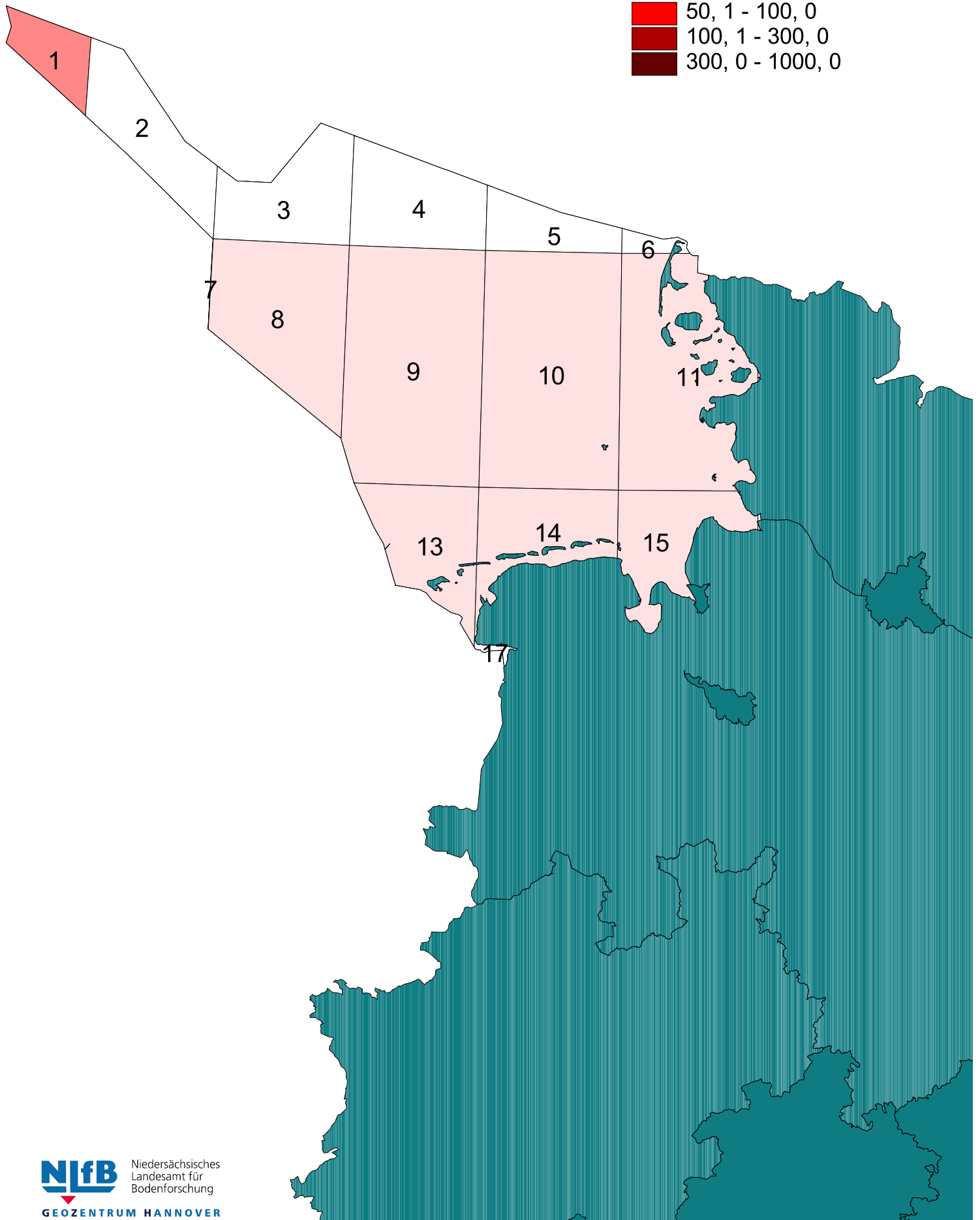
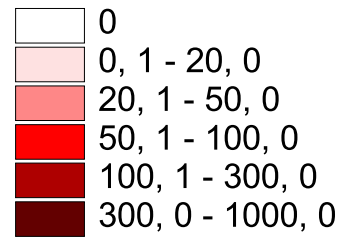
SHOT POINT DENSITY 1998

Density (SP/km²)



SHOT POINT DENSITY 1997

Density (SP/km²)



2D-Measurements 1997-2003, surveys

ID_Survey	SurveyShortName	Operator	Year	Recordlength (ms)	Sampling (ms)	Length (km)	Sum of year (km)	Remarks
230	pog97	ARHS	1997	6000	2	973,089		
110	HJLM 97	RDEA	1997	7000	2	709,731		
87	GH 97	BEB	1997	6000	2	397,570	2080,389	
142	L4L5 98	BEB	1998	6000	2	188,111		
88	GH 98	BEB	1998	6000	2	94,780		
82	G98	NOPE	1998	7000	2	712,699		
39	BC 98	BEB	1998	6000	2	211,284		
	D,E,H Blöcke	MAERSK	1998			2857,000	4063,874	no further data
162	OLBG 00	MEEG	2000			1,902		
81	G2000	Denerco	2000	8000	2	1225,480	1227,382	
244	NSO-01	NOSO	2001	6000	2	120,572		
		NOPE	2001				120,572	do further data
242	G2002	NOPE	2002	5000	1	2866,324	2866,324	
308	BGR-03-AUR	BGR	2003	4600	0,5	2112,714	2112,714	
					Sum:	12471,255	12471,255	

2D-Measurements 1997-2003, years

Year	Length (km)
1997	2080,389
1998	4063,874
1999	
2000	1227,382
2001	120,572
2002	2866,324
2003	2112,714

