

3.10.2011, 15.11-20.12.2011, Jnr 11/12588

DTU Aqua



## Cruise Report

North Sea Sandeel Dredge Survey, Sand eel Area 1 and 3, 2011

Vessel: R500 / Pernille Kim

Cruise dates (planned): 24. november  
2011 – 8. december

Cruise number: 2011

Cruise name: Sandeel Dredge Survey,  
Sandeel Area 1 and 3

<b>Port of departure:</b>	Thyborøn	<b>Date:</b>	24.11.2011
<b>Port of return:</b>	Thyborøn	<b>Date:</b>	8.12.2011
<b>Other ports:</b>	-	<b>Date and justification:</b>	

## Participants

Name	Institute	Function and main tasks
Hans Olesen	DTU Aqua	Cruise leader

## Objectives

The purpose of the sand eel dredge survey was to collect sand eels buried in the seabed and compare catches (number and age composition) with the previous year's collections to assess the 2011 year class strength of the lesser sand eel (*Ammodytes marinus*) in the different areas adopted by ICES in 2009. Data from the dredge survey is the basis for calculating a 0-group index, which will be used in stock assessment.

In 2011 the survey was improved with new locations in Skagerrak.

In addition, it was the aim to test an underwater video module mounted on the dredge, as well as try to validate/quality ensure each haul using bottom contact sensors mounted on the gear (dredges).

Furthermore, to identify any practical problems connected with the collection of quantitative samples during the survey.

## Itinerary

The vessel departed Thyborøn harbor 24.11.2011 at 14.00 hrs. and arrived Thyborøn harbor 8.12.2010 at 3.30 hrs. Sampling with the dredge typically started just after sun set (UTC 17.00 hrs) and the last station of the night was completed before sunrise (UTC 04.00 – 06.00 hrs) i.e. fishing was only conducted during darkness.

**Table 1.** Samples collected with dredge or Van Veen grab during the survey.

year	station	new_position	ICES_sq	latPosStart-Dec	lonPosStart-Dec	latPosEnd-Dec	lonPosEnd-Dec	datestart	time-start	dateend	timeend	Area	gear
2011	1	3961,42	39F1	55,2118	1,5392	55,2112	1,5312	26-11-2011	16:38:00	26-11-2011	16:48:00	1	DK2
2011	2	3961,42	39F1	55,2138	1,5335	55,2077	1,5362	26-11-2011	16:57:00	26-11-2011	17:07:00	1	DK2
2011	3	3961,42	39F1	55,2102	1,5327	55,2147	1,5400	26-11-2011	17:17:00	26-11-2011	17:27:00	1	DK2
2011	4	3961,28	39F1	55,0775	1,3830	55,0725	1,3810	26-11-2011	19:03:00	26-11-2011	19:13:00	1	DK2
2011	5	3961,28	39F1	55,0738	1,3775	55,0927	1,3885	26-11-2011	19:23:00	26-11-2011	19:33:00	1	DK2
2011	6	3961,28	39F1	55,0737	1,3850	55,0777	1,3762	26-11-2011	19:45:00	26-11-2011	19:55:00	1	DK2
2011	7	3961,29	39F1	55,0187	1,3523	55,0133	1,3520	26-11-2011	21:02:00	26-11-2011	21:12:00	1	DK2
2011	8	3961,29	39F1	55,0150	1,3477	55,0192	1,3563	26-11-	21:21:00	26-11-	21:31:00	1	DK2

