

DTU Aqua



Cruise Report "20.9.2010, 20-11-8.12.2010, jnr 10/11676"

North Sea Sandeel Dredge Survey, Sand eel Area 1 and 3, 2010

Vessel: R500 / Pernille Kim

Cruise dates (planned): 22.11.2010 – 4.12.2010

Cruise number: 2010

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

Port of departure:	Thyborøn	Date:	22.11.2010
Port of return:	Thyborøn	Date:	4.12.2010
Other ports:	-	Date and justification:	

Participants

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

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 2010 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 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 22.11.2010 at 14.00 hrs. and arrived Thyborøn harbor 4.12.2010 at 00.30 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.

Date	Pos_no	ICES sq.	Sand-eel Area	Station	Gear	Start_UTC	End_UTC	Start_lon	Start_lat	End_lon	End_lat	Depth_m	Remarks
23-11-2010	3964-03	39F4	1	1	DK2	04:07:00	04:17:00	042495	552913	042439	552891	30	Valid
23-11-2010	3964-03	39F4	1	2	DK2	04:29:00	04:39:00	042436	552905	042500	552891	30	Valid
23-11-2010	3964-03	39F4	1	3	DK2	04:47:00	04:57:00	042465	552865	042461	552923	30	Valid
23-11-2010	3964-02	39F4	1	4	DK2	05:40:00	05:50:00	041923	552507	041868	552482	34	Invalid
23-11-2010	3964-02	39F4	1	5	DK2	05:59:00	06:09:00	041893	552496	041953	552487	34	Valid
23-11-2010	3964-02	39F4	1	6	DK2	06:16:00	06:26:00	041914	552481	041892	552519	34	Valid
23-11-2010	3964-02	39F4	1	7	DK2	06:35:00	06:45:00	041918	552515	041882	552482	34	Valid
23-11-2010	3861-17	38F1	1	8	DK2	16:20:00	16:30:00	015985	545048	015918	545054	21	Valid
23-11-2010	3861-17	38F1	1	9	DK2	16:37:00	16:47:00	015947	545071	015966	545035	21	Valid

