DTU Aqua

Cruise Report

R/V Dana

Cruise 06/2022

”DK IBTS 3Q 2022”

Vessel: R/V DANA

Cruise dates (planned): 16/8 –2/9 2022

Cruise number: 06/22

Cruise name: DK IBTS 3Q 2022

Port of departure:	Hirtshals	**Date:**	16 August
Port of return:	Hirtshals	**Date:**	2 September
Other ports:	Esbjerg	**Date and justification:**	24 August: Scheduled exchange of scientific staff and crew

Participants

Leg 1: Hirtshals – Esbjerg		
Name	**Institute**	**Function and main tasks**
Helle Rasmussen	DTU Aqua, Monitering	Cruise leader, Scientist, Fish lab
Maria Jarnum	DTU Aqua, Monitering	Technician, Fish lab
Tom Svoldgaard	DTU Aqua, Monitering	Technician, Fish lab
Kasper Schaltz	DTU Aqua, Monitering	Technician, Fish lab
Dirk Tijssen	DTU Aqua, Monitering	Technician, Fish lab
Julieta Rodrigues	INIDEP* / POGO* / Eurofleets	Scientist, Trainee
Ronny Sørensen	DTU Aqua, Monitering	Technician, CTD, Maintenance
Bastian Huwer	DTU Aqua, Marine Living Resources	Scientist, Fish larvae and eggs
Nicholas Bezio	DTU Aqua, Marine Living Resources	Scientist, Jellyfish

Leg 2: Esbjerg – Hirtshals		
Name	**Institute**	**Function and main tasks**
Kai Wieland	DTU Aqua, Monitering	Cruise leader, Scientist, Fish lab
Stina B. Hansen	DTU Aqua, Monitering	Technician, Fish lab
Brian Thomsen	DTU Aqua, Monitering	Technician, Fish lab
Flemming Thaarup	DTU Aqua, Monitering	Technician, Fish lab
Niels Lyse	DTU Aqua, Monitering	Technician, Fish lab
Julieta Rodrigues	INIDEP* / POGO* / Eurofleets	Scientist, Trainee
Ronny Sørensen	DTU Aqua, Monitering	Technician, CTD, Maintenance
Bastian Huwer	DTU Aqua, Marine Living Resources	Scientist, Fish larvae and eggs
Nicholas Bezio	DTU Aqua, Marine Living Resources	Scientist, Jellyfish

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POGO: Partnership for Observation of the Global Ocean

Objectives

The survey is part of the 3rd quarter International Bottom Trawl Survey (IBTS) in the North Sea, which is coordinated by the ICES International Bottom Trawl Survey Working Group and has been conducted with standard fishing gear in the 3rd quarter since 1991.

The IBTS aims to provide ICES assessment and science groups with consistent and standardised data for examining spatial and temporal changes in (a) the distribution and relative abundance of fish and fish assemblages; and (b) of the biological parameters of commercial fish species for stock assessment purposes. The main objectives in the 3rd quarter IBTS are to:

- To determine the distribution and relative abundance of pre-recruits of the main commercial species (cod, haddock, whiting, Norway pout, saithe, herring, sprat, mackerel and plaice) with a view of deriving recruitment indices;
- To monitor changes in the stocks of commercial fish species independently of commercial fisheries data;
- To monitor the distribution and relative abundance of all captured fish species and selected invertebrates;
- To collect data for the determination of biological parameters for selected species;
- To collect hydrographical and environmental information.
- To collect information of the amount and distribution of marine litter

Technical details are described in the current version of the survey manual (ICES. 2020. Manual for the North Sea International Bottom Trawl Surveys. Series of ICES Survey Protocols SISP 10-IBTS 10, Revision 11. 102 pp. http://doi.org/10.17895/ices.pub.7562).

Additional midwater sampling with a MIK net for fish larvae and jellyfish was conducted during night for a national Danish project.

The area to be covered by Denmark with RV Dana in the 3rd quarter 2022 was allocated initially during the IBTS Working Group meeting in April 2021. However, due to a delayed application process by Scotland for receiving permissions outside UK waters some re-allocation of stations was agreed by the participating countries in advance of the survey period. Further re-allocation of effort became necessary during the survey due to technical issues faced by England, Scotland and Germany which did not allow them to complete its initially planned area coverage.

The working area for the GOV/CTD sampling of Denmark consisted of 44 ICES statistical rectangles located in the Skagerrak and the North Sea and in 8 of these rectangles two stations were planned (Fig. 1). 5 additional GOV/CTD stations were allocated to Denmark during the survey to cover tows which originally had been assigned to England (Rectangles, 40F3, 38F3, 44F4 and 44F5) and Scotland (Rectangle 37F2) due to technical problems with their vessels.

Itinerary

R/V Dana left Hirtshals on Tuesday 16th August at 09:00 local time but had to return to port for a short technical repair. R/V Dana sailed again at 17:00 and the field work started in the western Skagerrak (Fig. 1) on the same day. R/V Dana stayed in the port of Esbjerg on Wednesday 24th August from 08:50 to 12:50 for a scheduled exchange of scientific staff

and crew and field work resumed on the same day in the afternoon. R/V Dana returned to Hirtshals on Friday 2nd September at 13:20 local time.

Favorable weather conditions prevailed during the entire survey (Fig. 2). While westerly winds with about 7 m/s on average occurred during the 1st leg wind direction changed to northeast during the main part of the 2nd leg with wind speeds below 13 m/s.