								2011		2011			
2011	9	3961,29	39F1	55,0167	1,3593	55,0172	1,3480	26-11-2011	21:41:00	26-11-2011	21:51:00	1	DK2
2011	10	3861,14	38F1	54,8525	1,4313	54,8467	1,4355	26-11-2011	23:36:00	26-11-2011	23:46:00	1	DK2
2011	11	3861,14	38F1	54,8475	1,4310	54,8535	1,4358	26-11-2011	23:55:00	27-11-2011	00:05:00	1	DK2
2011	12	3861,14	38F1	54,8507	1,4390	54,8485	1,4278	27-11-2011	00:12:00	27-11-2011	00:22:00	1	DK2
2011	13	3861,32	38F1	54,9858	1,8440	54,9912	1,8517	27-11-2011	02:35:00	27-11-2011	02:45:00	1	DK2
2011	14	3861,32	38F1	54,9880	1,8550	54,9878	1,8438	27-11-2011	02:56:00	27-11-2011	03:06:00	1	DK2
2011	15	3861,32	38F1	54,9900	1,8475	54,9840	1,8533	27-11-2011	03:16:00	27-11-2011	03:26:00	1	DK2
2011	16	3861,17	38F1	54,8455	1,9927	54,8385	1,9947	27-11-2011	04:54:00	27-11-2011	05:04:00	1	DK2
2011	17	3861,17	38F1	54,8393	1,9902	54,8442	1,9978	27-11-2011	05:14:00	27-11-2011	05:24:00	1	DK2
2011	18	3861,17	38F1	54,8418	1,9992	54,8427	1,9892	27-11-2011	05:35:00	27-11-2011	05:45:00	1	DK2
2011	19	3861,19	38F1	54,5653	1,2548	54,5692	1,2680	27-11-2011	17:29:00	27-11-2011	17:39:00	1	DK2
2011	20	3861,19	38F1	54,5650	1,2697	54,5682	1,2598	27-11-2011	17:48:00	27-11-2011	17:59:00	1	DK2
2011	21	3861,19	38F1	54,5695	1,2635	54,5645	1,2692	27-11-2011	18:08:00	27-11-2011	18:18:00	1	DK2
2011	22	3861,22	38F1	54,5387	1,5690	54,5377	1,5792	27-11-2011	19:46:00	27-11-2011	19:56:00	1	DK2
2011	24	3861,22	38F1	54,5403	1,5747	54,5358	1,5685	27-11-2011	20:22:00	27-11-2011	20:32:00	1	DK2
2011	23	3861,22	38F1	54,5352	1,5743	54,5403	1,5685	27-11-2011	20:04:00	27-11-2011	20:14:00	1	DK2
2011	25	3861,23	38F1	54,5450	1,6192	54,5465	1,6283	27-11-2011	21:01:00	27-11-2011	21:11:00	1	DK2
2011	26	3861,23	38F1	54,5438	1,6275	54,5468	1,6185	27-11-2011	21:20:00	27-11-2011	21:30:00	1	DK2
2011	27	3861,23	38F1	54,5482	1,6230	54,5415	1,6232	27-11-2011	20:22:00	27-11-2011	20:32:00	1	DK2
2011	28	3761,04	37F1	54,4683	1,9785	54,4670	1,9887	28-11-2011	00:09:00	28-11-2011	00:19:00	1	DK2
2011	29	3761,04	37F1	54,4647	1,9855	54,4712	1,9815	28-11-2011	00:27:00	28-11-2011	00:37:00	1	DK2
2011	30	3761,04	37F1	54,4707	1,9863	54,4655	1,9800	28-11-2011	00:46:00	28-11-2011	00:56:00	1	DK2
2011	31	3762,01	37F2	54,4562	2,1320	54,4567	2,1430	28-11-2011	02:08:00	28-11-2011	02:18:00	1	DK2
2011	32	3762,01	37F2	54,4600	2,1390	54,4533	2,1388	28-11-2011	02:47:00	28-11-2011	02:57:00	1	DK2
2011	33	3762,01	37F2	54,4588	2,1432	54,4550	2,1358	28-11-2011	03:22:00	28-11-2011	03:32:00	1	DK2
2011	34	3762,05	37F2	54,4908	2,3752	54,4935	2,3843	28-11-2011	05:01:00	28-11-2011	05:11:00	1	DK2
2011	35	3762,05	37F2	54,4912	2,3860	54,4930	2,3753	28-11-2011	05:19:00	28-11-2011	05:29:00	1	DK2
2011	36	3762,05	37F2	54,4952	2,3793	54,4895	2,3830	28-11-2011	05:36:00	28-11-2011	05:46:00	1	DK2
2011	37	3862,01	38F2	54,5815	2,1473	54,5868	2,1523	28-11-2011	17:14:00	28-11-2011	17:24:00	1	DK2
2011	38	3862,01	38F2	54,5845	2,1548	54,5828	2,1443	28-11-2011	17:33:00	28-11-2011	17:43:00	1	DK2
2011	39	3862,01	38F2	54,5857	2,1472	54,5805	2,1532	28-11-2011	17:49:00	28-11-2011	17:59:00	1	DK2
2011	40	3861,36	38F1	54,5778	1,8878	54,5778	1,8763	28-11-2011	19:29:00	28-11-2011	19:39:00	1	DK2
2011	41	3861,36	38F1	54,5817	1,8805	54,5750	1,8855	28-11-2011	19:48:00	28-11-2011	19:58:00	1	DK2
2011	42	3861,36	38F1	54,5755	1,8817	54,5808	1,8865	28-11-2011	20:06:00	28-11-2011	20:16:00	1	DK2
2011	43	3861,35	38F1	54,6370	1,6702	54,6405	1,6598	28-11-2011	22:25:00	28-11-2011	22:35:00	1	DK2
2011	44	3861,35	38F1	54,6433	1,6653	54,6358	1,6650	28-11-2011	22:43:00	28-11-2011	22:53:00	1	DK2
2011	45	3861,35	38F1	54,5755	1,8817	54,5808	1,8865	28-11-	23:02:00	28-11-	23:12:00	1	DK2

								2011		2011			
2011	46	3861,34	38F1	54,5308	1,3680	54,5280	1,3597	29-11-2011	02:07:00	29-11-2011	02:17:00	1	DK2
2011	47	3861,34	38F1	54,5310	1,3578	54,5273	1,3670	29-11-2011	02:27:00	29-11-2011	02:37:00	1	DK2
2011	48	3861,34	38F1	54,5265	1,3632	54,5335	1,3612	29-11-2011	02:46:00	29-11-2011	02:56:00	1	DK2
2011	49	3760,03	37F0	54,2120	0,8037	54,2180	0,7960	29-11-2011	17:56:00	29-11-2011	18:06:00	1	DK2
2011	50	3760,03	37F0	54,2172	0,8038	54,2128	0,7945	29-11-2011	18:17:00	29-11-2011	18:27:00	1	DK2
2011	51	3760,03	37F0	54,2118	0,7995	54,2182	0,7993	29-11-2011	18:38:00	29-11-2011	18:48:00	1	DK2
2011	52	3760,64	37F0	54,2582	0,7985	54,2642	0,7997	29-11-2011	19:17:00	29-11-2011	19:27:00	1	DK2
2011	53	3760,04	37F0	54,2637	0,8052	54,2615	0,7945	29-11-2011	19:39:00	29-11-2011	19:49:00	1	DK2
2011	54	3760,04	37F0	54,2652	0,8007	54,2580	0,8095	29-11-2011	20:02:00	29-11-2011	20:12:00	1	DK2
2011	55	3760,05	37F0	54,3127	0,9240	54,3170	0,9317	29-11-2011	20:55:00	29-11-2011	21:05:00	1	DK2
2011	56	3760,05	37F0	54,3152	0,9357	54,3155	0,9243	29-11-2011	21:15:00	29-11-2011	21:25:00	1	DK2
2011	57	3760,05	37F0	54,3170	0,9300	54,3127	0,9357	29-11-2011	21:35:00	29-11-2011	21:45:00	1	DK2
2011	58	3761,08	37F1	54,1903	1,5782	54,1875	1,5852	30-11-2011	00:47:00	30-11-2011	00:57:00	1	DK2
2011	59	3761,08	37F1	54,1867	1,5785	54,1937	1,5805	30-11-2011	01:07:00	30-11-2011	01:17:00	1	DK2
2011	60	3761,08	37F1	54,1912	1,5857	54,1878	1,5743	30-11-2011	01:26:00	30-11-2011	01:36:00	1	DK2
2011	61	3762,02	37F2	54,1478	2,0525	54,1507	2,0650	30-11-2011	04:13:00	30-11-2011	04:23:00	1	DK1
2011	62	3762,02	37F2	54,1530	2,0593	54,1460	2,0657	30-11-2011	04:47:00	30-11-2011	04:57:00	1	DK1
2011	63	3762,02	37F2	54,1468	2,0605	54,1523	2,0640	30-11-2011	05:05:00	30-11-2011	05:15:00	1	DK1
2011	64	3963,01	39F3	55,0888	3,4780	55,0842	3,4723	30-11-2011	16:59:00	30-11-2011	17:09:00	1	DK1
2011	65	3963,01	39F3	55,0860	3,4708	55,0872	3,4812	30-11-2011	17:18:00	30-11-2011	17:28:00	1	DK1
2011	66	3963,01	39F3	55,0850	3,4802	55,0885	3,4720	30-11-2011	17:37:00	30-11-2011	17:47:00	1	DK1
2011	67	3963,04	39F3	55,2663	3,7288	55,2613	3,7218	30-11-2011	19:36:00	30-11-2011	19:46:00	1	DK1
2011	68	3963,04	39F3	55,2645	3,7213	55,2623	3,7337	30-11-2011	19:55:00	30-11-2011	20:05:00	1	DK1
2011	69	3963,04	39F3	55,2612	3,7287	55,2670	3,7233	30-11-2011	20:14:00	30-11-2011	20:24:00	1	DK1
2011	70	3964,01	39F4	55,4182	4,0613	55,4207	4,0717	30-11-2011	22:12:00	30-11-2011	22:22:00	1	DK1
2011	71	3964,01	39F4	55,4188	4,0713	55,4207	4,0623	30-11-2011	22:32:00	30-11-2011	22:42:00	1	DK1
2011	72	3964,01	39F4	55,4228	4,0667	55,4160	4,0675	30-11-2011	22:52:00	30-11-2011	23:02:00	1	DK1
2011	73	3964,02	39F4	55,4157	4,3138	55,4185	4,3245	01-12-2011	00:06:00	01-12-2011	00:16:00	1	DK1
2011	74	3964,02	39F4	55,4150	4,3238	55,4170	4,3133	01-12-2011	00:26:00	01-12-2011	00:36:00	1	DK1
2011	75	3964,02	39F4	55,4192	4,3167	55,4128	4,3182	01-12-2011	00:46:00	01-12-2011	00:56:00	1	DK1
2011	76	3964,03	39F4	55,4813	4,4043	55,4852	4,4115	01-12-2011	01:50:00	01-12-2011	02:00:00	1	DK1
2011	77	3964,03	39F4	55,4835	4,4157	55,4842	4,4028	01-12-2011	02:09:00	01-12-2011	02:19:00	1	DK1
2011	78	3964,03	39F4	55,4860	4,4078	55,4813	4,4138	01-12-2011	02:30:00	01-12-2011	02:40:00	1	DK1
2011	79	4065,01	40F5	55,7793	5,0597	55,7822	5,0680	01-12-2011	17:23:00	01-12-2011	17:33:00	1	DK1
2011	80	4065,01	40F5	55,7635	5,0682	55,7825	5,0577	01-12-2011	17:43:00	01-12-2011	17:53:00	1	DK1
2011	81	4065,01	40F5	55,7833	5,0633	55,7775	5,0667	01-12-2011	18:02:00	01-12-2011	18:12:00	1	DK1
2011	82	4065,01	40F5	55,7787	5,0663	55,7827	5,0713	01-12-2011	18:35:00	01-12-2011	18:45:00	1	DK2

