

Cruise Report

R/V Dana

Cruise 05/2023

"DK IBTS 3Q 2023"



Vessel: R/V DANA

Cruise dates (planned): 17/8 –4/9 2023

Cruise number: 05/23

Cruise name: DK IBTS 3Q 2023

Port of departure:	Hirtshals	Date:	17 August
Port of return:	Hirtshals	Date:	4 September
Other ports:	Esbjerg	Date and justification:	25 August: Scheduled exchange of scientific staff and crew

Participants

Leg 1: Hirtshals – Esbjerg		
Name	Institute	Function and main tasks
Helle Rasmussen	DTU Aqua, Monitoring	Cruise leader, Scientist, Fish lab
Mads Blum	DTU Aqua, Monitoring	Technician, Fish lab
Hans Henrik Bang Jørgensen	DTU Aqua, Monitoring	Technician, Fish lab
Flemming Thaarup	DTU Aqua, Monitoring	Technician, Fish lab
Elise Eidset	IMR Bergen	Technician, Fish lab
Maria Luz Torres Alberto	INIDEP* / POGO* / Eurofleets	Scientist, Trainee
Ronny Sørensen	DTU Aqua, Monitoring	Technician, CTD, Maintenance
Bastian Huwer	DTU Aqua, Marine Living Resources	Scientist, Fish larvae and eggs
Malthe Friis Schmidt	DTU Aqua, Centre for Ocean Life	Scientist, Jellyfish

Leg 2: Esbjerg – Hirtshals		
Name	Institute	Function and main tasks
Kai Wieland	DTU Aqua, Monitoring	Cruise leader, Scientist, Fish lab
Maria Jarnum	DTU Aqua, Monitoring	Technician, Fish lab
Brian Thomsen	DTU Aqua, Monitoring	Technician, Fish lab
Per Christensen	DTU Aqua, Monitoring	Technician, Fish lab
Tom Svoldgaard	DTU Aqua, Monitoring	Technician, Fish lab
Maria Luz Torres Alberto	INIDEP* / POGO* / Eurofleets	Scientist, Trainee
Ronny Sørensen	DTU Aqua, Monitoring	Technician, CTD, Maintenance
Bastian Huwer	DTU Aqua, Marine Living Resources	Scientist, Fish larvae and eggs
Malthe Friis Schmidt	DTU Aqua, Centre for Ocean Life	Scientist, Jellyfish

*: National Institute for Fisheries Research and Development (INIDEP), Bueno Aires, Argentina

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 standardized 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

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

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> , and ICES. 2013. Manual for the Midwater Ring Net sampling during IBTS Q1. Series of ICES Survey Protocols SISP 2-MIK 2. 18 pp. <http://doi.org/10.17895/7578>.

The area to be covered by Denmark with RV Dana in the 3rd quarter 2023 was allocated initially during the IBTS Working Group meeting in April 2022.

The working area for the GOV/CTD sampling of Denmark consisted of 46 ICES statistical rectangles located in the Skagerrak and the North Sea and in 6 of these rectangles two stations were planned (Fig. 1).

Itinerary

R/V Dana left Hirtshals on Thursday 17th August at 09:00 local time as scheduled, 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 Friday 25th August from 09:00 to 13:00 for a scheduled exchange of scientific staff and crew and fieldwork resumed on the same day in the afternoon. R/V Dana returned to Hirtshals on Monday 4th September at 09:15 local time.

Favorable weather conditions prevailed during almost the entire survey (Fig. 2). While wind winds with about 8 m/s on average occurred during the 1st leg wind direction changed to

northwest during the main part of the 2nd leg with wind speeds below 7 m/s most of the time.

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:

52 valid standard GOV hauls and 2 invalid GOV hauls on standard positions. The reason for the invalidity of the GOV hauls, which were repeated on alternative tracks in the same rectangle, were severe trawl damage (rectangle 32F2) and a break of the middle bridle (rectangle 33F2), respectively. The nominal tow duration was 30 min in the majority of the cases. However, at five stations tow duration was between 14 and 26 min due to either suspected mass occurrence of bryozoans, not enough space between cables and pipelines or unsuitable bottom conditions at the beginning and end of the track.

5 experimental GOV tows were for trawl rigging adjustments and testing of alternative trawl doors.

52 CTD profiles (with additional sensors for e.g., dissolved oxygen and turbidity) at GOV stations.

70 valid MIK nighttime hauls, 2 MIK stations for flowmeter calibration, and 4 MIK stations for testing purposes.

Results

Routine sampling

Three 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 trawls 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 most of stations, and the remaining 4 missing values for the standard tows can 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 45.8 tons (without Bryozoans). Here, haddock and whiting were the most abundant species.