Achievements

All trawl hauls were carried out with a 36/47 polyethylene GOV (chalut á Grande Overture Verticale) with the standard groundgear A (see IBTS Manual for specifications), 60 m sweeps and Vonin flyers replacing the standard kite, representing the standard rigging used for the IBTS on DANA since 2019.

The following activities were achieved:

56 valid standard GOV hauls and 1 invalid (unacceptable net geometry and too low SOG) GOV hauls on standard positions. 2 of the valid GOV hauls were shorter than 15 min. The reason for the invalidity of the GOV haul and the short nominal tow duration for two tows were a mass occurrence of bryozoans (Rectangles 35F3, 35F4, 34F3, 34F4 and 33F3; see Annex 1).

55 CTD profiles (with additional sensors for e.g., dissolved oxygen).

63 valid MIK hauls and 2 MIK stations for flowmeter calibration, performed during night time.

Results

Routine sampling

Two different GOV trawls were used which should show an identical net geometry at a given warp/depth ration. This, however, has not been the case (Fig. 3a) although the two trawl were produced by the same netmaker and should have been rigged according to the manual by the fishing master. Nonetheless, the trawl parameters for the standard tows (vertical net opening and door spread) as monitored with a Scanmar system were in the range or close to the suggested limits specified in the IBTS manual in most cases (Fig. 3a). The remaining deviations from the theoretical values for door spread and net opening from flume tank experiments can likely be attributed to the high sensibility of the GOV to current effects and bottom type. Marport sensors for wing spread worked properly on almost all stations, and the remaining 5 missing values can easily be estimated from a linear regression with door spread (Fig. 3b).

In total, 78 different species of fish, cephalopods and crustaceans were found in catches (Tab. 1) and the total weight of the catches was 31.4 tons (without Bryozoans). Total catch and species richness in the standard tows ranged from 18 kg (10 min tow in rectangle 34F4) to 2.2 tons (30 min tow in rectangle 39F2) per haul (Fig. 4) and from 10 to 28 different IBTS mandatory fish and invertebrate species.

Length measurements were made for all commercial and non-commercial fish species. Sharks, skates and rays and selected shellfish species were measured separately by sex (length composition and weight). Single fish data (length, weight, sex and maturity) and otoliths were collected for the main commercial species (cod, haddock, whiting, Norway pout, saithe, herring, sprat, mackerel and plaice) to fulfil requirements of the national DCF (Data Collection Framework of the European Union) sampling requirements (Tab. 2). Stomachs from whiting (n=209) and monkfish (n=12) were taken according to a request from the EU.

Additional single fish data were taken for hake (n=23) and anchovy (n=18) as well as for various ray species (Thornback ray n=10, Spotted ray n=10, Blonde ray n=7, Starry ray n=1) in conjunction with genetic samples. 50 juvenile mackerel were collected for parasite studies (IMR Bergen) and squids (Loligo forbesi (n=95) and Ilex coindetti (n=25)) were frozen for ageing based on the statoliths (Thuenen Institute Bremerhaven).

Preliminary abundance indices for the main commercial species indicate that e.g., whiting but also plaice and mackerel (at age 1 and 2+) were widely distributed in the survey area whereas Norway pout was quite rare and 0-group cod were caught at a few stations only (Tab. 3).

Marine litter was recorded in each GOV catch using four main categories: plastic, glass, metals and miscellaneous, which were subdivided in several minor categories to meet the request by the ICES Working Group for Marine Litter. The total amount of marine litter sorted from the catches retained in the codend was 87.4 kg of which 85.9 kg was plastic.

Temperature, salinity and dissolved oxygen content at surface and bottom were extracted from the CTD profiles for storage in the institute's fish data base. The temperature and salinity values will be submitted to the ICES DATRAS database together with the GOV catch results and measurements of surface and bottom currents (speed and direction) at the trawl stations to DATRAS, and the complete CTD profiles will be submitted to the ICES hydrographical data center. The surface and bottom temperatures ranged from 15.8 to 21.4 and from 6.8 to 21.3 °C, respectively, with the highest values found in the southeastern part of the survey area.

Special observations

Like the last year, mass occurrence of bryozoans in the south-eastern part of the survey area (see Annex 1). In addition, relative high catches of anchovy and 0-group (5 – 7 cm) sardine in the German Bight and the occurrence of 0-group (4 – 6 cm) striped red mullet in the southern part of the survey area was observed again. Furthermore, a catch of more than 100 mackerel between 4 and 5 cm (early 0-group) in rectangle 41F3 was unusual.

Miscellaneous

Results of the plankton sampling for sprat and other fish larvae as well as observations on the occurrence jellyfish in the plankton samples conducted during night will be reported elsewhere later.

A cruise summary report has been delivered online to http://seadata.bsh.de/csr/online.

