

**R/V Dana**

**Cruise 01/2022**

**"DK IBTS 1Q 2022"**



Vessel: R/V DANA

Cruise dates (planned): 26/1 – 13/2 2022

Cruise number: 01/22

Cruise name: DK IBTS 1Q 2022

<b>Port of departure:</b>	Hirtshals	<b>Date:</b>	26 January
<b>Port of return:</b>	Hirtshals	<b>Date:</b>	14 February
<b>Other ports:</b>	Esbjerg	<b>Date and justification:</b>	4 February: Scheduled exchange of scientific staff and vessel crew

## Participants

<b>Leg 1: Hirtshals – Esbjerg</b>		
<b>Name</b>	<b>Institute</b>	<b>Function and main tasks</b>
Helle Rasmussen	DTU Aqua, Monitoring	Cruise leader, Technician, Fish lab
Tom Svoldgaard	DTU Aqua, Monitoring	Technician, Fish lab
Jesper Knudsen	DTU Aqua, Monitoring	Technician, Fish lab
Rene Erlandsen	DTU Aqua, Monitoring	Technician, Fish lab
Brian Werner Thomsen	DTU Aqua, Monitoring	Technician, Fish lab
Bastian Huwer	DTU Aqua, Marine Living Resources	Scientist, Fish eggs and larvae
Per Christensen	DTU Aqua, Monitoring	Technician, Fish eggs and larvae
Eik Ehlert Britsch	DTU Aqua, Monitoring	Technician, CTD, Maintenance

<b>Leg 2: Esbjerg – Hirtshals</b>		
<b>Name</b>	<b>Institute</b>	<b>Function and main tasks</b>
Kai Wieland	DTU Aqua, Monitoring	Cruise leader, Scientist, Fish lab
Helle Rasmussen	DTU Aqua, Monitoring	Technician, Fish lab
Tom Svoldgaard	DTU Aqua, Monitoring	Technician, Fish lab
Jesper Knudsen	DTU Aqua, Monitoring	Technician, Fish lab, Deck
Brian Werner Thomsen	DTU Aqua, Monitoring	Technician, Fish lab
Bastian Huwer	DTU Aqua, Marine Living Resources	Scientist, Fish eggs and larvae
Per Christensen	DTU Aqua, Monitoring	Technician, Fish eggs and larvae (part time), Fish lab (part time)
Eik Ehlert Britsch	DTU Aqua, Monitoring	Technician, CTD, Maintenance
Louise Koehler	DTU Aqua, Marine Living Resources	Scientist, Jellyfish

## Objectives

The survey is part of the 1<sup>st</sup> quarter International Bottom Trawl Survey in the North Sea (NS-IBTS), which is coordinated by the ICES International Bottom Trawl Survey Working Group and has been conducted with standard fishing gear in the 1<sup>st</sup> quarter since 1983.

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 1<sup>st</sup> 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, and mackerel) 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 fish species and selected invertebrates;
- To collect data for the determination of biological parameters for selected species;
- To collect hydrographical and environmental information;
- To determine the distribution of in particular herring and sprat larvae;

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 1<sup>st</sup> quarter 2022 (Fig. 1) was allocated during the most recent IBTS Working Group meeting in April 2021. The survey area consisted of 43 ICES statistical rectangles located in the Skagerrak and the North Sea. In 41 of these rectangles, one GOV/CTD station and two MIK stations were planned whereas in two of the rectangles in which Denmark was the only country sampling intensity should have been doubled.

## Itinerary

Embarkation was on 25<sup>th</sup> January in the afternoon after a final pre-survey Covid-19 test onshore.

Departure of R/V Dana was delayed due to technical issues. The vessel left Hirtshals on Wednesday 26<sup>th</sup> January at 19:00 local time heading towards the Norwegian coast. The field work started in the western Skagerrak (Fig. 1) first on 28<sup>th</sup> January and had interrupted again on 30<sup>th</sup> January due to bad weather at which the vessel stayed off the southern Norwegian coast for seeking shelter. RV Dana returned to Hirtshals on 31<sup>st</sup> January (7:15 – 16:15) for an emergency repair.

The vessel arrived in the port of Esbjerg on Friday 4<sup>th</sup> February at 9:15 for a scheduled exchange of scientific staff and vessel crew. Pre-boarding Covid tests of the exchange staff were done in Esbjerg but unfortunately not all test results were negative. Re-arranging

working duties and convincing staff to continue for the 2<sup>nd</sup> cruise leg not result in sufficient crew, and waiting for replacement delayed departure until 20:00 local time. At this time it was too late for taking a direct course to the central and western part of the working area due to the actual weather conditions (Fig. 1 inlet). Field work commenced first in the late morning on Monday 7<sup>th</sup> February. Moderate to rough weather conditions prevailing during the following days but on Saturday 12<sup>th</sup> February again not field work was possible where the vessel stayed close to shore in the eastern part of the survey area. Two fishing stations were made on Sunday 13<sup>th</sup> February and R/V Dana returned to Hirtshals on Monday 14<sup>th</sup> February at 00:40 local time.