								2011		2011			
2011	83	4065,01	40F5	55,7783	5,0683	55,7837	5,0603	01-12-2011	19:07:00	01-12-2011	19:17:00	1	DK1
2011	84	4065,01	40F5	55,7827	5,0662	55,7772	5,0633	01-12-2011	19:30:00	01-12-2011	19:40:00	1	DK2
2011	85	4065,02	40F5	55,8872	5,1445	55,8925	5,1510	01-12-2011	20:55:00	01-12-2011	21:05:00	1	DK2
2011	86	4065,02	40F5	55,8905	5,1527	55,8920	5,1427	01-12-2011	21:17:00	01-12-2011	21:27:00	1	DK2
2011	87	4065,02	40F5	55,8928	5,1483	55,8868	5,1515	01-12-2011	21:36:00	01-12-2011	21:46:00	1	DK2
2011	88	4065,03	40F5	55,9962	5,2983	56,0007	5,3080	01-12-2011	23:01:00	01-12-2011	23:11:00	1	DK2
2011	89	4065,03	40F5	55,9980	5,3083	55,9988	5,2968	01-12-2011	23:21:00	01-12-2011	23:31:00	1	DK2
2011	90	4065,03	40F5	56,0005	5,3015	55,9945	5,3038	01-12-2011	23:40:00	01-12-2011	23:50:00	1	DK2
2011	91	4165,01	41F5	56,0258	5,2613	56,0308	5,2542	02-12-2011	00:17:00	02-12-2011	00:27:00	1	DK2
2011	92	4165,01	41F5	56,0305	5,2605	56,0247	5,2550	02-12-2011	00:37:00	02-12-2011	00:47:00	1	DK2
2011	93	4165,01	41F5	56,0267	5,2538	56,0292	5,2637	02-12-2011	00:58:00	02-12-2011	01:08:00	1	DK2
2011	94	4165,02	41F5	56,0588	5,2855	56,0645	5,2873	02-12-2011	01:32:00	02-12-2011	01:42:00	1	DK2
2011	95	4165,02	41F5	56,0635	5,2907	56,0603	5,2810	02-12-2011	01:53:00	02-12-2011	02:03:00	1	DK2
2011	96	4165,02	41F5	56,0638	5,2827	56,0595	5,2933	02-12-2011	02:12:00	02-12-2011	02:22:00	1	DK2
2011	97	4165,16	41F5	56,2957	5,5872	56,3017	5,5912	02-12-2011	04:15:00	02-12-2011	04:25:00	1	DK2
2011	98	4165,16	41F5	56,2998	5,5943	56,2978	5,5845	02-12-2011	04:35:00	02-12-2011	04:45:00	1	DK2
2011	99	4165,16	41F5	56,3013	5,5847	56,2972	5,5932	02-12-2011	04:54:00	02-12-2011	05:04:00	1	DK2
2011	100	4263,02	42F3	56,8150	3,7168	56,8118	3,7063	02-12-2011	17:15:00	02-12-2011	17:25:00	3	DK2
2011	101	4263,02	42F3	56,8137	3,7057	56,8130	3,7187	02-12-2011	17:41:00	02-12-2011	17:51:00	3	DK2
2011	102	4263,02	42F3	56,8110	3,7162	56,8155	3,7083	02-12-2011	18:05:00	02-12-2011	18:15:00	3	DK2
2011	103	4264,03	42F4	56,6683	4,1458	56,6657	4,1568	02-12-2011	20:42:00	02-12-2011	20:52:00	3	DK2
2011	104	4264,03	42F4	56,6638	4,1510	56,6703	4,1495	02-12-2011	21:03:00	02-12-2011	21:13:00	3	DK2
2011	105	4264,03	42F4	56,6692	4,1548	56,6650	4,1450	02-12-2011	21:24:00	02-12-2011	21:34:00	3	DK2
2011	106	4264,05	42F4	56,6640	4,4107	56,6632	4,4228	02-12-2011	22:58:00	02-12-2011	23:08:00	3	DK2
2011	107	4264,05	42F4	56,6608	4,4185	56,6663	4,4140	02-12-2011	23:19:00	02-12-2011	23:29:00	3	DK2
2011	108	4264,05	42F4	56,6670	4,4198	56,6615	4,4147	02-12-2011	23:41:00	02-12-2011	23:51:00	3	DK2
2011	109	4364,05	43F4	57,1583	4,7338	57,1547	4,7247	03-12-2011	05:02:00	03-12-2011	05:12:00	3	DK2
2011	110	4364,05	43F4	57,1565	4,7235	57,1558	4,7347	03-12-2011	05:25:00	03-12-2011	05:35:00	3	DK2
2011	111	4364,05	43F4	57,1532	4,7323	57,1583	4,7278	03-12-2011	05:46:00	03-12-2011	05:56:00	3	DK2
2011	112	4364,07	43F4	57,3027	4,5603	57,3003	4,5728	03-12-2011	21:25:00	03-12-2011	21:35:00	3	DK2
2011	113	4364,07	43F4	57,2988	4,5697	57,3033	4,5635	03-12-2011	21:46:00	03-12-2011	21:56:00	3	DK2
2011	114	4364,07	43F4	57,3033	4,5722	57,2992	4,5622	03-12-2011	22:05:00	03-12-2011	22:15:00	3	DK2
2011	115	4365,08	43F5	57,1350	5,2162	57,1290	5,2208	04-12-2011	01:25:00	04-12-2011	01:35:00	3	DK2
2011	116	4365,08	43F5	57,1282	5,2158	57,1333	5,2203	04-12-2011	01:47:00	04-12-2011	01:57:00	3	DK2
2011	117	4365,08	43F5	57,1325	5,2238	57,1302	5,2125	04-12-2011	02:10:00	04-12-2011	02:20:00	3	DK2
2011	118	4365,04	43F5	57,1412	5,4828	57,1425	5,4842	04-12-2011	03:49:00	04-12-2011	03:59:00	3	DK2
2011	119	4365,04	43F5	57,1432	5,4713	57,1375	5,4825	04-12-	04:08:00	04-12-	04:18:00	3	DK2