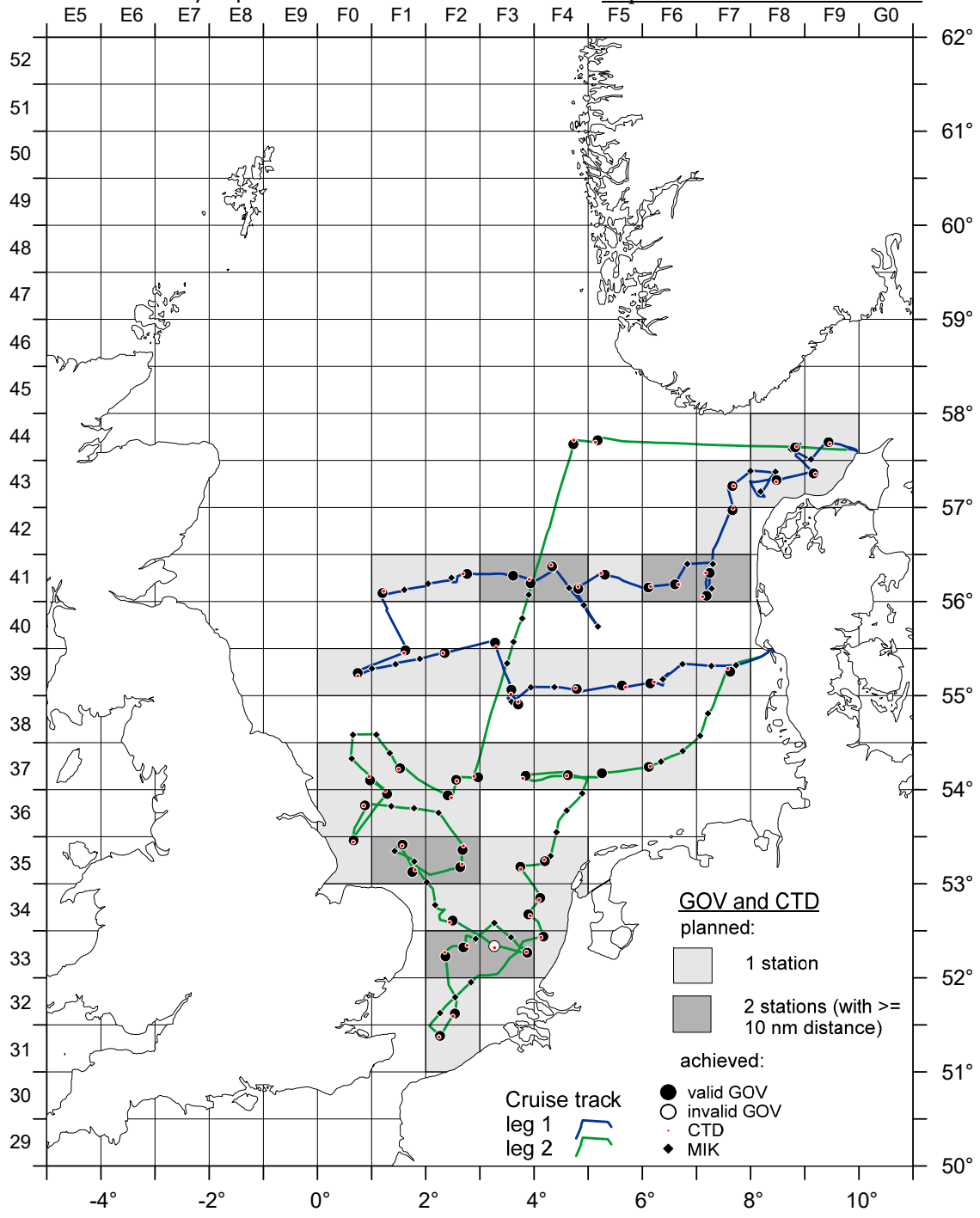

Fig. 1: Survey map with cruise track and sampling locations, RV Dana DK IBTS 3Q 2022.