Favorable weather conditions prevailed during short periods of the survey only and were interrupted by periodically heavy storms almost every second day in particular during the 1<sup>st</sup> cruise leg (Fig. 2). While north-easterly winds with up to 30 m/s prevailed during the 1<sup>st</sup> leg wind direction changed to west and south-west the main part of the 2<sup>nd</sup> leg with wind speeds below 25 m/s.

In total, 7 working days were lost because technical or poor weather conditions.

## **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 sampling activities were performed:

26 valid standard GOV hauls and 1 invalid GOV haul.

26 CTD profiles (with additional sensors for dissolved oxygen and turbidity).

54 valid MIK (2 m ringnet) hauls, performed during night time, all with MIKey (20 cm fine meshed ringnet) net attached.

## **Results**

### ***Routine sampling***

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). Deviations from the theoretical values for net opening occurred during the beginning of the survey can be attribute to the use of a new trawl which was not entirely adjusted. Marport sensors for wing spread did not work properly on all stations. The obtained data, however, indicate a sufficiently close relationship door spread so that the missing wing spread observations can easily be estimated with linear regression (Fig. 3b).

In total, 65 different species of fish, cephalopods and crustaceans were found in catches. The total weight of the catches was 5.9 tons (Tab. 1) which was much lower than in

previous years and is related to the low number of stations conducted. Total catch and species richness in the standard tows ranged from 17 kg to 3.2 tons per haul and from 10 to 27 different fish and IBTS mandatory invertebrate species (Fig. 4). High turbidity values measured off the Danish west coast (Fig. 5), however, makes it a bit questionable that the catches of roundfish species for which a herding effect by the warps, doors and sweeps affecting its catchabilities are representative due the low visibility at shallow water stations resulting from the wind stress caused by the various gales.

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 for the new target species according to the actual EU Data Collection Framework (witch flounder, dab, lemon sole, flounder, turbot and grey gurnard) (Tab. 2). Stomachs were collected from whiting (n=156) and monkfish (n=2) according to a request from the EU.

Preliminary abundance indices for the main commercial species indicate that whiting, herring and sprat recruits were widely distributed in the sampled area (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 1.7 kg for the 26 valid tows. In addition, 5 abandoned crab pots were caught at one station, 1 pot in the codend, 1 in the tunnel blocking the entrance to the codend and 3 wrapped around the starboard wing of the trawl and thus the tow was classified as invalid.

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.

### ***Special requests***

Infestation with liver worms and gill parasites was recorded for cod and haddock, respectively, for all individuals for which single fish data were taken.

Genetic samples for national projects were taken from anchovy (10 individuals), cuckoo ray (1), thornback ray (4), spotted ray (6) and starry ray (3) as well as from adult cod in spawning condition (2) together with the recording of single length and weight.

### ***Miscellaneous***

Results of the MIK and MIKey plankton sampling for in particular herring larvae, fish eggs and jellyfish conducted during night will be reported later elsewhere.