23-11-2010	3861-17	38F1	1	10	DK2	16:55:00	17:05:00	015935	545035	015972	545065	22	Valid
23-11-2010	3861-32	38F1	1	11	DK2	18:22:00	18:32:00	015107	545915	015068	545949	26	Valid
23-11-2010	3861-32	38F1	1	12	DK2	18:40:00	18:50:00	015100	545947	015068	545913	26	Valid
23-11-2010	3861-32	38F1	1	13	DK2	18:58:00	19:08:00	015057	545925	015116	545932	26	Valid
23-11-2010	3961-18	39F1	1	14	DK2	21:06:00	21:16:00	013230	551263	013169	551282	33	Valid
23-11-2010	3961-18	39F1	1	15	DK2	21:24:00	21:34:00	013201	551289	013207	551270	34	Valid
23-11-2010	3961-18	39F1	1	16	DK2	21:42:00	21:52:00	013186	551262	013240	551280	34	Valid
23-11-2010	3961-28	39F1	1	17	DK2	23:39:00	23:49:00	012289	550470	012287	550432	33	Valid
23-11-2010	3961-28	39F1	1	18	DK2	23:59:00	00:09:00	012259	550443	012322	550456	33	Valid
24-11-2010	3961-28	39F1	1	19	DK2	00:18:00	00:28:00	012313	550438	012256	550466	33	Valid
24-11-2010	3961-29	39F1	1	20	DK2	01:06:00	01:16:00	012131	550119	012089	550083	30	Valid
24-11-2010	3961-29	39F1	1	21	DK2	01:24:00	01:34:00	012061	550095	012120	550104	30	Valid
24-11-2010	3961-29	39F1	1	22	DK2	01:44:00	01:54:00	012125	550085	012098	550115	30	Valid
24-11-2010	3861-14	38F1	1	23	DK2	03:17:00	03:27:00	012584	545116	012620	545080	22	Valid
24-11-2010	3861-14	38F1	1	24	DK2	03:37:00	03:47:00	012586	545078	012619	545112	22	Valid
24-11-2010	3861-14	38F1	1	25	DK2	03:57:00	04:07:00	012635	545091	012567	545102	22	Valid
24-11-2010	3861-02	38F1	1	26	DK2	16:45:00	16:55:00	010661	543981	010709	544006	34	Valid
24-11-2010	3861-02	38F1	1	27	DK2	17:03:00	17:13:00	010724	543992	010658	544003	34	Valid
24-11-2010	3861-02	38F1	1	28	DK2	17:20:00	17:30:00	010683	544009	010704	543978	34	Valid
24-11-2010	3861-19	38F1	1	29	DK2	18:58:00	19:08:00	011608	543388	011566	543421	25	Valid
24-11-2010	3861-19	38F1	1	30	DK2	19:17:00	19:27:00	011610	543417	011560	543400	25	Valid
24-11-2010	3861-19	38F1	1	31	DK2	19:38:00	19:48:00	011555	543399	011626	543404	25	Valid
24-11-2010	2010-01	38F1	1	32	DK2	20:37:00	20:47:00	012206	543186	012149	543166	27	Valid
24-11-2010	2010-01	38F1	1	33	DK2	20:56:00	21:06:00	012141	543178	012212	543170	28	Valid
24-11-2010	2010-01	38F1	1	34	DK2	21:15:00	21:25:00	012197	543157	012165	543191	29	Valid
24-11-2010	2010-01	38F1	1	35	Van Veen	21:35:00		012184	543178			28	Valid
24-11-2010	2010-01	38F1	1	36	Van Veen	21:40:00		012182	543174			28	Valid
24-11-2010	2010-01	38F1	1	37	Van Veen	21:45:00		012177	543170			28	Valid
24-11-2010	3861-22	38F1	1	38	DK2	22:43:00	22:53:00	013394	543236	013460	543227	23	Valid
24-11-2010	3861-22	38F1	1	39	DK2	23:01:00	23:11:00	013432	543216	013421	543253	23	Valid
24-11-2010	3861-22	38F1	1	40	DK2	23:19:00	23:29:00	013445	543248	013411	543215	23	Valid
24-11-2010	3861-23	38F1	1	41	DK2	23:51:00	00:01:00	013718	543265	013766	543290	19	Valid
25-11-2010	3861-23	38F1	1	42	DK2	00:09:00	00:19:00	013768	543271	013702	543285	19	Valid
25-11-2010	3861-23	38F1	1	43	DK2	00:27:00	00:37:00	013725	543292	013752	543257	19	Valid
25-11-2010	3761-04	37F1	1	44	DK2	02:17:00	02:27:00	015878	542815	015936	542798	16	Valid
25-11-2010	3761-04	37F1	1	45	DK2	02:36:00	02:46:00	015892	542787	015912	542826	16	Valid
25-11-2010	3761-04	37F1	1	46	DK2	02:53:00	03:03:00	015934	542817	015878	542798	16	Valid
25-11-2010	3762-01	37F2	1	47	DK2	03:55:00	04:05:00	020795	542738	020868	542739	15	Valid
25-11-2010	3762-01	37F2	1	48	DK2	04:13:00	04:23:00	020852	542724	020812	542784	15	Valid
25-11-2010	3762-01	37F2	1	49	DK2	04:30:00	04:40:00	020841	542754	020806	542721	15	Valid
25-11-2010	3760-03	37F0	1	50	DK2	16:48:00	16:58:00	004781	541256	004798	5414304	25-50	Valid
25-11-2010	3760-03	37F0	1	51	DK2	17:07:00	17:17:00	004818	541298	994765	541278	25-50	Valid
25-11-2010	3760-03	37F0	1	52	DK2	17:25:00	17:35:00	004753	541293	004820	541289	25-50	Valid
25-11-2010	3760-04	37F0	1	53	DK2	18:06:00	18:16:00	004793	541553	004799	541591	35-65	Valid
25-11-2010	3760-04	37F0	1	54	DK2	18:26:00	18:36:00	004821	541582	004749	541589	35-65	Valid
25-11-2010	3760-04	37F0	1	55	DK2	18:49:00	18:59:00	004774	541581	004800	541544	35-65	Valid
25-11-2010	3760-05	37F0	1	56	DK2	19:56:00	20:06:00	005599	541901	005537	541885	38-60	Valid
25-11-2010	3760-05	37F0	1	57	DK2	20:14:00	20:24:00	005547	541902	005604	541876	38-60	Valid