								2011		2011			
2011	120	4365,04	43F5	57,1383	5,4772	57,1447	5,4800	04-12-2011	04:29:00	04-12-2011	04:39:00	3	DK2
2011	121	4365,01	43F5	57,2520	5,5212	57,2562	5,5283	04-12-2011	05:40:00	04-12-2011	05:50:00	3	DK2
2011	122	4365,01	43F5	57,2550	5,5297	57,2558	5,5193	04-12-2011	06:04:00	04-12-2011	06:14:00	3	DK2
2011	123	4365,01	43F5	57,2568	5,5247	57,2517	5,5307	04-12-2011	06:23:00	04-12-2011	06:33:00	3	DK2
2011	124	4366,06	43F6	57,1022	6,1187	57,1008	6,1308	04-12-2011	16:03:00	04-12-2011	16:13:00	3	DK2
2011	125	4366,06	43F6	57,0988	6,1273	57,1055	6,1230	04-12-2011	16:28:00	04-12-2011	16:38:00	3	DK2
2011	126	4366,06	43F6	57,1035	6,1290	57,0992	6,1198	04-12-2011	16:51:00	04-12-2011	17:01:00	3	DK2
2011	127	4366,11	43F6	57,0767	6,6932	57,0713	6,6873	04-12-2011	19:31:00	04-12-2011	19:41:00	3	DK2
2011	128	4366,11	43F6	57,0753	6,6857	57,0712	6,6957	04-12-2011	19:51:00	04-12-2011	20:01:00	3	DK2
2011	129	4366,11	43F6	57,0712	6,6903	57,0775	6,6882	04-12-2011	20:12:00	04-12-2011	20:22:00	3	DK2
2011	130	4367,02	43F7	57,0432	6,9997	57,0402	7,0105	04-12-2011	21:43:00	04-12-2011	21:53:00	3	DK2
2011	131	4367,02	43F7	57,0392	7,0052	57,0450	7,0045	04-12-2011	22:03:00	04-12-2011	22:13:00	3	DK2
2011	132	4367,02	43F7	57,0442	7,0093	57,0408	7,0008	04-12-2011	22:23:00	04-12-2011	22:33:00	3	DK2
2011	133	4367,06	43F7	57,0515	7,1010	57,0517	7,1132	04-12-2011	23:30:00	04-12-2011	23:40:00	3	DK2
2011	134	4367,06	43F7	57,0490	7,1112	57,0533	7,1033	04-12-2011	23:48:00	04-12-2011	23:58:00	3	DK2
2011	135	4367,06	43F7	57,0540	7,1070	57,0475	7,1023	05-12-2011	00:06:00	05-12-2011	00:16:00	3	DK2
2011	136	4367,16	43F7	57,0908	7,4312	57,0907	7,4430	05-12-2011	01:43:00	05-12-2011	01:53:00	3	DK2
2011	137	4367,16	43F7	57,0880	7,4417	57,0930	7,4328	05-12-2011	02:02:00	05-12-2011	02:12:00	3	DK2
2011	138	4367,16	43F7	57,0935	7,4390	57,0880	7,4352	05-12-2011	02:19:00	05-12-2011	02:29:00	3	DK2
2011	139	4367,23	43F7	57,0817	7,6657	57,0805	7,6780	05-12-2011	03:18:00	05-12-2011	03:28:00	3	DK2
2011	140	4367,23	43F7	57,0773	7,6740	57,0835	7,6705	05-12-2011	03:37:00	05-12-2011	03:47:00	3	DK2
2011	141	4367,23	43F7	57,0830	7,6772	57,0785	7,6687	05-12-2011	03:54:00	05-12-2011	04:04:00	3	DK2
2011	142	4368,03	43F8	57,2063	8,5050	57,2075	8,5277	05-12-2011	16:42:00	05-12-2011	16:52:00	3	DK2
2011	143	4368,03	43F8	57,2043	8,5252	57,2070	8,5168	05-12-2011	17:07:00	05-12-2011	17:17:00	3	DK2
2011	144	4368,03	43F8	57,2097	8,5173	57,2033	8,5213	05-12-2011	17:31:00	05-12-2011	17:41:00	3	DK2
2011	145	4368,04	43F8	57,2898	8,7272	57,2903	8,7402	05-12-2011	18:50:00	05-12-2011	19:00:00	3	DK2
2011	146	4368,04	43F8	57,2880	8,7388	57,2982	8,7295	05-12-2011	19:12:00	05-12-2011	19:22:00	3	DK2
2011	147	4368,04	43F8	57,2933	8,7328	57,2870	8,7340	05-12-2011	19:33:00	05-12-2011	19:43:00	3	DK2
2011	148	4368,05	43F8	57,3685	8,5378	57,3673	8,5487	05-12-2011	21:33:00	05-12-2011	21:43:00	3	DK2
2011	149	4368,05	43F8	57,3650	8,5490	57,3698	8,5397	05-12-2011	21:55:00	05-12-2011	22:05:00	3	DK2
2011	150	4368,05	43F8	57,3715	8,5438	57,3653	8,5433	05-12-2011	22:17:00	05-12-2011	22:27:00	3	DK2
2011	151	4368,06	43F8	57,4065	8,6308	57,4050	8,6422	05-12-2011	23:11:00	05-12-2011	23:21:00	3	DK2
2011	152	4368,06	43F8	57,4028	8,6427	57,4075	8,6333	05-12-2011	23:32:00	05-12-2011	23:42:00	3	DK2
2011	153	4368,06	43F8	57,4085	8,6372	57,4022	8,6377	05-12-2011	23:52:00	06-12-2011	00:02:00	3	DK2
2011	154	4368,07	43F8	57,4153	8,5983	57,4143	8,6100	06-12-2011	00:32:00	06-12-2011	00:42:00	3	DK2
2011	155	4368,07	43F8	57,4118	8,6105	57,4163	8,6010	06-12-2011	00:54:00	06-12-2011	01:04:00	3	DK2
2011	156	4368,07	43F8	57,4175	8,6050	57,4112	8,6053	06-12-	01:14:00	06-12-	01:24:00	3	DK2