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

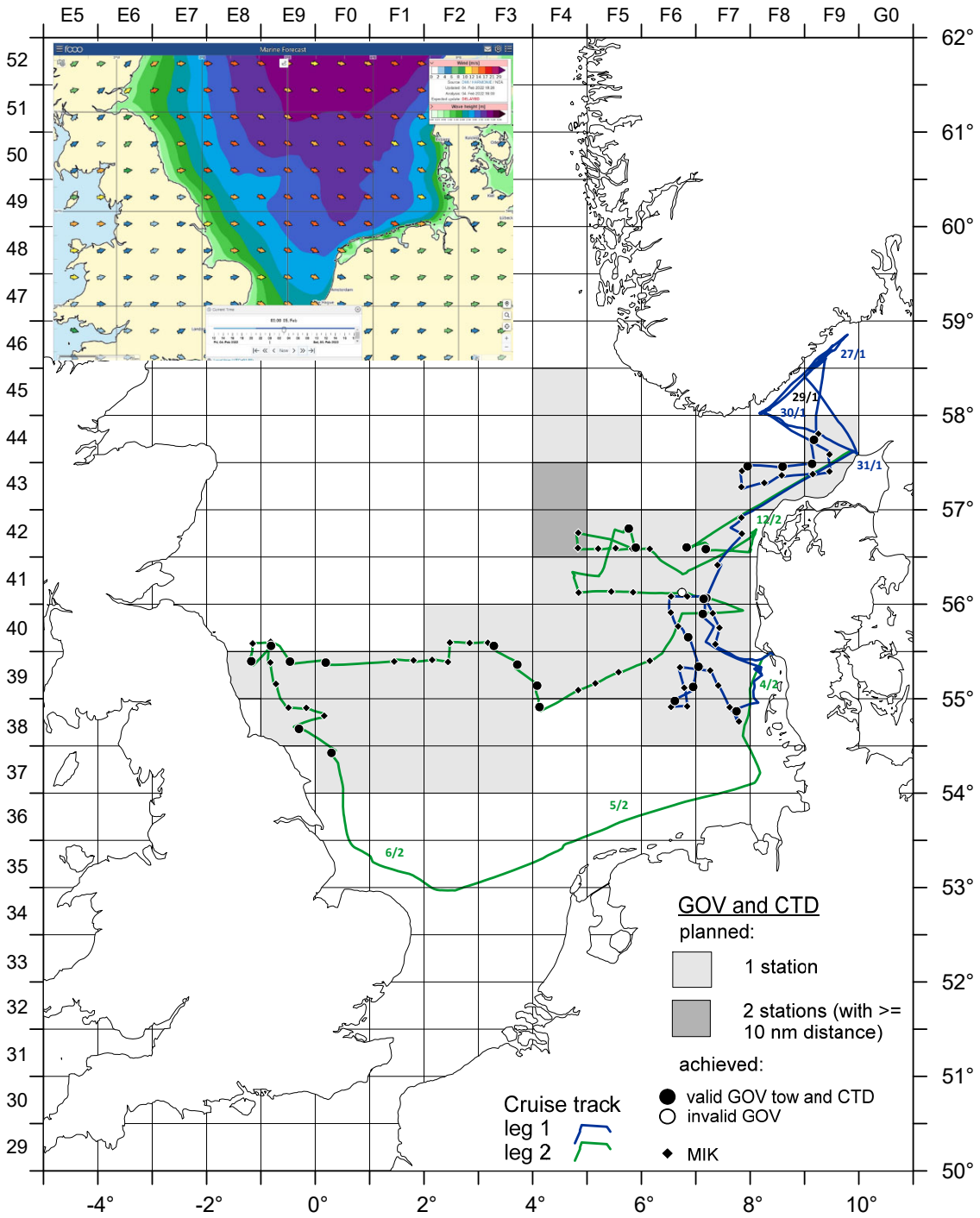


Fig. 1: Survey map with cruise track and sampling locations, RV Dana DK IBTS 1Q 2022.

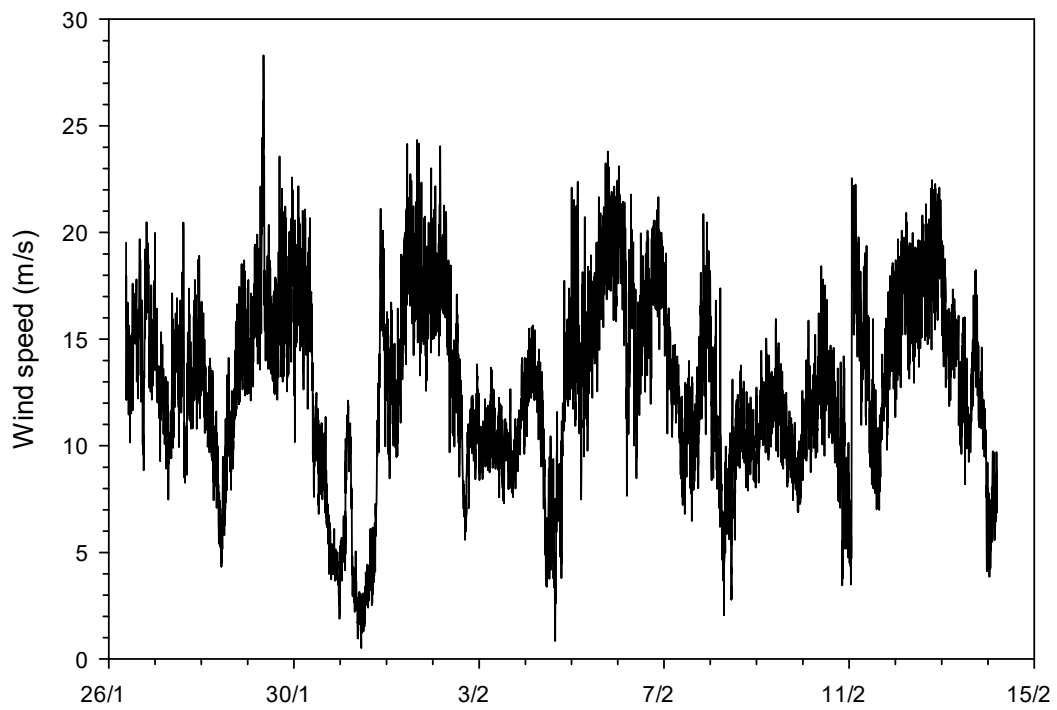
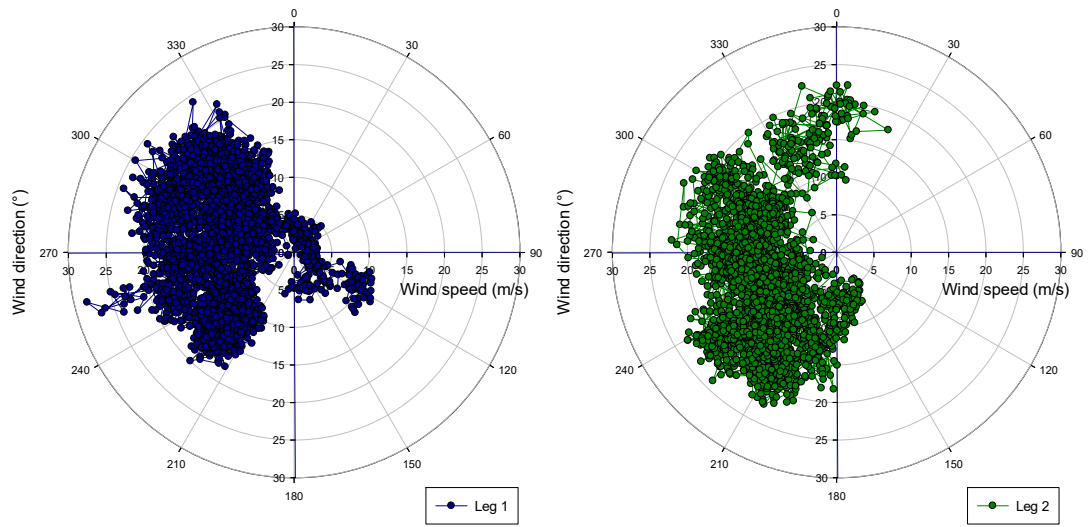