Total catch and species richness in the standard tows ranged from 13 kg (15 min tow in rectangle 35F3) to 3033 kg (32 min tow in rectangle 39F0) per haul (Fig. 4) and from 12 to 29 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 as well as witch flounder) to fulfil requirements of the national DCF (Data Collection Framework of the European Union) sampling requirements (Tab. 2). Additional single fish data and otoliths were taken for hake (n=18) in conjunction with genetic samples and for turbot (n = 21) and brill (n = 3) together with stomach sampling. Furthermore, infestation with liver worms was recorded for cod.

Stomach data were collected for cod, horse mackerel, turbot, brill and tub gurnard according to a request from the EU. The number of individuals (≥ 15 cm length) examined and the numbers of non-empty stomach collected for later analysis are listed in table 3.

Preliminary abundance indices for the main commercial species indicate that e.g., haddock, 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. 4).

Marine litter was recorded in each GOV catch using four main categories: plastic, glass, metals and miscellaneous, which were subdivided into 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 2.86 kg of which 2.24 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 15.0 to 19.5 and from 7.5 to 19.5 °C, respectively, with the highest values found in the southeastern part of the survey area.

Special observations

In contrast to the last two years, mass occurrence of bryozoans in the south-eastern part of the survey area was limited to one station (rectangle 35F4, 232 kg in 19 min tow).

Catches of anchovy and 0-group 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 but with lower abundance than in previous years.

On the hand, the total catch of tope (Tab. 1) ranging from 105 to 159 cm in length and 5.4 to 21.4 kg in individual weight was the highest seen in the time series.

Miscellaneous

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

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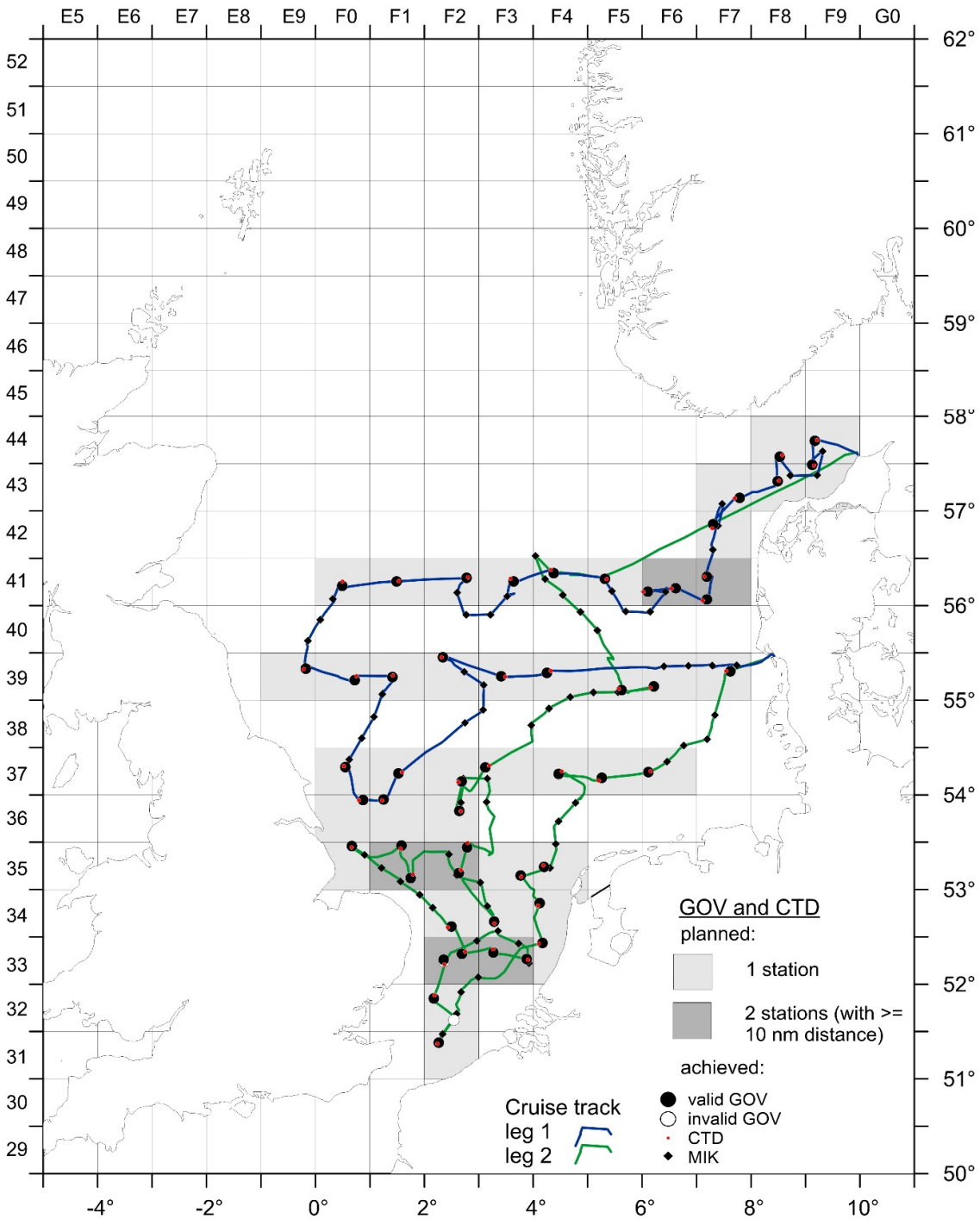