								2011		2011			
2011	157	4368,08	43F8	57,4655	8,7087	57,4652	8,7217	06-12-2011	02:28:00	06-12-2011	02:38:00	3	DK2
2011	158	4368,08	43F8	57,4632	8,7203	57,4673	8,7110	06-12-2011	02:49:00	06-12-2011	02:59:00	3	DK2
2011	159	4368,08	43F8	57,4680	8,7158	57,4623	8,7153	06-12-2011	03:09:00	06-12-2011	03:19:00	3	DK2
2011	160	4469,02	44F9	57,5732	9,5272	57,5745	9,5412	06-12-2011	16:58:00	06-12-2011	17:08:00	3	DK2
2011	161	4469,02	44F9	57,5707	9,5413	57,5752	9,5357	06-12-2011	17:19:00	06-12-2011	17:29:00	3	DK2
2011	162	4469,02	44F9	57,5760	9,5390	57,5712	9,5318	06-12-2011	17:42:00	06-12-2011	17:52:00	3	DK2
2011	163	4469,03	44F9	57,6152	9,3083	57,6175	9,3182	06-12-2011	20:06:00	06-12-2011	20:16:00	3	DK2
2011	164	4469,03	44F9	57,6153	9,3170	57,6192	9,3073	06-12-2011	20:26:00	06-12-2011	20:36:00	3	DK2
2011	165	4469,03	44F9	57,6218	9,3102	57,6138	9,3127	06-12-2011	20:43:00	06-12-2011	20:53:00	3	DK2
2011	166	4469,01	44F9	57,5225	9,2247	57,5255	9,2363	07-12-2011	02:45:00	07-12-2011	02:55:00	3	DK2
2011	167	4469,01	44F9	57,5222	9,2483	57,5263	9,2278	07-12-2011	03:05:00	07-12-2011	03:15:00	3	DK2
2011	168	4469,01	44F9	57,5280	9,2320	57,5213	9,2268	07-12-2011	03:26:00	07-12-2011	03:36:00	3	DK2
2011	169	4369,01	43F9	57,4778	9,1448	57,4723	9,1342	07-12-2011	04:24:00	07-12-2011	04:34:00	3	DK2
2011	170	4369,01	43F9	57,4745	9,1327	57,4757	9,1442	07-12-2011	04:42:00	07-12-2011	04:52:00	3	DK2
2011	171	4369,01	43F9	57,4723	9,1448	57,4762	9,1353	07-12-2011	04:59:00	07-12-2011	05:09:00	3	DK2
2011	172	4368,01	43F8	57,1003	8,4425	57,1002	8,4297	07-12-2011	16:42:00	07-12-2011	16:52:00	3	DK2
2011	173	4368,01	43F8	57,0863	8,4317	57,0890	8,4398	07-12-2011	17:00:00	07-12-2011	17:10:00	3	DK2
2011	174	4368,01	43F8	57,0968	8,4325	57,1023	8,4385	07-12-2011	17:19:00	07-12-2011	17:29:00	3	DK2
2011	175	4368,02	43F8	57,0653	8,3583	57,0660	8,3463	07-12-2011	18:05:00	07-12-2011	18:15:00	3	DK2
2011	176	4368,02	43F8	57,0688	8,3485	57,0628	8,3543	07-12-2011	18:23:00	07-12-2011	18:33:00	3	DK2
2011	177	4368,02	43F8	57,0627	8,3488	57,0685	8,3540	07-12-2011	18:41:00	07-12-2011	18:51:00	3	DK2
2011	178	4267,25	42F7	56,9823	7,7032	56,9827	7,6900	07-12-2011	22:04:00	07-12-2011	22:14:00	3	DK2
2011	179	4267,25	42F7	56,9852	7,6922	56,9803	7,7008	07-12-2011	22:22:00	07-12-2011	22:32:00	3	DK2
2011	180	4267,25	42F7	56,9788	7,6952	56,9850	7,6977	07-12-2011	22:40:00	07-12-2011	22:50:00	3	DK2
2011	181	4267,27	42F7	56,9135	7,6108	56,9122	7,5985	07-12-2011	23:41:00	07-12-2011	23:51:00	3	DK2
2011	182	4267,27	42F7	56,9150	7,5982	56,9107	7,6087	07-12-2011	23:49:00	07-12-2011	23:59:00	3	DK2
2011	183	4267,27	42F7	56,9090	7,6033	56,9158	7,6038	08-12-2011	00:07:00	08-12-2011	00:17:00	3	DK2
2011	184	4267,12	42F7	56,9408	7,4353	56,9413	7,4235	08-12-2011	01:06:00	08-12-2011	01:16:00	3	DK2
2011	185	4267,12	42F7	56,9437	7,4257	56,9388	7,4335	08-12-2011	01:24:00	08-12-2011	01:34:00	3	DK2
2011	186	4267,12	42F7	56,9382	7,4257	56,9450	7,4318	08-12-2011	01:43:00	08-12-2011	01:53:00	3	DK2