25-11-2010	3760-05	37F0	1	58	DK2	20:33:00	20:43:00	005572	541873	005576	541916	38-60	Valid
25-11-2010	3761-08	37F1	1	59	DK2	23:40:00	23:50:00	013449	541149	013507	541127	27	Valid
25-11-2010	3761-08	37F1	1	60	DK2	23:58:00	00:08:00	013471	541120	013480	541161	27	Valid
26-11-2010	3761-08	37F1	1	61	DK2	00:15:00	00:25:00	013503	541150	013443	541126	27	Valid
26-11-2010	3762-02	37F2	1	62	DK2	02:42:00	02:52:00	020322	540899	020387	540894	23	Valid
26-11-2010	3762-02	37F2	1	63	DK2	03:00:00	03:10:00	020366	540880	020343	540919	23	Valid
26-11-2010	3762-02	37F2	1	64	DK2	03:17:00	03:27:00	020369	540919	020348	540877	23	Valid
26-11-2010	2010-02	38F1	1	65	DK2	17:32:00	17:42:00	013940	543849	014000	543829	18	Valid
26-11-2010	2010-02	38F1	1	66	DK2	17:53:00	18:03:00	013989	543816	013984	543862	18	Valid
26-11-2010	2010-02	38F1	1	67	DK2	18:11:00	18:21:00	014007	543850	013970	543816	19	Valid
26-11-2010	2010-02	38F1	1	68	Van Veen			013973	543830			21	Valid
26-11-2010	2010-02	38F1	1	69	Van Veen			013964	543829			21	Valid
26-11-2010	2010-02	38F1	1	70	Van Veen			013956	543828			21	Valid
26-11-2010	2010-03	38F1	1	71	DK2	19:59:00	20:09:00	015268	543485	015318	543455	21	Valid
26-11-2010	2010-03	38F1	1	72	DK2	20:16:00	20:26:00	015294	543450	015305	543491	21	Valid
26-11-2010	2010-03	38F1	1	73	DK2	20:35:00	20:45:00	015328	543485	015268	543458	21	Valid
26-11-2010	2010-03	38F1	1	74	Van Veen			015274	543467			23	Valid
26-11-2010	2010-03	38F1	1	75	Van Veen			015266	543467			22	Valid
26-11-2010	2010-03	38F1	1	76	Van Veen			015262	543467			21	Valid
26-11-2010	3862-01	38F2	1	77	DK2	22:54:00	23:04:00	020918	543492	020856	543515	18	Valid
26-11-2010	3862-01	38F2	1	78	DK2	23:10:00	23:20:00	020882	543521	020893	543481	18	Valid
26-11-2010	3862-01	38F2	1	79	DK2	23:27:00	23:37:00	020859	543494	020924	543511	18	Valid
27-11-2010	2010-04	37F2	1	80	DK2	01:10:00	01:20:00	022257	542964	022304	542937	17	Valid
27-11-2010	2010-04	37F2	1	81	DK2	01:30:00	01:40:00	022268	542931	022290	542969	17	Valid
27-11-2010	2010-04	37F2	1	82	DK2	01:49:00	01:59:00	022309	542963	022248	542943	17	Valid
27-11-2010	2010-04	37F2	1	83	Van Veen			022240	542954			16	Valid
27-11-2010	2010-04	37F2	1	84	Van Veen			022239	542956			16	Valid
27-11-2010	2010-04	37F2	1	85	Van Veen			022230	542956			16	Valid
27-11-2010	3963-01	39F3	1	86	DK2	16:26:00	16:36:00	032833	550504	032874	550539	30	Valid
27-11-2010	3963-01	39F3	1	87	DK2	16:47:00	16:57:00	032882	550525	032813	550513	30	Valid
27-11-2010	3963-01	39F3	1	88	DK2	17:03:00	17:13:00	032823	550530	032880	550513	30	Valid
27-11-2010	3963-04	39F3	1	89	DK2	19:49:00	19:59:00	032327	551577	034397	551590	32	Valid
27-11-2010	3963-04	39F3	1	90	DK2	19:05:00	19:15:00	034386	551574	034319	551590	32	Valid
27-11-2010	3963-04	39F3	1	91	DK2	19:22:00	19:32:00	034352	551600	034349	551560	32	Valid
27-11-2010	3964-01	39F4	1	92	DK2	21:38:00	21:48:00	040420	552514	040351	552514	26	Valid
27-11-2010	3964-01	39F4	1	93	DK2	21:59:00	22:09:00	040382	552531	040417	552499	26	Valid
27-11-2010	3964-01	39F4	1	94	DK2	22:16:00	22:26:00	040385	552492	040407	552529	26	Valid
28-11-2010	4065-01	40F5	1	95	DK2	03:37:00	03:47:00	050358	554688	050428	554695	33	Valid
28-11-2010	4065-01	40F5	1	96	DK2	03:55:00	04:05:00	050403	554677	050352	554704	33	Valid
28-11-2010	4065-01	40F5	1	97	DK2	04:14:00	04:24:00	050384	554710	050383	554673	33	Valid
28-11-2010	4065-02	40F5	1	98	DK2	16:35:00	16:45:00	050855	555338	050921	555345	34	Valid
28-11-2010	4065-02	40F5	1	99	DK2	16:54:00	17:04:00	050913	555328	050862	555355	34	Valid
28-11-2010	4065-02	40F5	1	100	DK2	17:11:00	17:21:00	050890	555366	050888	555328	34	Valid
28-11-2010	4065-03	40F5	1	101	DK2	18:28:00	18:38:00	051801	555983	051853	560005	41	Valid
28-11-2010	4065-03	40F5	1	102	DK2	18:46:00	18:56:00	051843	555986	051773	555996	41	Valid
28-11-2010	4065-03	40F5	1	103	DK2	19:04:00	19:14:00	051792	560009	051839	555978	41	Valid