Fig. 1: Survey map with cruise track and sampling locations, RV Dana DK IBTS 3Q 2023.

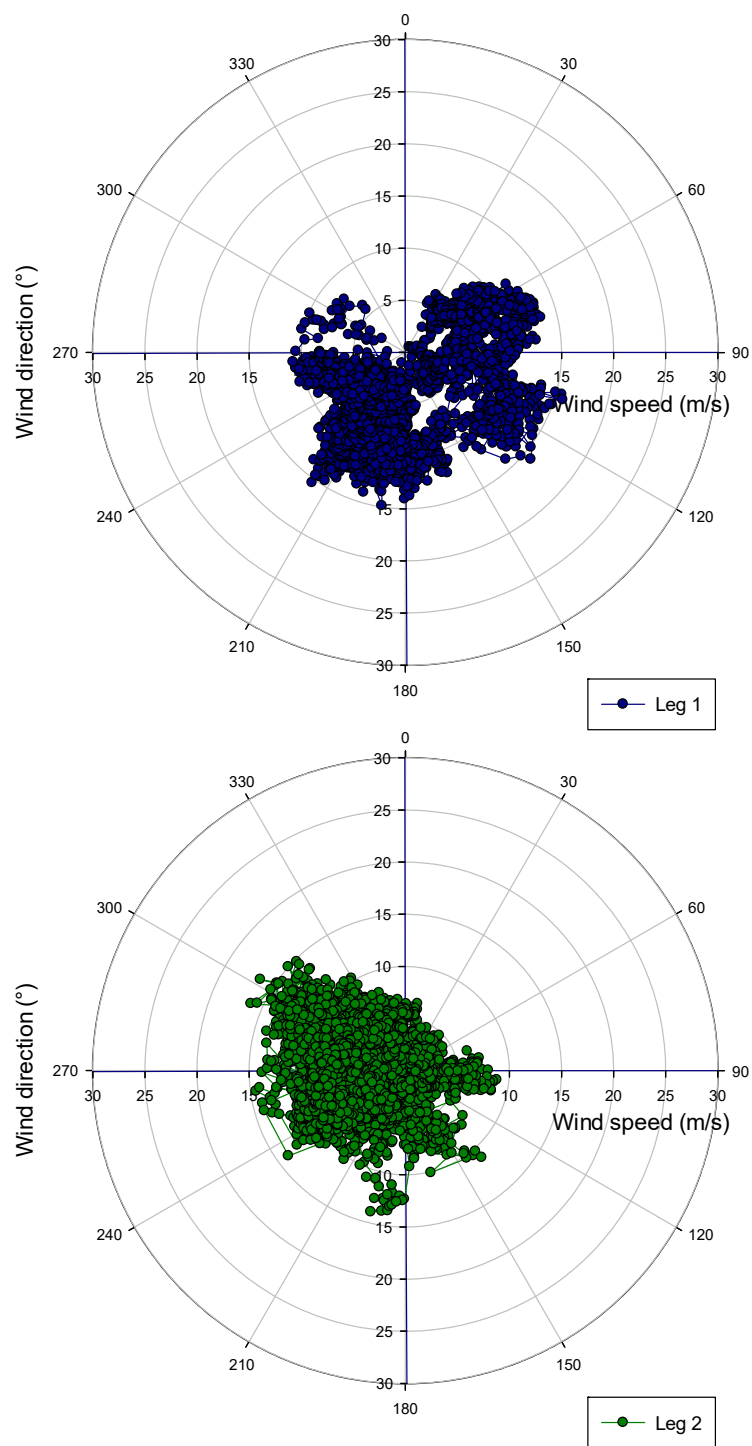


Fig. 2. Wind speed (m/s) and wind direction ($^{\circ}$) recorded along the cruise track, RV Dana DK IBTS 3Q 2023.