## Achievements

## Types of data collected

- GPS Positions
- Depth
- Dredge (sand eels; species, weight, length)

## Achievements in 2011:

- 18 days at sea (planned: 18)
- 61 locations, (32 in area 1 and 29 in area 3), priority 1 = 54 and priority 0 = 7.  
Planned: 55 with priority 1 and 13 with priority 0)



## Methods

On each sampling location three hauls were carried out with the modified mussel dredge according to descriptions for fishing with modified mussel dredge used since 2004. The DK II dredge was used as the primary gear and the DK I dredge served as ' back-up '.

On new sample locations sediment samples should have been conducted with a Van Veen grab (0.2m<sup>2</sup>), for the determination of grain size composition i.e. whether the bottom could be classified as a suitable habitat for sand eel (e.g. could a very fine-grained sediment be unfit as overwintering habitat). This was however not possible due to the weather conditions.

### Time of sampling

Sand eels survive the winter by burying in the seabed, but can under some circumstances be forced to seek food in the water column. In these cases, the food search is almost exclusively carried out in daylight. In order to ensure that as large and constantly a fraction of sand eels as possible is available for the fishing gear the fishing was therefore exclusively done during darkness (i.e. optimizing the constancy of the catch ability). Sailing between sampling locations were hence, if possible, done during the light hours of the day.

### Prioritization of the sampling

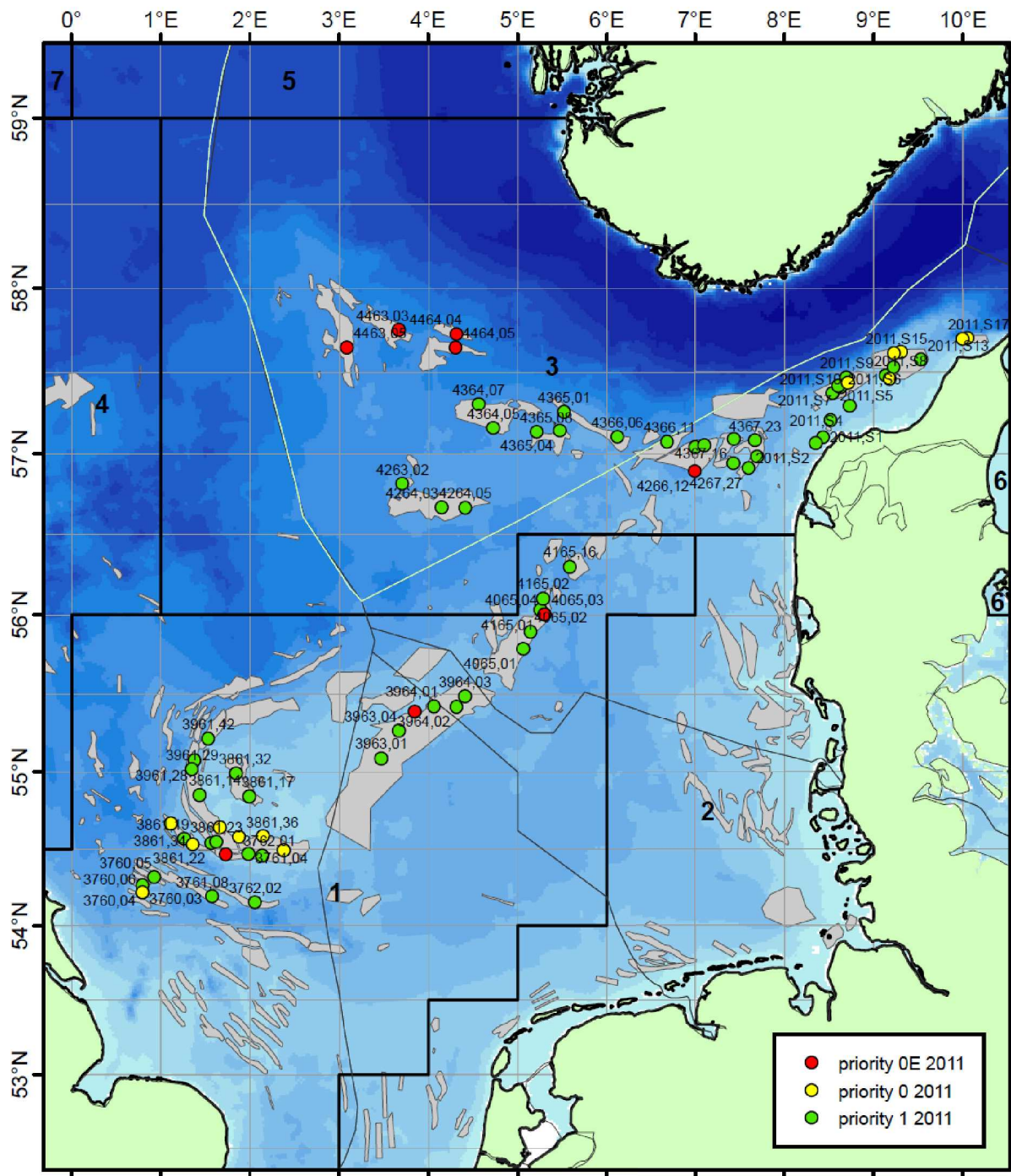
It was sought after, that samples should be collected from all of the planned positions indicated on the map (Figure 1). In the event of problems causing exclusion of locations, e.g. by bad weather, the highest priority (1) was given to the locations where samples had been collected during previous sand eel surveys or where the samples were considered to provide important information for a specific area. Lowest priority (0) was given to the positions where only a few previous sand eel cruises had taken samples or where the samples were not considered to have important information for a specific area. The organization of the sampling (sail route) was done, so time spent sailing between locations was minimized.