28-11-2010	4165-01	41F5	1	104	DK2	19:38:00	19:48:00	051560	560154	051538	560193	37	Valid
28-11-2010	4165-01	41F5	1	105	DK2	19:56:00	20:06:00	051574	560191	051533	560160	37	Valid
28-11-2010	4165-01	41F5	1	106	DK2	20:13:00	20:23:00	051512	560173	051580	560169	37	Valid
28-11-2010	4165-02	41F5	1	107	DK2	20:46:00	20:56:00	051712	560353	051729	561780	39	Valid
28-11-2010	4165-02	41F5	1	108	DK2	21:05:00	21:15:00	051757	560382	051687	560366	39	Valid
28-11-2010	4165-02	41F5	1	109	DK2	21:22:00	22:32:00	051684	560381	051740	560361	39	Valid
29-11-2010	2008-02	41F5	1	110	DK2	00:18:00	00:28:00	053564	561807	053510	561780	36	Valid
29-11-2010	2008-02	41F5	1	111	DK2	00:37:00	00:47:00	053503	561802	053576	561788	36	Valid
29-11-2010	2008-02	41F5	1	112	DK2	00:55:00	01:05:00	053557	561777	053516	561810	36	Valid
29-11-2010	4264-05	42F4	3	113	DK2	22:25:00	22:35:00	042523	563983	042453	563971	51	Valid
29-11-2010	4264-05	42F4	3	114	DK2	22:45:00	22:55:00	042459	563994	042517	563971	51	Valid
29-11-2010	4264-05	42F4	3	115	DK2	23:05:00	23:15:00	042502	563955	042506	563996	51	Valid
30-11-2010	4264-03	42F4	3	116	DK2	00:26:00	00:36:00	040946	564002	040868	564000	48	Valid
30-11-2010	4264-03	42F4	3	117	DK2	00:44:00	00:54:00	040873	564020	040920	563991	48	Valid
30-11-2010	4264-03	42F4	3	118	DK2	01:02:00	01:12:00	040891	563978	040907	564016	48	Valid
30-11-2010	4263-02	42F3	3	119	DK2	03:22:00	03:32:00	034316	564876	034236	564880	52	Valid
30-11-2010	4263-02	42F3	3	120	DK2	03:44:00	03:54:00	034223	564893	034277	564869	52	Valid
30-11-2010	4263-02	42F3	3	121	DK2	04:05:00	04:15:00	034226	564860	034287	564886	52	Valid
30-11-2010	4364-07	43F4	3	122	DK1	16:28:00	16:38:00	043432	571820	043364	571795	57	Valid
30-11-2010	4364-07	43F4	3	123	DK1	16:50:00	17:00:00	043356	571813	043425	571803	57	Valid
30-11-2010	4364-07	43F4	3	124	DK1	17:10:00	17:20:00	043410	571797	043380	571826	57	Valid
30-11-2010	4364-05	43F4	3	125	DK1	18:51:00	19:01:00	044348	570957	044388	570923	55	Valid
30-11-2010	4364-05	43F4	3	126	DK1	19:10:00	19:20:00	044340	570922	044394	570950	55	Valid
30-11-2010	4364-05	43F4	3	127	DK1	19:30:00	19:40:00	044390	570934	044315	570931	55	Valid
30-11-2010	4365-08	43F5	3	128	DK1	22:34:00	22:44:00	051278	570797	051345	570791	51	Valid
30-11-2010	4365-08	43F5	3	129	DK1	22:55:00	23:05:00	051317	570775	051280	570812	51	Valid
30-11-2010	4365-08	43F5	3	130	DK1	23:15:00	23:25:00	051312	570813	051292	570770	51	Valid
01-12-2010	4365-04	43F5	3	131	DK1	00:48:00	00:58:00	052821	570839	052882	570859	43	Valid
01-12-2010	4365-04	43F5	3	132	DK1	01:09:00	01:19:00	052883	570842	052811	570861	43	Valid
01-12-2010	4365-04	43F5	3	133	DK1	01:27:00	01:37:00	052834	570869	052872	570837	43	Valid
01-12-2010	4365-01	43F5	3	134	DK1	02:38:00	02:48:00	053143	571513	053154	571552	55	Valid
01-12-2010	4365-01	43F5	3	135	DK1	02:56:00	03:06:00	053181	571545	053123	571518	55	Valid
01-12-2010	4365-01	43F5	3	136	DK1	03:14:00	03:24:00	053102	571534	053175	571528	55	Valid
01-12-2010	4366-06	43F6	3	137	DK1	16:03:00	16:13:00	060779	570613	060705	570604	47	Valid
01-12-2010	4366-06	43F6	3	138	DK1	16:24:00	16:34:00	060719	570624	060774	570600	47	Valid
01-12-2010	4366-06	43F6	3	139	DK1	16:44:00	16:54:00	060754	570590	060743	570628	47	Valid
01-12-2010	2007-?	43F6	3	140	DK1	19:57:00	20:07:00	064170	570436	064089	570442	51	Valid
01-12-2010	2007-?	43F6	3	141	DK1	20:16:00	20:26:00	064101	570454	064142	570425	51	Valid
01-12-2010	2007-?	43F6	3	142	DK1	20:38:00	20:48:00	064111	570419	064150	570449	51	Valid
02-12-2010	4367-02	43F7	3	143	DK1	00:12:00	00:22:00	065988	570248	070067	570254	39	Invalid
02-12-2010	4367-16	43F7	3	144	DK1	16:07:00	16:15:00	072597	570534	072650	570559	25	Valid
02-12-2010	4367-16	43F7	3	145	DK1	16:24:00	16:34:00	072653	570540	072521	570548	25	Valid
02-12-2010	4367-16	43F7	3	146	DK1	16:43:00	16:53:00	072600	570555	072645	570529	25	Valid
02-12-2010	4367-23	43F7	3	147	DK1	17:48:00	17:58:00	074058	570475	073991	570490	24	Valid
02-12-2010	4367-23	43F7	3	148	DK1	18:08:00	18:18:00	074032	570464	074032	570501	24	Valid
02-12-2010	4367-23	43F7	3	149	DK1	18:25:00	18:35:00	074052	570492	073982	570465	24	Valid
02-12-2010	4267-25	42F7	3	150	DK1	19:14:00	19:24:00	074178	565906	074159	565866	18	Valid
02-12-2010	4267-25	42F7	3	151	DK1	19:31:00	19:41:00	074139	565882	074206	565901	18	Valid
02-12-2010	4267-25	42F7	3	152	DK1	19:49:00	19:59:00	074199	565884	074140	565905	18	Valid