Fig. 2. Wind speed (m/s) and wind direction (°) recorded along the cruise track, RV Dana DK IBTS 1Q 2022.

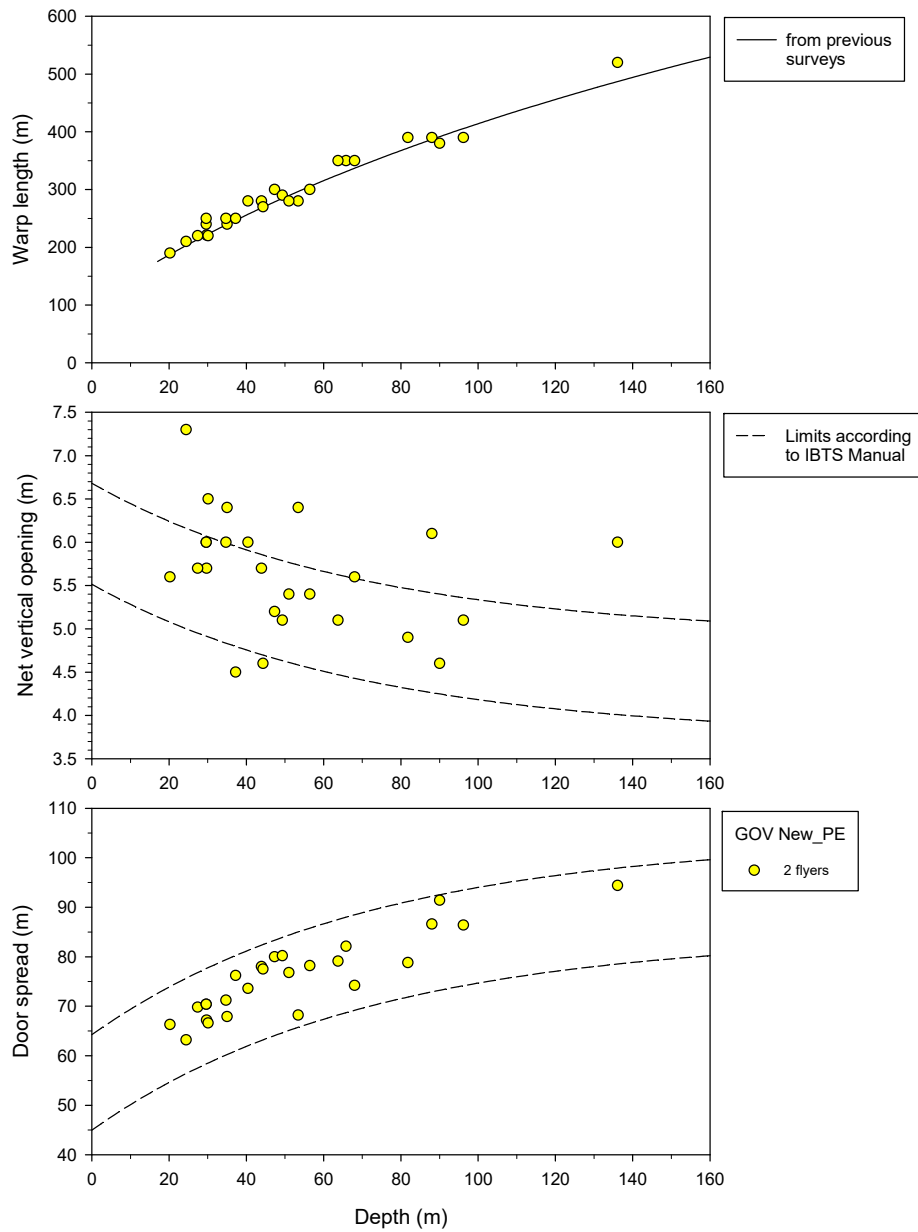
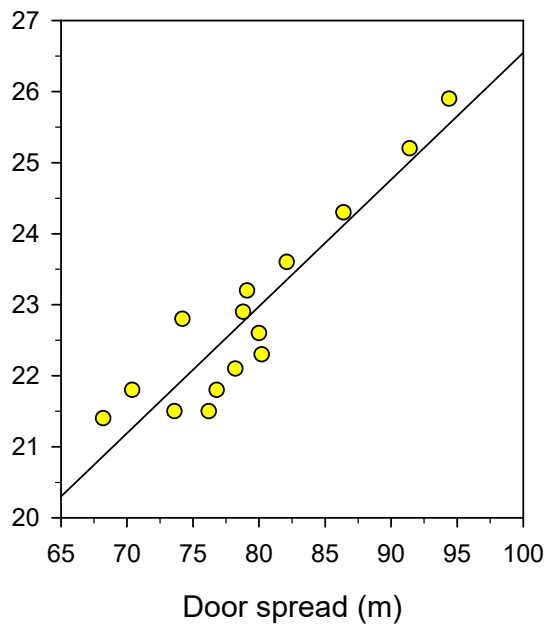