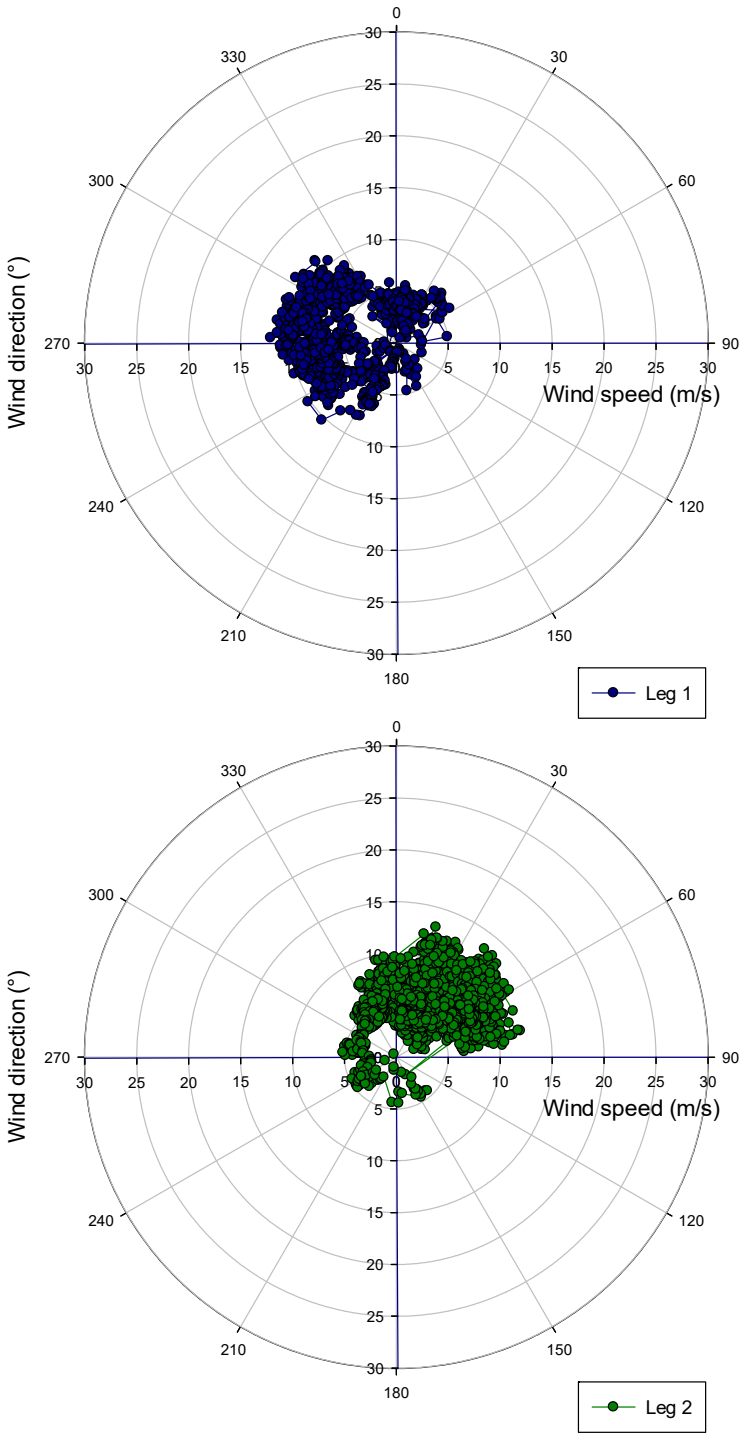

Fig. 2. Wind speed (m/s) and wind direction (°) recorded along the cruise track, RV Dana DK IBTS 3Q 2022.

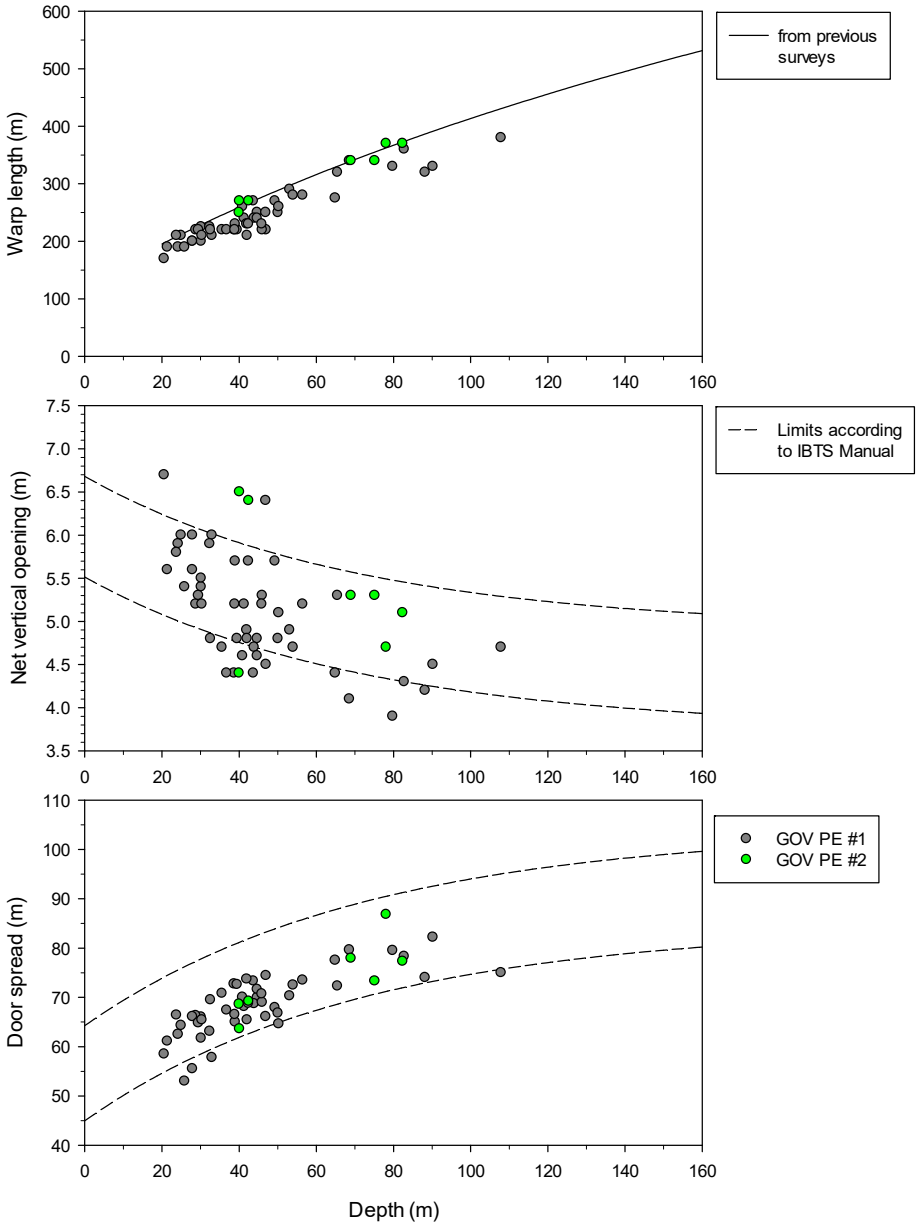

Fig. 3a: Warp length, net opening and door spread in relation to depth, RV Dana DK IBTS 3Q 2022.