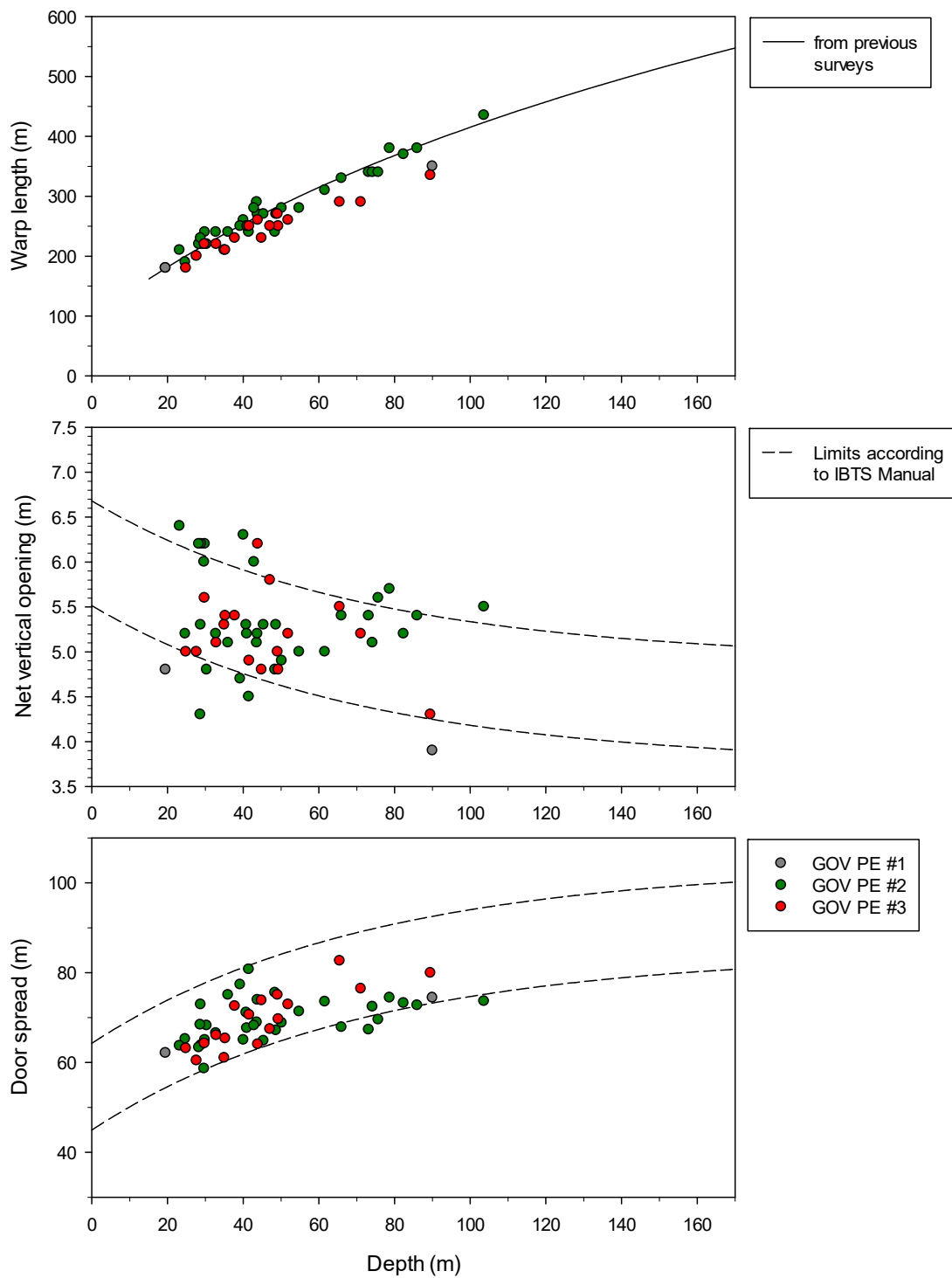


Fig. 3a: Warp length, net opening and door spread in relation to depth, RV Dana DK IBTS 3Q 2023.