02-12-2010	4267-27	42F7	3	153	DK1	20:35:00	20:45:00	073645	565455	073531	565458	21	Valid
02-12-2010	4267-27	42F7	3	154	DK1	20:51:00	21:01:00	073579	565476	073650	565474	21	Valid
02-12-2010	4267-27	42F7	3	155	DK1	21:10:00	21:20:00	073638	565460	073599	565494	21	Valid
02-12-2010	4267-12	42F7	3	156	DK1	22:15:00	22:25:00	072604	565642	072545	565663	26	Valid
02-12-2010	4267-12	42F7	3	157	DK1	22:33:00	22:43:00	072571	565666	072582	565626	26	Valid
02-12-2010	4267-12	42F7	3	158	DK1	22:50:00	23:00:00	072550	565636	072600	565664	26	Valid
03-12-2010	4367-06	43F7	3	159	DK1	00:34:00	00:44:00	070660	570305	070591	570317	25	Valid
03-12-2010	4367-06	43F7	3	160	DK1	00:53:00	01:03:00	070616	570329	070637	570295	25	Valid
03-12-2010	4367-06	43F7	3	161	DK1	01:10:00	01:20:00	070597	570295	070646	570325	25	Valid
03-12-2010	4367-02	43F7	3	162	DK1	01:50:00	02:00:00	070061	570258	065989	570245	37	Valid
03-12-2010	4367-02	43F7	3	163	DK1	02:08:00	02:18:00	065994	570263	070056	570243	37	Invalid
03-12-2010	4367-02	43F7	3	164	DK1	02:26:00	02:36:00	070020	570231	070024	570271	37	Valid

Achievements

Types of data collected

- GPS Positions
- Depth
- Dredge (sand eels; species, weight, length)
- Van Veen grab (sediment samples; grain size composition)

Achievements in 2010:

- 12 days at sea (planned: 12)
- 50 locations (planned: 42 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 were taken with the Van Veen grab (0.2m²), 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).

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 darkness. 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) was tested for use as verification for the quality of the hauls.