Fig. 3a: Warp length, net opening and door spread in relation to depth, RV Dana DK IBTS 1Q 2022.





Data Source: Data 1 in DanaTrawlGeometry\_1Q2022.JNB

Equation: Polynomial; Linear

$f = y_0 + a * x$

R	Rsqr	Adj Rsqr	Standard Error of Estimate
0.926	0.857	0.846	0.541

	Coefficient	Std. Error	t	P
y0	8.698	1.613	5.392	0.0001
a	0.179	0.020	8.811	<0.0001

Analysis of Variance:

	DF	SS	MS
Regression	2	7861.390	3930.695
Residual	13	3.800	0.292
Total	15	7865.190	524.346

Corrected for the mean of the observations:

	DF	SS	MS
Regression	1	22.696	22.696
Residual	13	3.800	0.292
Total	14	26.496	1.893

Statistical Tests:

Normality Test (Shapiro-Wilks) Passed (P = 0.2574)  
W Statistic = 0.9283 Significance Level = 0.0500

Fig. 3b: Relationship between door and wing spread, RV Dana DK IBTS 1Q 2022.

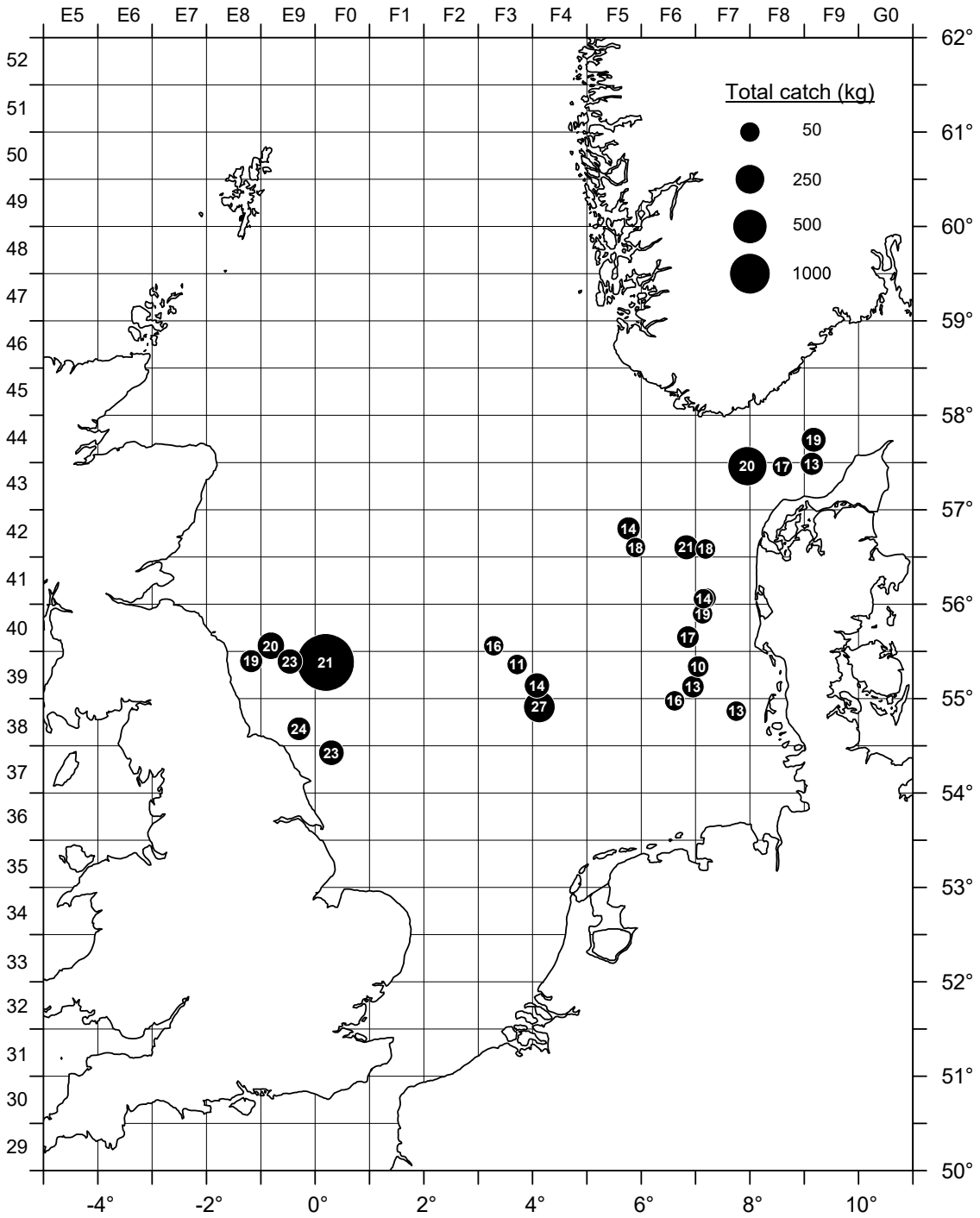


Fig. 4: Total catch of fish and shellfish (symbol size) and species richness (numbers within the circles) per tow (Note: catch in kg per tow, i.e. not adjusted for differences in tow duration and swept area fished), Dana DK IBTS 1Q2022.