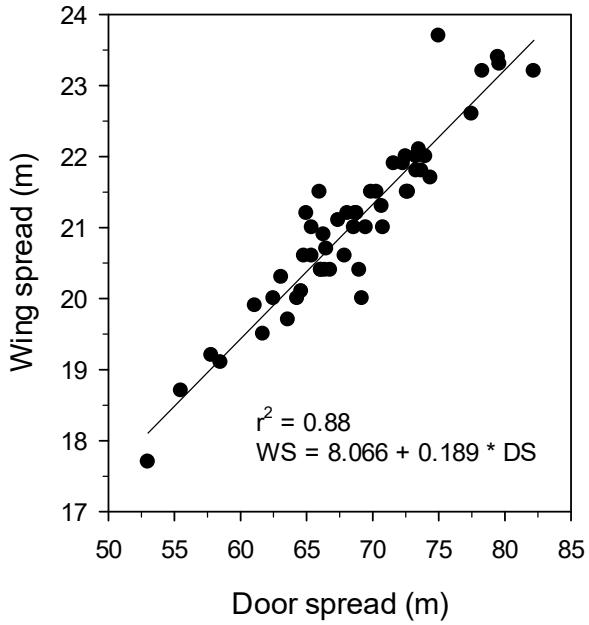

Fig. 3b: Relationship between door and wing spread, RV Dana DK IBTS 3Q 2022.

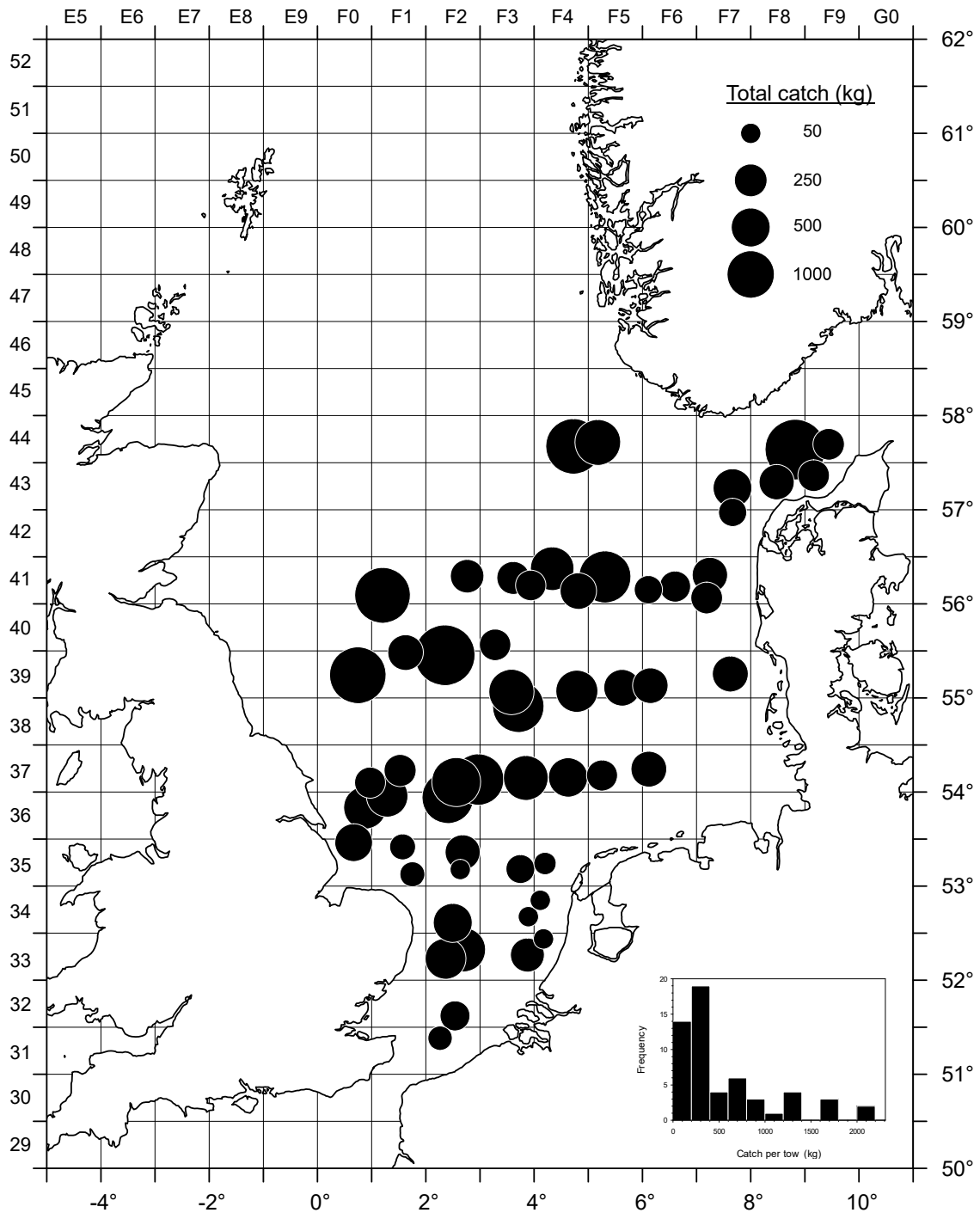

Fig. 4: Total catch of fish and shellfish (symbol size) per tow (Note: catch in kg per tow, i.e. not adjusted for differences in tow duration and swept area fished), Dana DK IBTS 3Q 2022.

Tab. 1: Species list, Dana DK IBTS 3Q 2022 (L: total length in cm below (fish); ML: mantle length (cephlapods); CPL or CPW: carapace length or width (crusteaceans).