3D-Measurements 1997-2003, surveys

3D-Survey	3D-Survey	Client	Archive	Contractor	Processing	County/Area
25	Heide-Büsum 1997	RDEA	0121212	CGG	PRAK	Schleswig-Holstein
89	Deutsche Nordsee A5 2000	ARHS	0122526	PGS	ESGP	Nordsee
84	Heide-Büsum 2001	RDEA	0121322	CGG	WECO	Schleswig-Holstein
82	German North Sea Consortium-3D Seismik 2001	WIAG	0122301	PGS		Nordsee
87	German North Sea Block J 2001	EEG	0121712	Geocon		Nordsee
90	Entenschnabel 2002	FUGO	0122752	PGS		Nordsee

3D-Survey	3D-Survey	Startdate	Enddate	S: Shots V: Vibrator	Sampling (ms)	Recordlength (ms)	Area (km²)
25	Heide-Büsum 1997	15.9.1997	30.11.1997	S,V	2	6000	65,575
89	Deutsche Nordsee A5 2000	6.2000	7.2000	S	2	6000	203,512
84	Heide-Büsum 2001	6.3.2001	27.4.2001	S	2	6000	75,522
82	German North Sea Consortium-3D Seismik 2001	29.4.2001	20.8.2001	S	2	6000	1579,994
87	German North Sea Block J 2001	11.10.2001	21.11.2001	S	2	7168	286,604
90	Entenschnabel 2002	21.4.2002	17.9.2002	S	2	8192	1434,748
Sum:							3645,954

3D-Measurements 1997-2003, years

Year	Area (km²)
1997	65,575
1998	0,000
1999	0,000
2000	203,512
2001	1942,120
2002	1434,748
2003	0,000
Sum:	3645,954

Grid		3D-Seismic-Area							
GRID ID	Grid-Area [km²]	1997-2003 [km²]	2003 [km²]	2002 [km²]	2001 [km²]	2000 [km²]	1999 [km²]	1998 [km²]	1997 [km²]
1	1053,258	225,645			22,134	203,512			
2	2358,438	2448,264		890,404	1557,861				
3	2542,553	544,334		544,334					
4	2626,155								
5	1297,662								
6	239,561								
7	3,956	0,009		0,009					
8	4292,483	0,001		0,001					
9	7145,318								
10	7208,839	286,604			286,604				
11	5339,928	103,966			57,728				46,239
12	3,161								
13	2519,728								
14	2401,327								
15	2179,150	37,130			17,794				19,336
16	5,572								
17	59,427								
Sum:		3645,954	0,000	1434,748	1942,120	203,512			65,575

Grid		2D-Seismic-Lines							
GRID ID	Grid-Area [km²]	1997-2003 [km]	2003 [km]	2002 [km]	2001 [km]	2000 [km]	1999 [km]	1998 [km]	1997 [km]
1	1053,258	1041,405	91,296						950,110
2	2358,438	199,563	158,760	1,045				16,780	22,979
3	2542,553	555,445	79,916	113,956		54,552		307,021	
4	2626,155	667,174	231,410	94,716		89,422		251,626	
5	1297,662	79,656	79,656						
6	239,561	9,167	9,167						
7	3,956	4,605		4,167		0,256		0,182	
8	4292,483	4219,487	316,449	2580,551		1032,870		201,997	87,621
9	7145,318	1491,620	523,993	71,889		48,381		241,157	606,200
10	7208,839	659,460	407,376		120,572				131,513
11	5339,928	214,691	214,691						
12	3,161								
13	2519,728	346,779						188,111	158,668
14	2401,327	123,300							123,300
15	2179,150	1,902				1,902			
16	5,572								
17	59,427								
Sum:		9614,255	2112,714	2866,324	120,572	1227,382	0,000	1206,874	2080,389

Grid	Shots of 2D and 3D-Seismic								
GRID ID	Grid-Area [km²]	1997-2003 # SP	2003 # SP	2002 # SP	2001 # SP	2000 # SP	1999 # SP	1998 # SP	1997 # SP
1	1053,258	222172,6	3651,8	0,0	17707,1	162809,3	0,0	0,0	38004,4
2	2358,438	1966594,1	6350,4	712364,8	1246288,5	0,0	0,0	671,2	919,2
3	2542,553	457684,9	3196,6	440025,3	0,0	2182,1	0,0	12280,8	0,0
4	2626,155	26687,0	9256,4	3788,6	0,0	3576,9	0,0	10065,1	0,0
5	1297,662	3186,2	3186,2	0,0	0,0	0,0	0,0	0,0	0,0
6	239,561	366,7	366,7	0,0	0,0	0,0	0,0	0,0	0,0
7	3,956	191,4	0,0	173,9	0,0	10,2	0,0	7,3	0,0
8	4292,483	168780,4	12658,0	103222,9	0,0	41314,8	0,0	8079,9	3504,8
9	7145,318	59664,8	20959,7	2875,6	0,0	1935,3	0,0	9646,3	24248,0
10	7208,839	255661,7	16295,0	0,0	234106,1	0,0	0,0	0,0	5260,5
11	5339,928	91760,6	8587,6	0,0	46182,1	0,0	0,0	0,0	36990,8
12	3,161	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
13	2519,728	13871,2	0,0	0,0	0,0	0,0	0,0	7524,4	6346,7
14	2401,327	4932,0	0,0	0,0	0,0	0,0	0,0	0,0	4932,0
15	2179,150	29780,3	0,0	0,0	14235,3	76,1	0,0	0,0	15469,0
16	5,572	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
17	59,427	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Sum:	3301333,7	84508,6	1262451,2	1558519,1	211904,6	0,0	48275,0	135675,4

[illegible]