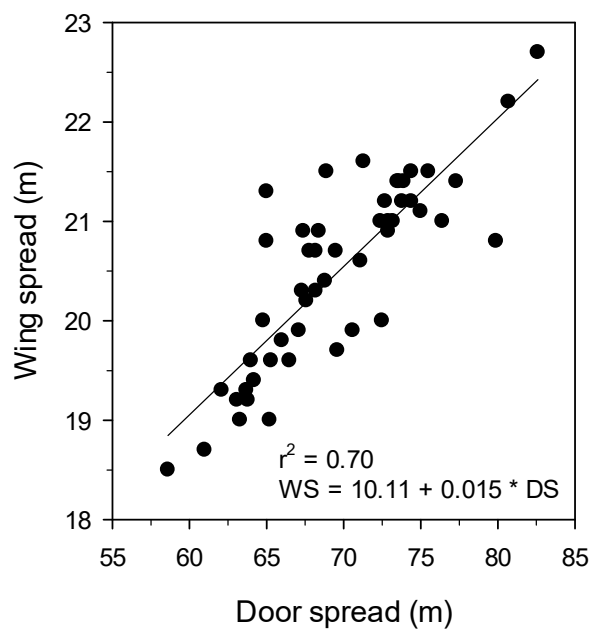


Fig. 3b: Relationship between door and wing spread, RV Dana DK IBTS 3Q 2023.

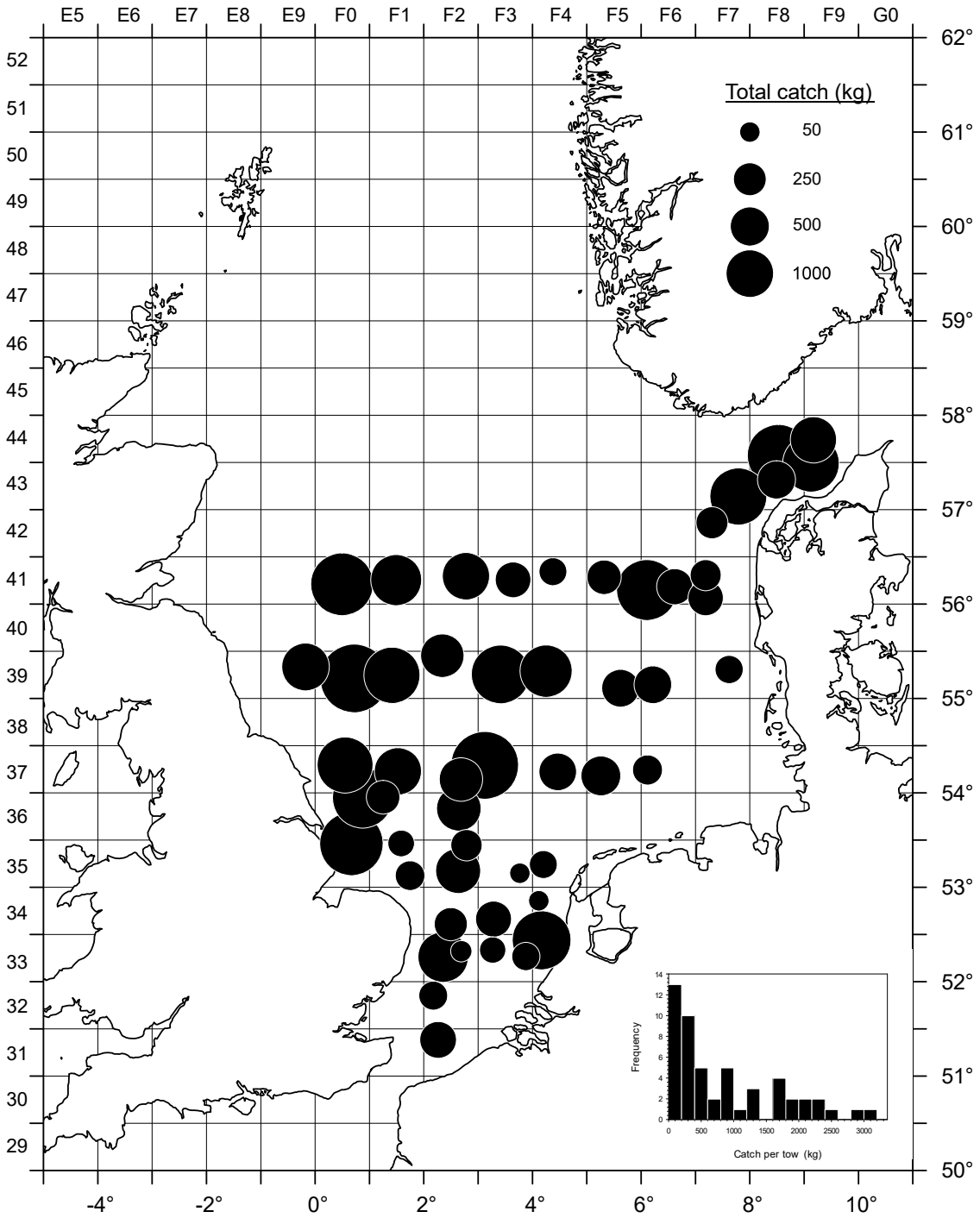


Fig. 4: Total catch of fish and shellfish (symbol size) per tow (Note: catch in kg per tow, i.e. not adjusted for differences in tow duration and swept area fished), Dana DK IBTS 3Q 2023.