Latin name	English name	Danish name	Weight (kg)	Number	L_{min} (cm)	L_{max} (cm)	Remark
Aequipecten opercularis	Queen scallop	Jomfruøsters	0.644	6	-	-	
Agonus cataphractus	Pogge	Panser ulk	0.576	54	8.0	13.0	
Alloteuthis subulata	European common squid	Dværgblæksprutte	58.574	9168	1.0	15.0	ML
Amblyraja radiata	Starry ray	Tærbe	8.070	22	9.0	44.0	
Ammodytes marinus	Lesser sandeel	Havtobis	13.906	3601	7.0	19.0	
Anarhichas lupus	Catfish	Stribet havkat	5.372	3	47.0	66.0	
Argentina sphyraena	Lesser silver smelt	Strømsild	0.364	7	17.0	25.0	
Arnoglossus laterna	Scaldfish	Tungehvarre	1.269	125	4.0	14.0	
Bryozoa	Bryozoans	Mosdyr	1030.960	-	-	-	
Buglossidium luteum	Solenette	Glastunge	3.041	389	3.0	12.0	
Callionymus lyra	Common dragonet	Stribet fløjfisk	8.486	230	4.0	27.0	
Callionymus maculatus	Spotted dragonet	Plettet fløjfisk	0.025	3	7.0	16.0	
Cancer pagurus	Edible crab	Taskekrabbe	90.059	227	6.5	21.5	CPW
Chelidonichthys cuculus	Red gurnard	Tværstribet knurhane	3.966	33	19.0	29.0	
Chelidonichthys lucerna	Tub gurnard	Rød knurhane	6.395	22	10.0	44.0	
Chelon labrosus	Thick lipped mullet	Tyklæbet multe	3.067	2	56.0	56.0	
Clupea harengus	Herring	Sild	2287.290	94997	6.0	33.0	
Dicentrarchus labrax	Bass	Havbars	3.248	4	38.0	43.0	
Echiichthys vipera	Lesser weever	Fjæsing lille	25.181	1094	5.0	18.0	
Eledone cirrhosa	Horned octopus	Eledone Blæksprutte	0.049	1	-	-	
Enchelyopus cimbrius	Four-bearded rockling	Firetrådet havkvabbe	1.049	27	9.0	25.0	
Engraulis encrasicolus	Anchovy	Ansjos	1.023	153	6.0	19.0	
Entelurus aequoreus	Snake pipefish	Snippe	0.016	1	44.0	44.0	
Eutrigla gurnardus	Grey gurnard	Grå knurhane	575.567	7572	10.0	37.0	
Gadus morhua	Cod	Torsk	414.136	720	7.0	100.0	
Galeorhinus galeus	Tope	Gråhaj	132.140	14	72.0	146.0	
Glyptocephalus cynoglossus	Witch	Skærising	1.635	7	24.0	41.0	
Gymnammodytes semisquamatus	Smoothed sandeel	Nøgentobis	5.057	333	10.5	21.5	
Helicolenus dactylopterus	Blackbelly rosefish	Blåkæft	0.321	3	16.0	20.0	
Hippoglossoides platessoides	American plaice	Håising	99.167	1753	8.0	26.0	
Hippoglossus hippoglossus	Atlantic halibut	Helleflynder	44.000	1	142.0	142.0	
Homarus gammarus	European lobster	Hummer	34.110	58	5.6	14.8	CPL
Hyperoplus lanceolatus	Greater sandeel	Plettet tobiskonge	36.030	1435	12.5	32.0	
Illex coindetii	Southern shortfin squid	Rød blæksprutte	4.062	46	10.0	18.0	ML
Lampetra fluviatilis	River lamprey	Flodlampret	0.070	1	33.0	33.0	
Limanda limanda	Common dab	Ising	3132.146	56326	3.0	35.0	
Liparis liparis	Sea snail	Finnebræmmet ringbug	0.031	9	5.0	7.0	
Lithodes maja	Norway king crab	Troldkrabbe	2.172	4	8.4	11.3	CPL
Loligo sp	Loligo squids	*Loligoblæksprutter	5.824	364	1.0	17.0	ML
Loligo forbesii	Northern squid	Loligoblæksprutte	76.440	2912	2.0	30.0	ML
Lophius piscatorius	Anglerfish	Havtaske, alm.	39.464	16	9.0	63.0	
Melanogrammus aeglefinus	Haddock	Kuller	8174.771	121312	8.0	47.0	
Merlangius merlangus	Whiting	Hvilling	8591.725	183491	4.0	43.0	
Merluccius merluccius	Hake	Kulmule	44.064	25	41.0	84.0	
Micromesistius poutassou	Blue whiting	Blåhvilling	0.683	8	21.0	24.0	
Microstomus kitt	Lemon sole	Rødtunge	149.857	1419	11.0	42.0	
Molva molva	Ling	Lange	6.857	3	68.0	81.0	
Mullus surmuletus	Striped red mullet	Stribet rød Mulle	26.075	578	5.0	29.0	
Mustelus asterias	Starry smooth-hound	Stjernehaj	99.070	49	53.0	108.0	
Myoxocephalus scorpius	Sculpin	Almindelig ulk	1.460	32	10.0	22.0	
Nephrops norvegicus	Norway lobster	Jomfruhummer	0.942	24	1.6	5.7	CPL
Pecten maximus	Great scallop	Stor kammusling	0.660	2	-	-	
Pholis gunnellus	Butter fish	Tangspræl	0.997	42	15.0	19.0	
Phrynorhombus norvegicus	Norwegian topknot	Småhvarre	0.033	1	14.0	14.0	
Platichthys flesus	Flounder	Skrubbe	0.841	3	29.0	30.0	
Pleuronectes platessa	Plaice	Rødspætte	407.818	3324	10.0	48.0	
Pollachius pollachius	Pollack	Lyssej	1.734	1	64.0	64.0	
Pollachius virens	Saithe	Sej	134.882	185	24.0	56.0	
Pomatoschistus sp.	Sand gobies	*Sandkutlinger	0.097	70	3.0	7.0	
Raja brachyura	Blonde ray	Småplettet rokke	39.165	49	34.0	79.0	
Raja clavata	Thornback ray	Sømrokke	34.796	37	24.0	77.0	
Raja montagui	Spotted Ray	Storplettet Rokke	29.034	47	31.0	54.0	
Sardina pilchardus	Pilchard	Sardin	156.579	1615	4.0	39.0	
Scomber scombrus	Mackerel	Makrel	1805.674	8564	4.0	42.0	
Scophthalmus maximus	Turbot	Pighvarre	19.878	19	20.0	48.0	
Scophthalmus rhombus	Brill	Slethvarre	5.642	10	23.0	43.0	
Scyliorhinus canicula	Lesser-spotted dogfish	Småplettet rødhaj	600.132	1111	24.0	69.0	
Sepia officinalis	Common cuttlefish	Sepiablæksprutte	1.046	2	15.0	17.0	ML
Sepiola atlantica	Atlantic bobtail squid	Sepiola atlantica	0.004	2	-	-	
Solea solea	Sole	Tunge	14.092	173	14.0	41.0	
Spondyliosoma cantharus	Black sea bream	Almindelig havrude	1.454	4	22.0	29.0	
Sprattus sprattus	Sprat	Brisling	2378.822	261217	5.5	14.5	
Taurulus bubalis	Sea scorpion	Langtornet ulk	0.059	1	15.0	15.0	
Todaropsis eblanae	Lesser flying squid	Todaropsis eblanae	0.193	3	9.0	10.0	ML
Trachinus draco	Greater weever fish	Fjæsing	54.083	272	14.0	43.0	
Trachurus trachurus	Horse mackerel	Hestemakrel	1059.198	113296	3.0	40.0	
Trisopterus esmarkii	Norway pout	Sperling	127.174	22900	5.0	19.0	
Trisopterus luscus	Bib	Skægtorsk	325.839	2892	13.0	28.0	
Trisopterus minutus	Poor-cod	Glyse	23.027	514	7.0	20.0	
Zeus faber	John dory	Sanktpetersfisk	6.067	20	22.0	27.0	