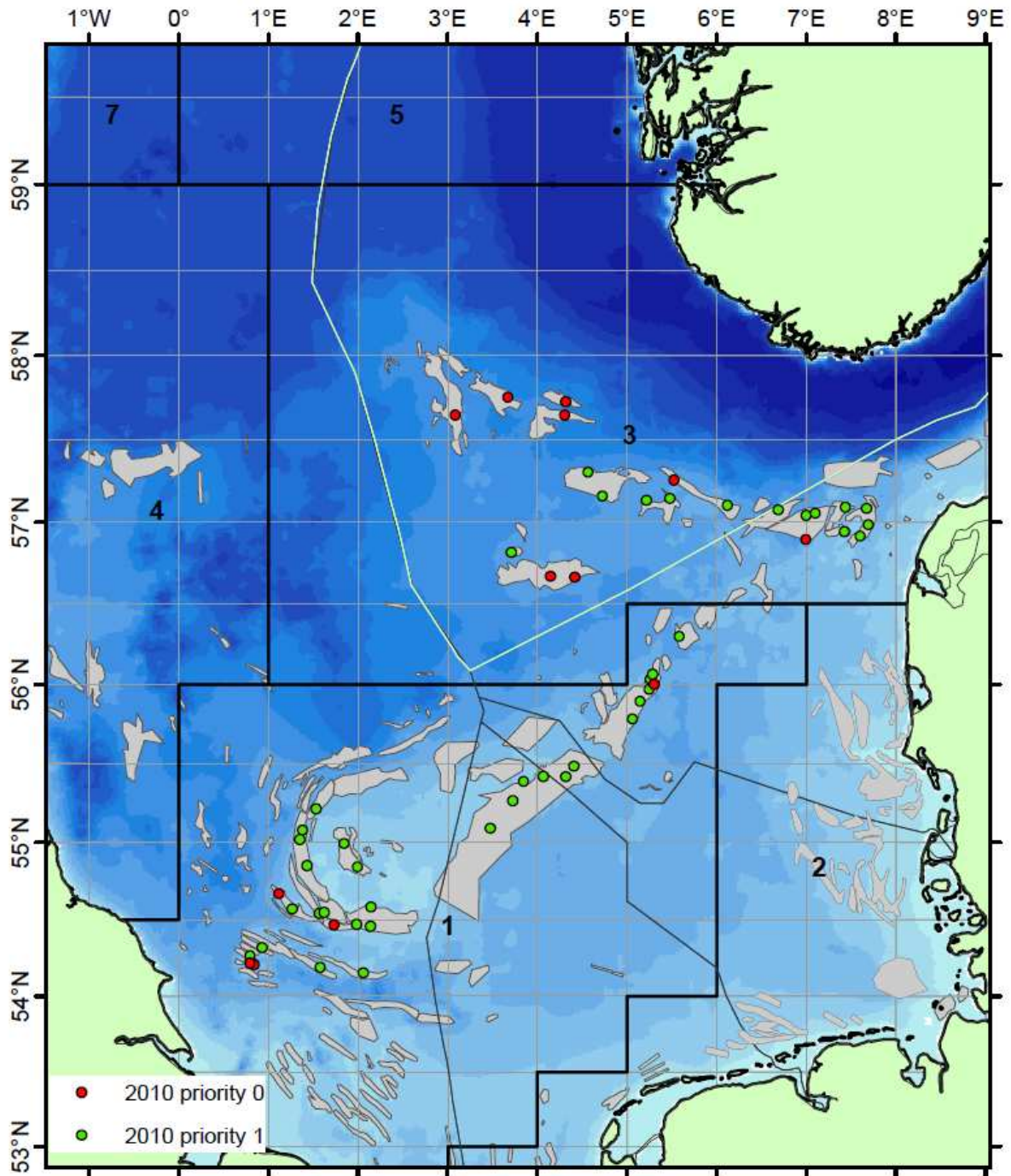


Figure 1. All planned sampling locations for sand eel area 1 and 3. The colours indicate relative priority (red = low priority 0 and green = high priority 1).

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 22. November 2010 – 4. December 2010. 50 locations were sampled; 33 in area 1 and 17 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. Catches for areas merged was around 70% of the catches (number of) in 2009. The largest decline was observed for area 3, where the catch amounted to about 30% of the 2009 level. The share of 0 group sand eel in the catches in both areas was very low, which in conjunction with catch rates indicates a small recruiting. 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.