### Processing of samples at sea

- Greater sand eel (*Hyperoplus lanceolatus*) and Smooth sand eel (*Gymnamodytes semisquamatus*) were identified at sea and discarded to separate sample bags. Small sand eel (*Ammodytes tobianus*) were not separated, and thus measured together with the lesser sand eel and first identified on land.
- Numbers of sand eels (total or sample) was recorded in a station scheme for each haul.
- One of the 3 hauls for each sample location was processed at sea
- All sand eels (or a sample) was length measured to the nearest half cm (scm) and the results were introduced in a graduated scheme.
- The fish were gathered in bags for each scm group, for each haul, which again were gathered for each location.

### Bottom contact

In order to be able to carry out an assessment of the individual hauls validity (in addition to the skipper's assessment of the haul quality) various forms of technical means for the determination of the dredge's contact with the bottom were used. There were mechanical bottom contacts fitted on both the dredges, each connected to a log, which registered contact/no contact each second. This enabled the calculation of the part of the haul where the dredge had bottom contact. This was used to exclude hauls with a low bottom contact frequency from the later data analysis. In addition an underwater video system (developed in 2008 and 2009) and further tested in 2010 was tested for use as verification for the quality of the hauls.



**Figure 1.** All planned sampling locations for sand eel area 1 and 3. The colours indicate relative priority (red = priority 0E (excluded), yellow = low priority 0 and green = high priority 1).

## Results

The sand eel dredge survey in sand eel areas 1 and 3 was carried out in accordance with the cruise program in the period from 24. November 2011 – 8. December 2011. 61 locations were sampled; 32 in area 1 and 29 in area 3. Catches of sand eel were generally larger in area 1 than in area 3. The average catch rates (CPUE) were, however, for both areas smaller than in 2009 and 2010. Catches for areas merged was around 40% of the catches (number of) in 2009. The share of 0 group sand eel in the catches in both areas

was very low, in particular in area 1, which in conjunction with catch rates indicates a small recruiting of sandeel. Bottom contact sensors and underwater video system was used for the validation of the bottom contact and hence as a quality assurance of each haul.

The survey was conducted during critical weather conditions i.e. strong winds prevailing throughout most of the survey.

Resampling of some of the locations was done during good weather conditions 3 weeks after the first sampling to study possible weather effects on the catch rates. The catch rates were very high compared to the 1. sampling though the fraction of 0 age group in the catches was still small. Real Time Monitoring of the fishery during the fishing season was suggested as a consequence of the bad weather conditions.

**Table 2.** Catch rates in the table shows number of sand eels per 1 hour of fishing (all age- and length groups) for each location. Catch rates cannot be compared between surveys due to variations in seasons, geographical coverage and type of gear.

Survey location	lon	lat	ICES square	16/99 (99 yc)	(03 yc)	E-400 (03 yc)	E349 (04 yc)	E349 (05 yc)	L151 (06 yc)	L151 (07 yc)	L151 (08 yc)	R500 (09 yc)	R500 (10 yc)	R500 (11yc)	Area	Sand-eel Area
3760,03	0,8387	54,2057	37F0					617	2708	528	528	546	1488	1252	Dogger	1
3760,04	0,799	54,2625	37F0					510	894	448	528	302	1062	822		
3760,05	0,9283	54,316	37F0					1871	1278	124	846	236	1800	170		
3761,04	1,984	54,4676	37F1			541	1744	3024	691	3920		11350	1666	12138		
3761,08	1,5788	54,1897	37F1					264	1598	1876	785	736	1938	84		
3762,01	2,1399	54,4574	37F2			138					1036	2618	4186	14510		
3762,02	2,0599	54,1496	37F2			581	305	3116	3967	3738	565	614	534	242		
3862,01	2,147	54,5808	38F2									480	1694	848		
3861,17	1,9958	54,8393	38F1									1552	2156	1196		
3961,42	1,5318	55,212	39F1									7638	4598	332		
3861,02	1,1151	54,6663	38F1		11	4		40		12	4		14	-		
3861,14	1,4332	54,8496	38F1		875	215	227	5496	1895	1828	836	4262	5806	622		
3861,19	1,264	54,5674	38F1			191	218	4143	4196	1636	2326	13054	11804	2044		
3861,22	1,5716	54,5385	38F1			112	218	2472	342	662	474	2180	1792	922		
3861,23	1,6227	54,5455	38F1			474		3955	1292	1382	1590	6444	6180	1776		
3861,32	1,847	54,9882	38F1	978	1774	155	656	1549		4050	5660	5796	4572	3822		
3961,28	1,3815	55,0751	39F1	783	269	59	672	7576	4601	680	1380	13962	5934	716		
3961,29	1,3516	55,0173	39F1	64	55	47	243	798	23	136		378	962	86		
3861,34	1,3632	53,5292	38F1										5670	2734		
3861,35	1,6643	54,6388	38F1										1466	1572		
3861,36	1,8823	54,5783	38F1										1048	616		
3762,05	2,3799	54,4919	37F2										20610	626		
3963,01	3,4759	55,0867	39F3			290	410	2594	54	380	22	1300	360	30		
3963,04	3,7258	55,2636	39F3	37		555	19	813		80	14	208	94	80		
3964,01	4,0654	55,4183	39F4		5179	2064	2743	5601	3457	9404	292	6826	3410	1024		
3964,02	4,3171	55,4162	39F4				1424	603		3270	62	3952	334	174		
3964,03	4,4102	55,4834	39F4		8162	913	4054	541	419	8046	140	2584	356	486		
4065,01	5,0642	55,7814	40F5		863		493	244	74	4822	72	1344	224	884		
4065,02	5,1483	55,8906	40F5		3657	83	567	1151	318	5556	370	3200	990	1744		
															Tail End	