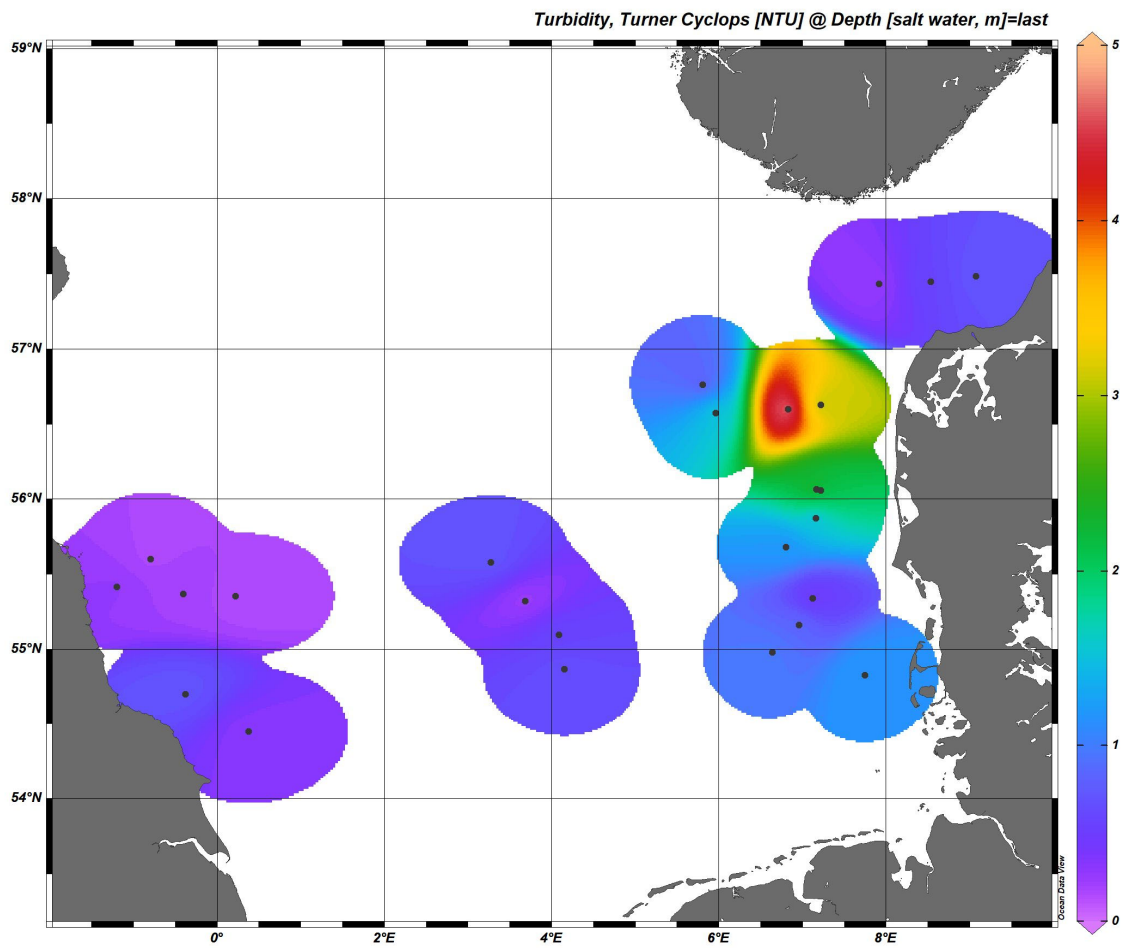


Fig. 5: Turbidity in bottom layer, Dana DK 1Q2022

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

Latin name	English name	Danish name	Weight (kg)	Number	L <sub>min</sub> (cm)	L <sub>max</sub> (cm)	Remark
<i>Aequipecten opercularis</i>	Queen scallop	Jomfrustøsters	0.052	2	-	-	
<i>Agonus cataphractus</i>	Pogge	Panser ulk	0.382	23	4.0	16.0	
<i>Alloteuthis subulata</i>	European common squid	Dværgeblæksprutte	9.579	2777	2.0	10.0	ML
<i>Alosa fallax</i>	Twaite shad	Stavsild	0.085	1	22.0	22.0	
<i>Amblyraja radiata</i>	Starry ray	Tærbe	11.153	27	17.0	48.0	
<i>Ammodytes marinus</i>	Lesser sandeel	Havtobis	0.402	203	5.5	19.5	
<i>Arnoglossus latera</i>	Scaldfish	Tungehvarre	0.259	27	4.0	13.0	
<i>Buglossidium luteum</i>	Solenette	Glastunge	1.374	127	5.0	12.0	
<i>Callionymus lyra</i>	Common dragonet	Stribet fløjfisk	0.777	26	4.0	22.0	
<i>Callionymus maculatus</i>	Spotted dragonet	Plettet fløjfisk	0.007	1	10.0	10.0	
<i>Callionymus reticulatus</i>	Reticulated dragonet	Kortfinnet fløjfisk	0.018	1	15.0	15.0	
<i>Cancer pagurus</i>	Edible crab	Taskekrabbe	30.859	60	10.4	23.1	CPW
<i>Clupea harengus</i>	Herring	Sild	484.441	20601	6.5	30.0	
<i>Cyclopterus lumpus</i>	Lumpfish	Stenbider	56.693	18	11.0	46.0	
<i>Echiichthys vipera</i>	Lesser weever	Fjæsing lille	0.407	13	9.0	16.0	
<i>Enchelyopus cimbrius</i>	Four-bearded rockling	Firetrådet havkvabbe	1.703	30	16.0	30.0	
<i>Engraulis encrasicolus</i>	Anchovy	Ansjos	0.288	33	8.0	15.0	
<i>Entelurus aequoreus</i>	Snake pipefish	Snippe	0.010	1	36.0	36.0	
<i>Eutrigla gurnardus</i>	Grey gurnard	Grå knurhane	108.221	1817	8.0	33.0	
<i>Gadus morhua</i>	Cod	Torsk	33.431	41	8.0	84.0	
<i>Gaidropsarus vulgaris</i>	Three-bearded rockling	Tretrådet havkvabbe	0.020	1	12.0	12.0	
<i>Glyptocephalus cynoglossus</i>	Witch	Skærising	3.755	23	6.0	42.0	
<i>Hippoglossoides platessoides</i>	American plaice	Håising	20.520	511	7.0	25.0	
<i>Hyperoplus lanceolatus</i>	Greater sandeel	Plettet tobiskonge	0.242	9	17.0	31.5	
<i>Illex coindetii</i>	Southern shortfin squid	Rød blæksprutte	0.011	3	4.0	5.0	ML
<i>Leucoraja naevus</i>	Cuckoo ray	Pletrokke	0.515	1	42.0	42.0	
<i>Limanda limanda</i>	Common dab	Ising	431.548	7607	5.0	29.0	
<i>Liparis montagui</i>	Montague's seasnail	Særfinnet ringbug	0.008	1	7.0	7.0	
<i>Lithodes maja</i>	Norway king crab	Troldekrabbe	2.535	6	6.2	10.9	CPL
<i>Loligo forbesii</i>	Northern squid	Loligoblæksprutte	2.809	17	8.0	29.0	ML