Tab. 1: Species list, Dana DK IBTS 3Q 2023 (L: total length in cm below (fish); ML: mantle length (cephlapods); CPL or CPW: carapace length or width (crustaceans)).

Latin name	English name	Danish name	Weight (kg)	Number	L _{min} (cm)	L _{max} (cm)	Remark
Aequipecten opercularis	Queen scallop	Jomfruesters	0.198	11	-	-	
Agonus cataphractus	Pogge	Panser ulk	0.095	9	6.0	13.0	
Alloteuthis subulata	European common squid	Dværgblæksprutte	37.003	4682	2.0	15.0	ML
Alosa fallax	Twaite shad	Stavsild	1.343	2	37.0	44.0	
Amblyraja radiata	Starry ray	Tærbe	3.959	10	25.0	46.0	
Ammodytes marinus	Lesser sandeel	Havtobis	0.293	21	7.5	21.0	
Arnoglossus laterna	Scaldfish	Tungehvarre	0.692	63	8.0	14.0	
Bryozoa	Bryozoans	Mosdyr	256.968	0	-	-	
Buglossidium luteum	Solenette	Glastunge	1.130	122	7.0	11.0	
Callionymus lyra	Common dragonet	Stribet fløjfisk	7.323	155	6.0	24.0	
Callionymus maculatus	Spotted dragonet	Plettet fløjfisk	0.044	4	8.0	14.0	
Cancer pagurus	Edible crab	Taskekrabbe	22.806	55	7.2	19.7	CPW
Chelidonichthys lucerna	Tub gurnard	Rød knurhane	10.753	31	22.0	44.0	
Ciliata mustela	Five-bearded rockling	Femtrådet havkvabbe	0.027	1	15.0	15.0	
Clupea harengus	Herring	Sild	2738.014	73972	7.5	34.0	
Dicentrarchus labrax	Bass	Havbars	40.644	32	36.0	63.0	
Echiichthys vipera	Lesser weever	Fjæsing lille	32.929	1400	6.0	19.0	
Eledone cirrhosa	Horned octopus	Eledone Blæksprutte	0.023	1	-	-	
Enchelyopus cimbrius	Four-bearded rockling	Firetrådet havkvabbe	2.792	82	15.0	26.0	
Engraulis encrasicolus	Anchovy	Ansjos	0.133	5	13.0	17.0	
Entelurus aequoreus	Snake pipefish	Snippe	0.116	6	41.0	50.0	
Eutrigla gurnardus	Grey gurnard	Grå knurhane	369.742	5790	10.0	35.0	
Gadus morhua	Cod	Torsk	132.624	521	7.0	67.0	
Galeorhinus galeus	Tope	Gråhaj	1016.640	74	105.0	159.0	
Glyptocephalus cynoglossus	Witch	Skaerising	5.916	22	12.0	42.0	
Gymnammodytes semisquamatus	Smoothed sandeel	Nøgentobis	2.216	130	14.0	23.0	
Helicolenus dactylopterus	Blackbelly rosefish	blåkæft	0.562	5	16.0	23.0	
Hippoglossoides platessoides	American plaice	Håising	100.513	2414	10.0	25.0	
Homarus gammarus	European lobster	Hummer	16.542	30	5.8	13.1	CPL
Hyperoplus lanceolatus	Greater sandeel	Plettet tobiskonge	58.624	2026	16.5	31.5	
Illex coindetii	Southern shortfin squid	Rød blæksprutte	2.671	33	10.0	18.0	ML
Leucoraja naevus	Cuckoo ray	Pletrokke	0.203	1	33.0	33.0	
Limanda limanda	Common dab	Ising	2707.967	48985	4.0	31.0	
Lithodes maja	Norway king crab	Troldkrabbe	3.540	7	6.8	12.7	CPL
Liza ramada	Thin lipped mullet	Tyndlæbet mulde	1.650	1	57.0	57.0	
Loligo	Loligo sp	*Loligoblæksprutter	5.131	4217	1.0	6.0	ML
Loligo forbesii	Northern squid	Loligoblæksprutte	140.021	3885	2.0	31.0	ML
Loligo vulgaris	European squid	Europæisk loligo	5.517	16	10.0	30.0	ML
Lophius piscatorius	Angler fish	Havtaske	11.684	11	20.0	55.0	
Lumpenus lampretaeformis	Snake blenny	Spidsalet langebarn	0.034	1	31.0	31.0	
Maja squinado	Common spider crab	Edderkoppekrabbe	0.385	2	8.4	8.9	CPL
Melanogrammus aeglefinus	Haddock	Kuller	13034.981	56752	11.0	55.0	
Merlangius merlangus	Whiting	Hvilling	11832.498	155752	5.0	45.0	
Merluccius merluccius	Hake	Kulmule	37.075	18	37.0	97.0	
Micromesistius poutassou	Blue whiting	Blåhvilling	0.255	3	19.0	26.0	
Microstomus kitt	Lemon sole	Rødtunge	114.302	1078	13.0	32.0	
Molva molva	Ling	Lange	2.776	5	43.0	50.0	
Mullus surmuletus	Striped red mullet	Stribet rød Mulle	23.606	242	5.0	29.0	
Mustelus asterias	Starry smooth-hound	Sternehaj	347.535	166	52.0	104.0	
Myoxocephalus scorpius	Sculpin	Almindelig ulk	0.850	9	12.0	20.0	
Myxine glutinosa	Hagfish	Slimål	0.037	1	-	-	
Nephrops norvegicus	Norway lobster	Jomfruhummer	7.328	244	1.7	6.2	CPL
Pecten maximus	Great scallop	Stor kammusling	1.128	8	-	-	
Pholis gunnellus	Butter fish	Tangspræl	0.018	1	17.0	17.0	
Platichthys flesus	Flounder	Skrubbe	3.358	12	21.0	37.0	
Pleuronectes platessa	Plaice	Rødspætte	437.866	3593	10.0	41.0	
Pollachius pollachius	Pollack	Lyssej	13.420	6	50.0	68.0	
Pollachius virens	Saithe	Sej	8.422	14	29.0	52.0	
Pomatoschistus	Sand gobies	*Sandkutlinger	0.001	1	4.0	4.0	
Raja brachyura	Blonde ray	Småplettet rokke	18.459	13	36.0	80.0	
Raja clavata	Thornback ray	Sømrrokke	70.237	57	28.0	79.0	
Raja montagui	Spotted Ray	Storplettet Rokke	18.168	23	38.0	56.0	
Rossia macrosoma	Stout bobtail squid	Ross's blæksprutte	0.064	35	-	-	
Sardina pilchardus	Pilchard	Sardin	304.484	3014	9.0	27.0	
Scomber scombrus	Mackerel	Makrel	4355.461	32195	20.0	41.0	
Scophthalmus maximus	Turbot	Pighvarre	26.750	21	24.0	63.0	
Scophthalmus rhombus	Brill	Slethvarre	5.491	7	29.0	53.0	
Scyliorhinus canicula	Lesser-spotted dogfish	Småplettet rødhaj	498.177	848	21.0	65.0	
Sepia officinalis	Common cuttlefish	Sepiablæksprutte	3.388	9	10.0	23.0	ML
Solea solea	Sole	Tunge	2.182	18	18.0	32.0	
Sprattus sprattus	Sprat	Brisling	5007.982	516271	6.0	15.0	
Squalus acanthias	Spurdog	Pighaj	16.144	24	26.0	81.0	
Todaropsis eblanae	Lesser flying squid	Todaropsis eblanae	0.142	1	11.0	11.0	ML
Trachinus draco	Greater weever fish	Fjæsing	23.300	141	16.0	39.0	
Trachurus trachurus	Horse mackerel	Hestemakrel	1871.626	56921	4.0	38.0	
Trisopterus esmarkii	Norway pout	Sperling	193.618	9362	5.0	18.0	
Trisopterus luscus	Bib	Skægtorsk	57.220	551	13.0	27.0	
Trisopterus minutus	Poor-cod	Glyse	33.545	1013	9.0	19.0	
Zeus faber	John dory	Sanktpetersfisk	0.604	2	25.0	26.0	