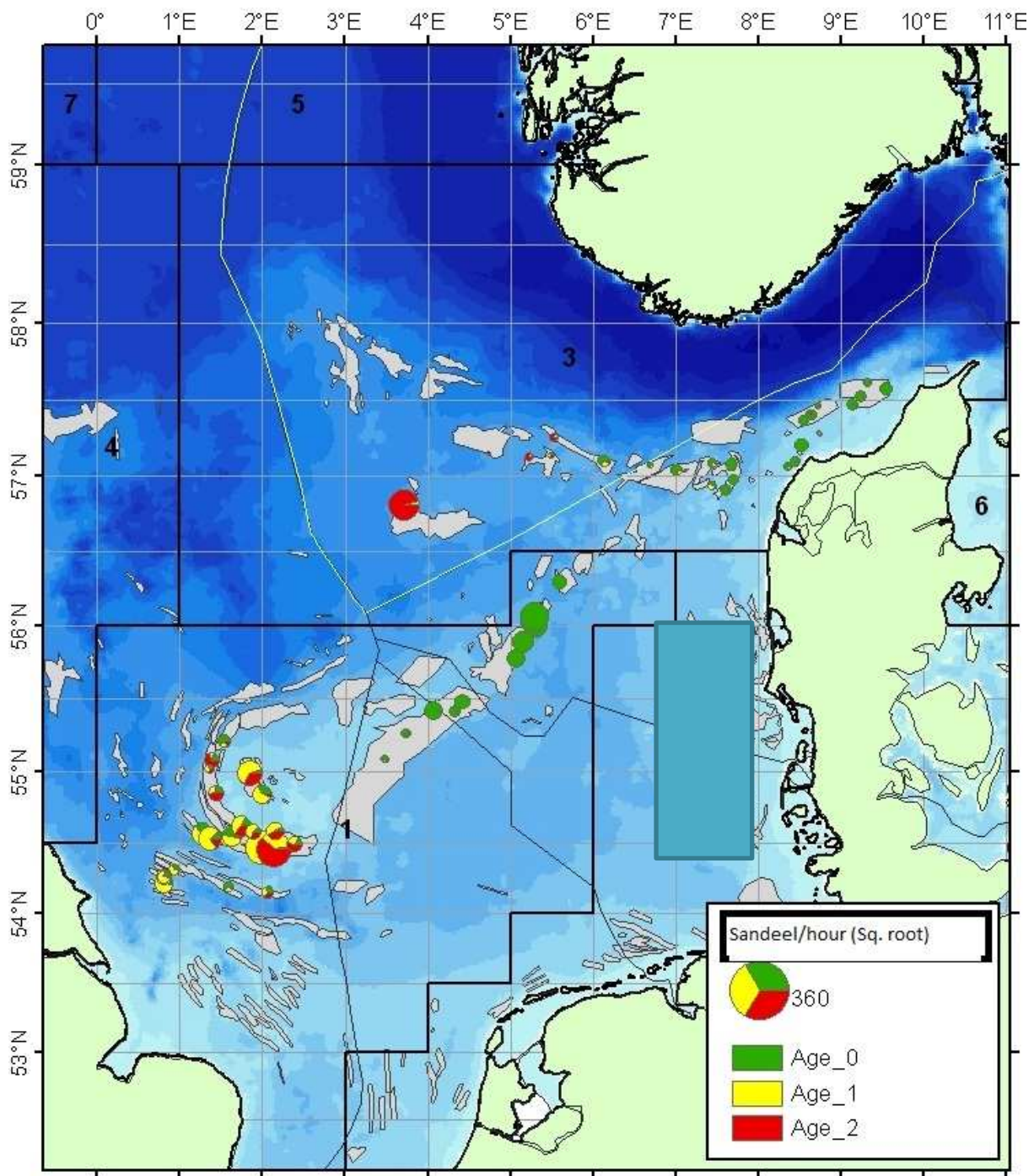
4065,03	5,2485	55,9655	40F5		628			1768	1637	3056	282	9380	436	2270	
4165,01	5,2586	56,0282	41F5		3147	186	1034	2975	432	4496	2316	3888	434	3258	
4165,02	5,2862	56,0621	41F5		3888	80	634	2147	670	7852	652	6640	372	5538	
4165,16	5,5873	56,2968	41F5								422	3194	494	372	
4267,12	7,4297	56,942	42F7	184	455	175	91	419		134	216	584	46	60	
4267,25	7,6965	56,9826	42F7	72	146	50	81	400	1030	404	246	122	60	114	
4267,27	7,6037	56,9126	42F7		68				288	210	86	50	80	126	
4367,02	7,0039	57,0422	43F7	175	118			801	1518	884		114	54	116	
4367,06	7,1047	57,0516	43F7		553						96	184	100	44	
4367,16	7,4368	57,0909	43F7	200	3169	242		201		792	42	300	78	80	
4367,23	7,6716	57,081	43F7		381		117		404	370	128	98	62	204	
4366,11	6,6878	57,0742	43F6									128	22	12	
4365,04	5,4767	57,1417	43F5						926	486	268	1406	178	14	
4366,06	6,125	57,1017	43F6						1566	524	1426	552	398	230	
4263,02	3,7117	56,8133	42F3						520	8556	9654	7324	2532	9020	
4264,03	4,15	56,6667	42F4							26	366	0	210	0	
4264,05	4,4167	56,6633	42F4						0	26	830	0	4	0	
4365,08	5,2183	57,1317	43F5						1524	2728	1260	2830	1042	46	
4365,01	5,525	57,255	43F5						1784	188		608	178	70	
4364,05	4,7283	57,1567	43F4								30	198	8	2	
4364,07	4,5667	57,3017	43F6							8	6	128	2	0	
4463,03	3,6717	57,75	44F3							10				-	
4464,04	4,3167	57,725	44F4							300	80			-	
4464,05	4,31	57,645	44F4							336	62			-	
4463,05	3,0883	57,645	44F3											-	
2011-S1	8,4358	57,1	43F8											176	
2011-S2	8,3517	57,0658	43F8											76	
2011-S3	8,5208	57,2058	43F8											282	
2011-S4	8,7333	57,29	43F8											0	
2011-S5	8,5433	57,3683	43F8											120	
2011-S6	8,6367	57,4052	43F8											270	
2011-S7	8,6042	57,4142	43F8											26	
2011-S8	9,1383	57,475	43F9											154	
2011-S9	8,7008	57,465	43F8											18	
2011-S10	8,7142	57,4325	43F8											-	
2011-S11	9,1858	57,4558	43F9											-	
2011-S12	9,23	57,525	44F9											166	
2011-S13	9,5342	57,5725	44F9											266	
2011-S14	9,31	57,6175	44F9											46	
2011-S15	9,2317	57,6117	44F9											-	
2011-S16	10,055	57,7017	44G0											-	
2011-S17	10,0017	57,695	44G0											-	
All positions	Average			312	1758	341	798	1997	1290	2061	909	2873	1991	1225	

Little Fisher

N EEZ

Skagerrak





**Figure 2.** Survey map showing sampling locations and the corresponding CPUE (Sq. root) for sandeels age 0, 1 and 2.