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)	Area	Sand eel Area		
3760,03	0,8387	54,2057	37F0					617				546	1488	Dogger	1		
3760,04	0,7990	54,2625	37F0					510	894	448	528	302	1062				
3760,05	0,9283	54,3160	37F0					1871	1278	124	846	236	1800				
3760,06	0,7971	54,2173	37F0						2708								
3761,03	1,7340	54,4665	37F1					863	652								
3761,04	1,9840	54,4676	37F1			541	1744	3024	691	3920		11350	1666				
3761,08	1,5788	54,1897	37F1					264	1598	1876	785	736	1938				
3762,01	2,1399	54,4574	37F2			138					1036	2618	4186				
3762,02	2,0599	54,1496	37F2			581	305	3116	3967	3738	565	614	534				
2009,01_3862,01	2,1470	54,5808	38F2									480	1694				
2009,02_3861,17	1,9958	54,8393	38F1									1552	2156				
2009,03_3961,42	1,5318	55,2120	39F1									7638	4598				
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				
3861,19	1,2640	54,5674	38F1			191	218	4143	4196	1636	2326	13054	11804				
3861,22	1,5716	54,5385	38F1			112	218	2472	342	662	474	2180	1792				
3861,23	1,6227	54,5455	38F1			474		3955	1292	1382	1590	6444	6180				
3861,32	1,8470	54,9882	38F1	978	1774	155	656	1549		4050	5660	5796	4572				
3961,28	1,3815	55,0751	39F1	783	269	59	672	7576	4601	680	1380	13962	5934				
3961,29	1,3516	55,0173	39F1	64	55	47	243	798	23	136		378	962				
2010,01/3861,34	1,3632	53,5292	38F1										5670				
2010,02/3861,35	1,6643	54,6388	38F1										1466				
2010,03/3861,36	1,8823	54,5783	38F1										1048				
2010,04/3762,05	2,3799	54,4919	37F2										20610				
3963,01	3,4759	55,0867	39F3			290	410	2594	54	380	22	1300	360			Elbow Spit	1
3963,04	3,7258	55,2636	39F3	37		555	19	813		80	14	208	94				
3963,08	3,8469	55,3865	39F3						407		440	1716					
3964,01	4,0654	55,4183	39F4		5179	2064	2743	5601	3457	9404	292	6826	3410				
3964,02	4,3171	55,4162	39F4				1424	603		3270	62	3952	334				
3964,03	4,4102	55,4834	39F4		8162	913	4054	541	419	8046	140	2584	356				
4065,01	5,0642	55,7814	40F5		863		493	244	74	4822	72	1344	224	Tail End	1		
4065,02	5,1483	55,8906	40F5		3657	83	567	1151	318	5556	370	3200	990				
4065,03	5,2485	55,9655	40F5		8				4		282	9380	436				
4065,04	5,3018	55,9986	40F5		628			1768	432	3056							
4165,01	5,2586	56,0282	41F5		3147	186	1034	2975	1637	4496	2316	3888	434				
4165,02	5,2862	56,0621	41F5		3888	80	634	2147	670	7852	652	6640	372				

2008,02	5,5873	56,2968	41F5								422	3194	494		
4266,12	6,9973	56,8931	42F6			661									
4267,12	7,4297	56,9420	42F7	184	455	175	91	419		134	216	584	46		
4267,25	7,6965	56,9826	42F7	72	146	50	81	400	1030	404	246	122	60		
4267,27	7,6037	56,9126	42F7			68				288	210	86	50	80	
4367,02	7,0039	57,0422	43F7	175	118				801	1518	884		114	54	
4367,06	7,1047	57,0516	43F7			553						96	184	100	
4367,16	7,4368	57,0909	43F7	200	3169	242		201		792	42	300	78		
4367,23	7,6716	57,0810	43F7			381		117		404	370	128	98	62	
2007/ 4366,11	6,6878	57,0742	43F6										128	22	
4365,04	5,4767	57,1417	43F5							926	486	268	1406	178	
4366,06	6,1250	57,1017	43F6							1566	524	1426	552	398	
4263,02	3,7117	56,8133	42F3							520	8556	9654	7324	2532	
4264,03	4,1500	56,6667	42F4								26	366	0	210	
4264,05	4,4167	56,6633	42F4							0	26	830	0	4	
4365,08	5,2183	57,1317	43F5							1524	2728	1260	2830	1042	
4365,01	5,5250	57,2550	43F5							1784	188		608	178	
4364,05	4,7283	57,1567	43F4									30	198	8	
4364,07	4,5667	57,3017	43F6								8	6	128	2	
4463,03	3,6717	57,7500	44F3								10				
4464,04	4,3167	57,7250	44F4								300	80			
4464,05	4,3100	57,6450	44F4								336	62			
4463,05	3,0883	57,6450	44F3												
All positions	Average			312	1622	341	798	1950	1248	2086	898	2848	1991		
	Geometric mean			174	501	174	402	1130	526	626	276	421	479		
	Std			360	2155	457	1019	1904	1252	2664	1739	3640	3542		