Tab. 2: Number of single fish data (length, individual weight, and sex; maturity for herring, sprat and hake; infestation with liver parasites for cod and samples for ageing and genetics (hake: otoliths just stored but not read), Dana DK IBTS 3Q 2023.

Species	Total
Herring (<i>Clupea harengus</i>)	446
Sprat (<i>Sprattus sprattus</i>)	157
Cod (<i>Gadus morhua</i>)	131
Haddock (<i>Melanogrammus aeglefinus</i>)	524
Whiting (<i>Merlangius merlangus</i>)	615
Saithe (<i>Pollachius virens</i>)	11
Norway pout (<i>Trisopterus ermarkii</i>)	46
Mackerel (<i>Scomber scombrus</i>)	354
Plaice (<i>Pleuronectes platessa</i>)	658
Hake (<i>Merluccius merluccius</i>)	18
Turbot (<i>Scophthalmus maximus</i>)	21
Brill (<i>Scophthalmus rhombus</i>)	3
Witch flounder (<i>Glyptocephalus cynoglossus</i>)	15
Sum:	2999

Tab. 3: Number of stomach data collected by species (V: everted, R: regurgitated, F: feeding, E: empty, -: not caught; note: only category F stomachs were collected for later analysis), Dana DK IBTS 3Q 2023.