Tab. 2: Number of single fish data (length, individual weight, and sex; maturity for herring, sprat and hake; infestation with liver parasites for cod (only in the Skagerrak) and samples for ageing and genetics (hake: otoliths just stored but not read), Dana DK IBTS 3Q 2022.

Species	Total
Herring (Clupea harengus)	436
Sprat (Sprattus sprattus)	190
Cod (Gadus morhua)	205
Haddock (Melanogrammus aeglefinus)	340
Whiting (Merlangius merlangus)	586
Saithe (Pollachius virens)	25
Norway pout (Trisopterus ermarkii)	22
Mackerel (Scomber scombrus)	291
Plaice (Pleuronectes platessa)	723
Hake (Merluccius merluccius)	23
Sum:	2841

Tab. 3: Preliminary abundance indices (number per hour trawling) for commercial IBTS species per tow, Dana DK IBTS 3Q 2022.

			COD			HADDOCK			WHITING			NORWAY POUT			HERRING			SPRAT			MACKEREL			SAITHE			PLAICE	
assumed Age:		0	1	2+	0	1	2+	0	1	2+	0	1	2+	0	1	2+	1	2+	0	1	2+	0	1	2+	0	1	2+
	Length:	<18	18-37	≥38	<17	17-29	≥30	<17	17-23	≥24	<13	13-15	≥16	<15.5	15.5-22.5	≥23	<13	≥13	<17	17-29	≥30	<22	22-32	≥33	<10	10-18	≥19
St No	Rect																										
2	44F9		283	46	2	4	28	10	38	14				2						88	38					2	104
7	44F8	12	527	14	14	962	5024		54	455	754	1175	633	4	22	8				156	1196						8
9	43F9															2				714	823					115	143
11	43F8		32	2			6	18	2	2										946	674					6	86
17	43F7		58	4		710	1216		66	209						10				51	839		46			2	38
19	42F7							16												232	223					162	70
20	41F7				735			360	14					28	66			2		1509	282					200	122
22	41F7																			465	75					444	114
29	41F6				2673	6	2	44	207	22				78	38		151	12		32	2					135	245
31	41F6				4717	20	2	30	231	50				2832	67	2	310	8								86	118
32	41F5				14377	14		1923	32	24				28867	16574	6557	2318	424		4	4					4	56
35	41F4		2		1541	1744	67		897	1119																2	149
41	41F4				17727	6	2	828	8	2					275	4842											62
42	41F3				6833	16	4	731		4																2	52
44	41F3				3223	29	6	136	10	12					2				238		2						41
45	41F2				949	477	50		413	1106					22	6				4							62
52	41F1					5074	2568		739	4291						1897				68	1049		2				34
53	39F1			2	9838	1134			398	675						28	20	22		4	4						78
55	39F0		2			6081	1789		6409	5813	26		2		36	381	272	243		14	46					2	50
64	39F2				112671	1748	6		1451	551					2	4		2		642	1338					2	252
65	40F3				8359			40	2	2										2							124
67	39F3				3610	48		4271	86	4				3775	68		130172									4	169
70	38F3				9436	242		143	426	20				176	2		187311									4	126
76	39F4				1221			141707	299					128	4	2	136			2						60	140
77	39F5				3282			9558	291	2				12469	40		8614									52	292
79	39F6				1016			2629	525	15				11703	496	8	31286									8	44
85	39F7				76			5500	71					6						2849	187					30	8
92	37F6							26135						2181	4		6834									24	54
93	37F5							1603	39					21697			6027			2	2					42	104
94	37F4							18123	3344					37163			47234									39	31
95	37F3				124		2	3699	17477	1371				882		2	1895									2	46
103	35F4							115	12	4				7866			5553				12					75	24
104	35F3							594	71					15589			3363		1646	731						653	160
106	34F4							6	6					18					6	6	6					30	
108	34F3													16					12	44						56	12
110	33F4							188	69					163		3	6937			6						11	8
117	31F2		7																	13	3					10	82
119	32F2		6	3					3											75	36					3	18
120	33F2		6						3199	2513					8					112	4						10
122	33F2		26	8					12	10										62	6		4	2		6	30
129	33F3							79	14					359	9					787	70					671	37
132	34F2		14						5236	3228					12	10		2		12	7					7	41
139	35F1							30	12	2										26	6					102	96
140	35F1								599	211					2					24	28					12	6
142	35F2							873	166	18				341			839									2	28
144	35F2							124	42	4				21447	92		6808	270	2	2						24	40
151	36F0	4				2	2	10	8893	2887										6	140					2	2
153	35F0							49	701	1254	8			2	16	8	11176	317		2	76						2
154	36F1	3						5	1868	1182				4055	3		94366	1037		16	3					38	149
156	37F0							2	1529	510										2	4					22	92
163	37F1				52	34	4	6	473	473						8										32	222
164	36F2				21	280	93		19054	4083										8	6					24	220
167	37F2		22	6	6	34	62	173	9623	8036			2	3628	4	12	4636				2					2	8
168	37F2				16	687	181		20492	3510										97	16					14	237
174	44F4	82	82	108	78	953	4843	14		1848	11202		2			1074				2	52			312			20
177	44F5	2	50	34	498	567	1796	8		736	30215	1573	296			220				23	231			6			6