All positions Excluding N EEZ	Average			312	1622	341	798	1950	1291	2422	731	3103	2266		
	Geometric mean			174	501	174	402	1130	593	1006	283	717	667		
	Std			360	2155	457	1019	1904	1351	2668	1121	3762	3792		
AREA 1	Average			466	2194	372	921	2189	1374	2933	880	4013	2863		
	Geometric mean			207	623	183	518	1331	584	1299	354	2192	1255		
	Std			486	2490	488	1060	1947	1436	2778	1211	3953	4087		
AREA 3	Average			158	694	156	96	455	956	940	925	860	297		
	Geometric mean			147	352	129	95	405	414	233	190	25	74		
	Std			58	1023	97	19	251	629	2064	2369	1808	627		
AREA 3 Excluding N EEZ	Average			158	694	156	96	455	810	466	136	198	63		
	Geometric mean			147	352	129	95	405	653	379	115	152	58		
	Std			58	1023	97	19	251	573	307	79	173	24		

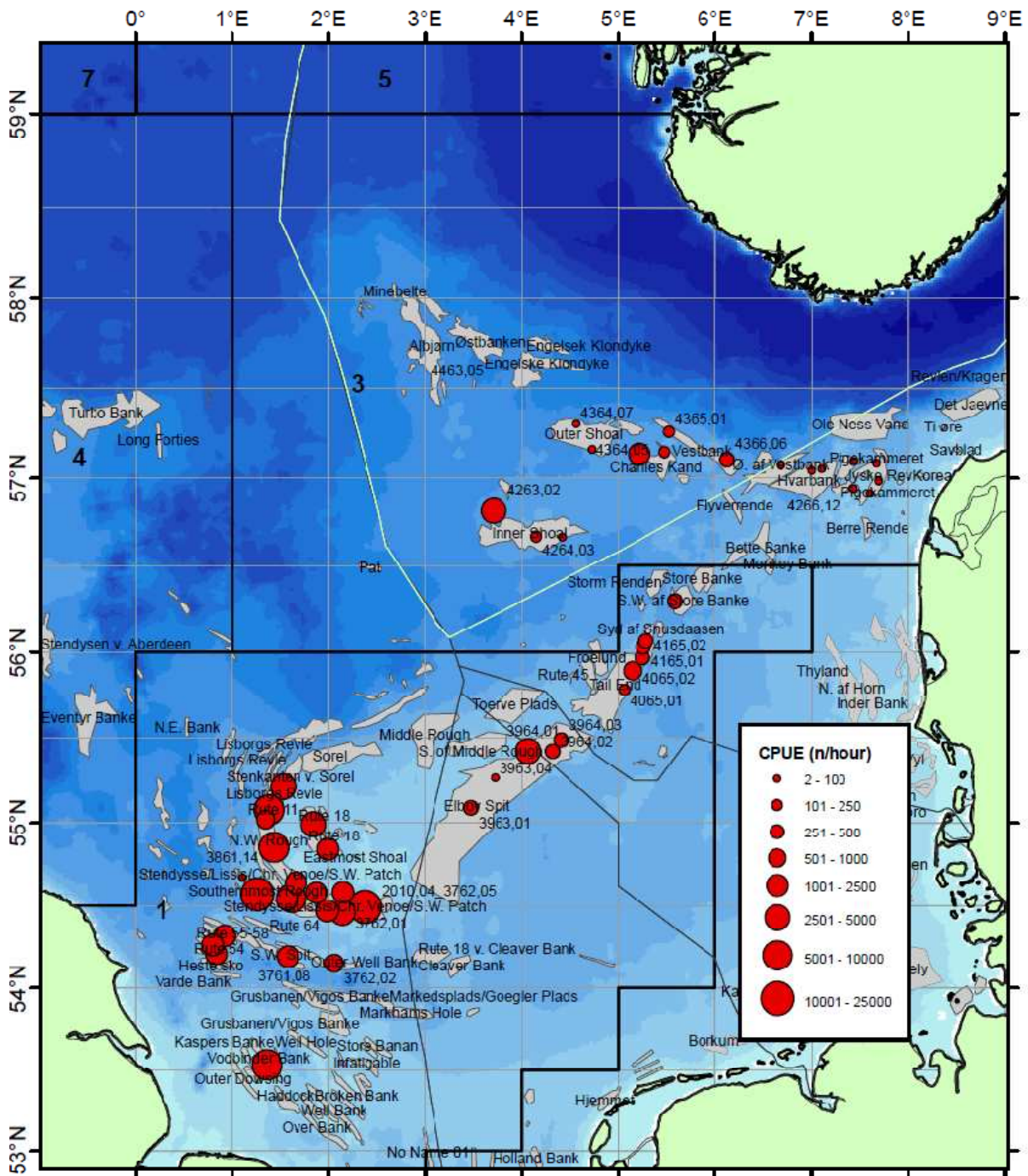


Figure 2. Survey map showing sampling locations and the corresponding CPUE.