Species	Number of stomachs per category				total
	V	R	F	E	
Cod	1	2	78	3	84
Horse mackerel	0	0	58	50	108
Turbot	0	0	17	0	17
Brill	0	0	2	1	3
Halibut	-	-	-	-	0
Pollack	-	-	-	-	0
Tusk	-	-	-	-	0
Ling	-	-	-	-	0
Tub gurnard	1	0	22	0	23
sum:			177		235

Tab. 4: Preliminary abundance indices (number per hour trawling) for commercial IBTS species per tow, Dana DK IBTS 3Q 2023.

		COD			HADDOCK			WHITING			NORWAY POUT			HERRING			SPRAT		MACKEREL			SAITHE			PLAICE		
assumed Age:	Length:	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+
St No	Rect	<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
2	44F9	50	408	20	32	1423	1557		110	622	2607	6292			28	18				33	411			26			56
4	43F9																				27076					532	258
9	44F8	10	255	58		1824	6155			386	398	8365	531		199	20				14	14						12
11	43F8					15	725								4	6				1208	45						78
12	43F7	12	61	8		9167	2971	82	3347	517					8	6				10	69		2			30	433
14	42F7		38	4		68	293	2	95	56										239	18					96	339
21	41F7							4	58							2				489	20					386	255
22	41F7		2			2		2	14											3294	34					141	170
24	41F6				6	191	10	42	249	8				6957	1096		17139	651		221	4					92	173
27	41F6			2		724	10	580	5918	116				12828	6244		315437			34	22					82	143
34	41F5				7	1126	15		610	291	2	4		21953	154		6228	113								8	154
35	41F4				4	72	34	8	64	20										6						2	60
37	41F3		2			1372	364		227	340				18	70		327	631									50
44	41F2		4			7293	2109	20	145	270		38	8			10					4						40
46	41F1		6	2		2456	4071		123	1288			10		1371	2864	6	2		87	6						56
47	41F0		6	8		3462	9047		49	1685	6	6	4		6887	1410				12	68						36
54	39E9		10	4		5510	1980		736	2137			8		90	92	2491	1162		4	22					4	42
55	39F0		2	4		7907	4955		2949	6944		42	26		763	7049	862	379		30	66						74
58	39F1					56	80		2	4					4	8				21892						2	169
68	37F0		8			10719	771		12264	3402		4	4		2	26	16	8		44	2					8	58
70	36F0				4	14	8	2908	43627	3232				72	24	2	30220	5876		253	16					14	32
72	36F1					2	2	309	1681	155										681						64	207
73	37F1					193	64		9214	4948							2			297	13					14	215
80	39F2					8401			1621	608				6	96					10							170
81	39F3							39	132	6				20591	24236		137111	16406								4	95
83	39F4				6	4413	438	235	2338	379				3750	7500		112817	5082								14	162
90	39F7							20	4					85			12			74	4					6	2
97	37F6				2	2		1105	162	10				124	4	4	3747			20	6					22	62
98	37F5							13776	1520					11918	295		61694			18	2					48	74
100	37F4							9030	8645	212				380	2		5948									26	32
109	35F4							22	25											240	13					133	25
111	35F3								12											157						12	20
112	34F4								5																	7	19
114	33F4	32						35036	38303											1831	59					30	148
121	31F2																			265	243					3	30
123	32F2					720	43		424	861	776									13	13						80
126	33F2					4			4	30							2			42	54						34
133	33F3							2	30											26	6					26	26
134	33F3																			658	68						37
136	33F2			4		4		4	16											10	4					6	28
138	34F2							42	2712	1441										44	16					18	44
146	35F0							6	1216	12300					2		28			2	68						
147	35F1			2				6	10	4							2			56	4					18	48
149	35F1					2		34	218	23										341	271						8
156	34F3							1298	135											112	26					16	66
157	35F2						2	395	127					3321	4		239220			2839						2	52
159	35F2							199	94	2				152	70		2597	111		44	2					25	408
166	36F2						2	5881	7945	561				46	2		1748	43			2					4	149
167	37F2		8	10		58	74	155	3711	7190				8	20		906										20
170	37F3			2		9300	511	888	14214	12784					2		14			2	72					2	133
178	39F5				8	56		80	110			2		1323	61		57544			2						6	177
179	39F6							2307	9525					1910	55		1792	11		238	24					66	86