<i>Lophius piscatorius</i>	Monk	Havtaske	3.256	2	43.0	51.0	
<i>Melanogrammus aeglefinus</i>	Haddock	Kuller	3337.836	16946	16.0	44.0	
<i>Merlangius merlangus</i>	Whiting	Hvilling	1149.841	11621	8.0	44.0	
<i>Micromesistius poutassou</i>	Blue whiting	Blåhvilling	0.188	4	17.0	23.0	
<i>Microstomus kitt</i>	Lemon sole	Rødtunge	12.175	118	13.0	39.0	
<i>Molva molva</i>	Ling	Lange	0.954	1	56.0	56.0	
<i>Mullus surmuletus</i>	Striped red mullet	Stribet rød Mulle	0.987	10	11.0	28.0	
<i>Mustelus asterias</i>	Starry smooth-hound	Stjernehaj	15.456	40	35.0	63.0	
<i>Myoxocephalus scorpius</i>	Sculpin	Almindelig ulk	3.494	48	7.0	30.0	
<i>Nephrops norvegicus</i>	Norway lobster	Jomfruhummer	8.826	232	2.2	5.5	CPL
<i>Pholis gunnellus</i>	Butter fish	Tangspræl	0.001	1	6.0	6.0	
<i>Phrynorhombus norvegicus</i>	Norwegian topknot	Småhvarre	0.062	8	6.0	9.0	
<i>Platichthys flesus</i>	Flounder	Skrubbe	3.980	17	22.0	34.0	
<i>Pleuronectes platessa</i>	Plaice	Rødspætte	90.449	1049	6.0	44.0	
<i>Pollachius virens</i>	Saithe	Sej	2.258	2	47.0	56.0	
<i>Pomatoschistus</i>	Sand gobies	*Sandkutlinger	0.035	30	3.0	7.0	
<i>Raja clavata</i>	Thornback ray	Sømrrokke	8.279	4	49.0	75.0	
<i>Raja montagui</i>	Spotted Ray	Storplettet Rokke	10.630	18	35.0	56.0	
<i>Rossia macrosoma</i>	Stout bobtail squid	Ross's blæksprutte	0.149	76	-	-	
<i>Sardina pilchardus</i>	Pilchard	Sardin	0.320	46	7.0	12.0	
<i>Scomber scombrus</i>	Mackerel	Makrel	3.155	73	16.0	26.0	
<i>Scophthalmus maximus</i>	Turbot	Pighvarre	2.559	4	25.0	44.0	
<i>Scophthalmus rhombus</i>	Brill	Slethvarre	0.990	1	40.0	40.0	
<i>Scyliorhinus canicula</i>	Lesser-spotted dogfish	Småpletlet rødhaj	6.723	10	27.0	61.0	
<i>Sepia officinalis</i>	Common cuttlefish	Sepiablæksprutte	0.145	1	10.0	10.0	ML
<i>Solea solea</i>	Sole	Tunge	0.974	5	23.0	30.0	
<i>Sprattus sprattus</i>	Sprat	Brisling	51.014	12556	5.0	14.5	
<i>Squalus acanthias</i>	Spurdog	Pighaj	0.251	1	38.0	38.0	
<i>Syngnathus acus</i>	Great pipefish	Stor tangnål	0.009	13	9.0	13.0	
<i>Syngnathus rostellatus</i>	Lesser pipefish	Lille tangnål	0.001	1	13.0	13.0	
<i>Trachinus draco</i>	Greater weever fish	Fjæsing	0.293	3	22.0	27.0	
<i>Trachurus trachurus</i>	Horse mackerel	Hestemakrel	0.793	28	10.0	25.0	
<i>Trisopterus esmarkii</i>	Norway pout	Sperling	8.348	377	8.0	20.0	
<i>Trisopterus luscus</i>	Bib	Skægtorsk	0.392	4	18.0	22.0	
<i>Trisopterus minutus</i>	Poor-cod	Glyse	0.796	13	7.0	21.0	