Annex 1: Mass occurrence of bryozoans

Similar to last year, a high amount of bryozoans, microscopically identified as *Electra pilosa*, caused invalidity or shortage of GOV tows to 10 – 15 min in rectangles 35F3, 35F4, 34F3, 34F4 and 33F3, an area located in southern Dutch coastal waters and extending almost half the way across the English Channel (Fig. A1). There, the catch of bryozoans ranged from 5 to 516 kg per tow and the hauls were aborted based on indication of unacceptable net geometry recorded by the door and trawl sensors. The quantity at three stations has been immense as indicated by the catches converted to tons per km^2 (Fig. A.1).

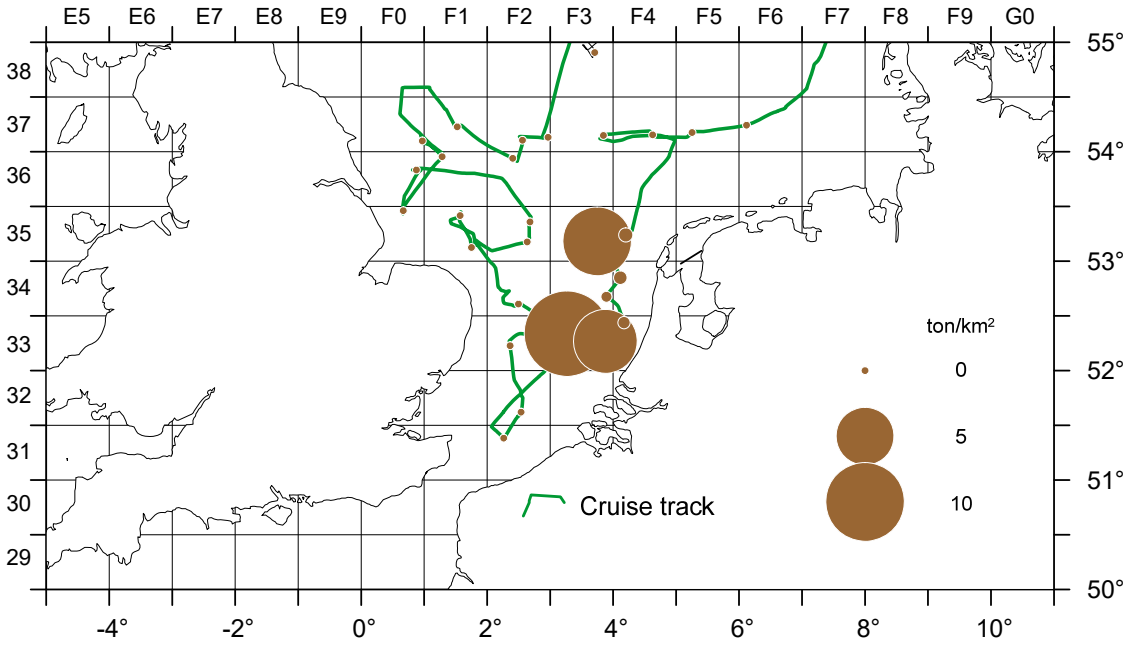

Fig. A.1. Occurrence of bryozoan, Dana DK IBTS 3Q 2022.

Fig. A.2. 10 min catch obtained in the eastern part of rectangle 33F3 Dana DK IBTS 3Q 2022 (Photos: Bastian Huever).