Tab. 2: Number of single fish data (length, individual weight, sex and maturity infestation with liver or gill parasites for cod and haddock) and samples for ageing (\*: no otoliths collected), Dana DK IBTS 1Q 2022.

Species	Total
Herring ( <i>Clupea harengus</i> )	362
Sprat ( <i>Sprattus sprattus</i> )	125
Cod ( <i>Gadus morhua</i> )	39
Haddock ( <i>Melanogrammus aeglefinus</i> )	187
Whiting ( <i>Merlangius merlangus</i> )	298
Saithe ( <i>Pollachius virens</i> )	2
Norway pout ( <i>Trisopterus ermarkii</i> )	57
Mackerel ( <i>Scomber scombrus</i> )	16
Plaice ( <i>Pleuronectes platessa</i> )	278
Witch flounder ( <i>Glyptocephalus cynoglossus</i> )	16
Dab ( <i>Limanda limanda</i> )	149
Lemon sole ( <i>Microstomus kitt</i> )	47
Flounder ( <i>Platichthys flesus</i> )	17
Turbot ( <i>Scophthalmus maximus</i> )	4
Hake ( <i>Merluccius merluccius</i> )*	-
Grey gurnard ( <i>Eutrigla gurnardus</i> )*	99
Sum:	1696

Tab. 3: Preliminary recruitment indices (age 1 based on length split, number per hour trawling) for commercial IBTS species per tow, Dana DK IBTS 1Q2022.

Station	Rectangle	Herring	Cod	Haddock	Whiting	Norway pout	Sprat	Mackerel
2	44F9	18	10	2	65	60	0	12
3	43F9	5304	4	0	118	0	42	0
5	43F8	108	0	0	68	0	0	2
7	43F7	0	2	223	0	84	0	110
20	41F7	961	7	0	11	0	11	0
22	40F7	308	2	0	26	0	0	0
24	38F7	13713	4	0	8	0	2019	0
35	38F6	1281	0	0	36	0	4405	0
36	39F6	6844	0	0	26	0	1270	0
38	39F7	3854	0	0	14	0	4955	0
40	40F6	603	0	0	12	0	400	0
50	37F0	0	0	6	25	0	8	0
52	38E9	0	0	0	2	2	32	0
62	39E8	2	0	2	0	4	36	0
63	40E9	20	0	135	40	52	0	0
65	39E9	14	0	46	84	46	2	2
67	39F0	6	0	259	400	311	0	0
77	40F3	0	2	6	0	0	10	18
78	39F3	0	2	4	2	0	0	0
80	39F4	1164	0	0	36	0	7443	0
82	38F4	495	0	133	599	4	1767	0
88	41F7	245	0	0	6	0	38	0
94	42F5	639	2	0	18	0	148	0
96	42F5	227	2	0	14	2	644	0
104	42F7	34	0	0	10	0	8	0
107	42F6	70	2	0	54	0	20	0
	mean:	1381	2	31	64	22	895	6