Data in Brief 60 (2025) 111432

Contents lists available at ScienceDirect

Data in Brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Gelatinous macrozooplankton in the North Sea: Biodiversity and distribution pattern during winter 2023-Q1 dataset

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ARTICLE INFO

Article history:
Received 13 December 2024
Revised 18 February 2025
Accepted 21 February 2025
Available online 27 February 2025

Dataset link: Jaspers, C., Meffre, M., Werner, M., Neumann, H., & Jensen, C. J. D. (2024). Jensen, Meffre et al. 2024 - Gelatinous macrozooplankton in the North Sea: Biodiversity and distribution pattern (Original data)

ABSTRACT

The biodiversity and distribution of gelatinous macrozooplankton in the North Sea and adjacent waters during winter (January/February) 2023 is presented both quantitatively and qualitatively. The data include species-specific jellyfish and comb jelly community data, encountered during the North Sea - Midwater Ring Net (MIK) survey [1]. The MIK survey targets ichthyoplankton and is conducted at night during the quarter 1 (Q1) International Bottom Trawl Surveys (IBTS). Presented data about the gelatinous macrozooplankton community stems from Danish (DTU Aqua), the Swedish (SLU), and German (TI) partners. A total of 158 stations were investigated using a MIK net (2 m diameter, 13 m long, 1.6 mm mesh size with 0.5 mm for net end and cod end) [2]. Samples were collected by double oblique hauls from the surface to 5 m above the seafloor with a maximum depth of ~100 m [2]. Eighteen gelatinous macrozooplankton species were encountered during the Q1 2023 survey. Species encountered are hydrozoans (i) *Aequorea vitrina*, (ii) *Agalma elegans* (siphonophore), (iii)

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https://doi.org/10.1016/j.dib.2025.111432

Keywords:
Biodiversity
Jellyfish
Comb jelly
Midwater Ring Net (MIK)
Fisheries survey
Non-indigenous species (NIS)
Good Environmental Status (GES)
Marine Strategy Framework Directive (MSFD)
International Bottom Trawl Survey (IBTS)

Aglantha digitale, (iv) *Apolemia uvaria* (siphonophore), (v) *Clytia spp*., (vi) *Eutima* spp., (vii) *Leuckartiara octona*, (viii) *Melicertum octocostatum*, (ix) *Muggiaea atlantica* (siphonophore), (x) *Nanomia cara* (siphonophore), (xi) *Tima bairdii*; scyphozoans (i) *Cyanea capillata* and (ii) *Cyanea lamarckii* as well as the ctenophores (i) *Beroe* spp., (ii) *Bolinopsis infundibulum*, (iii) *Pleurobrachia bachei,* (iv) *Pleurobrachia pileus*, and (v) the non-indigenous *Mnemiopsis leidyi*.

In total 12,093 individual specimens from samples and sub-samples were analyzed and extrapolated to generate a database with 77,099 records of gelatinous macrozooplankton caught in the investigation area during Q1 2023. For rare species, the entire sample was processed, while abundances were estimated from sub-samples for abundant taxa. Flowmeter recordings and maximum net depths during each haul were used to convert raw counts to volume-specific densities (individuals m^{-3}) and area-specific abundances (individuals m^{-2}). Further, sizes for the different species were obtained from a total of 5,566 individual gelatinous macrozooplankton organisms. Sizes are presented in the accompanying database and were used to calculate species-specific wet weights, using published size-weight regressions [3] and regressions outlined in Table 1. In addition, we present spatial wet weight distribution patterns for (i) the total gelatinous macrozooplankton community, (ii) hydrozoans only, (iii) scyphozoans only and (iv) ctenophora only. The presented data contribute to a time series describing the gelatinous macrozooplankton diversity and distribution in the extended North Sea area during winter [3,4] and summer [5] and are an important baseline to understand response of jellyfish to climate change.

Specifications Table

Subject	Oceanography Biodiversity Systematics, Ecology and Behavior
Specific subject area	Spatial distribution of the gelatinous macrozooplankton community in the North Sea/Skagerrak/Kattegat during winter (January – February) 2023. Species-specific densities, size-distributions and wet weights are provided for 18 species, including Hydrozoans (Hydromedusae and Siphonophores), Scyphozoans and Ctenophora.
Type of data	4 Tables 10 Figures 1 Appendix (raw data table)
Data collection	Gelatinous macrozooplankton data were collected during night-time at a total of 158 stations across the North Sea, NW Europe. Gelatinous macrozooplankton was quantitatively assessed as part of the Midwater Ring Net (MIK) survey activities during the International Bottom Trawl Surveys (IBTS). Data were collected using a 13 m long Midwater Ring Net (MIK) with a diameter of 2 m, a mesh size of 1.6 mm and a 0.5 mm meshed cod-end as well end of the net bag. Samples were analyzed right after catch using i) a light table, ii) a stereomicroscope or iii) a magnifying lamp with dark background. Size information was collected on a sub-set of the analysed species using conventional or electronic calipers. The entire samples were analyzed expect for abundant taxa, where sub-sampling was applied.

(*continued on next page*)

Data source location	Collected in north-western Europe, extended North Sea area including the Skagerrak and the Kattegat. Data stored at the National Institute of Aquatic Resources, Technical University of Denmark, DTU Aqua, Centre for Gelatinous Plankton Ecology & Evolution, 2800 Kgs. Lyngby, Denmark, and the Institute of Marine Research, Department of Aquatic Resources (SLU Aqua), Swedish University of Agricultural Sciences, 453 30 Lysekil, Sweden, and Thünen-Institute of Sea Fisheries (TI), Herwigstraße 31, 27572 Bremerhaven, Germany
Data accessibility	Repository name: zenodo Data identification number (doi): 10.5281/zenodo.14167122 Direct URL to data: https://zenodo.org/records/14167122
Related research article	

1. Value of the Data

- This dataset is important for assessing the biodiversity and distribution of native and non-indigenous gelatinous macrozooplankton in the extended North Sea area during winter (Q1 2023).
- The data is collected using standardized protocols (North Sea - Midwater Ring Net (MIK) survey; [1,2]) which enables close international collaboration to increase the spatial coverage.
- The data were generated during winter, which represents a season with limited numbers of plankton biodiversity assessments.
- This dataset contributes to a time series [3,4], which can help to address the impact of rising winter temperatures and anthropogenic stressors on the biodiversity, distribution, and abundance patterns of gelatinous macrozooplankton.

2. Background

The motivation for this dataset is to close the knowledge gap on quantitative biodiversity and distribution pattern of gelatinous macrozooplankton in north-western Europe during winter. Further, knowledge about the co-existence of commercial important fish species and their gelatinous competitors/food resource and/or predators is sparse. Hence, engaging ichthyoplankton ecologists to quantify bycatch during regular monitoring surveys like the North Sea - Midwater Ring Net survey (MIK) [1] presents an important contribution to close this knowledge gap. The same methodology is applied during winter [3] and summer [5] surveys, across national borders, hence methodologically consistent datasets can easily be attained. This dataset includes records from Danish, Swedish and German surveys.

3. Data Description

This publication describes quantitative, species-specific distribution pattern of gelatinous macrozooplankton organisms in the extended North Sea area during winter 2023. Data were collected as a part of the Danish, Swedish, and German contributions to the North Sea - Midwater Ring Net (MIK) survey [1], an ichthyoplankton survey conducted at night-time during the quarter 1 (Q1) International Bottom Trawl Survey (IBTS). A total of 158 stations were sampled across the western, central and eastern part of the North Sea as well as the Skagerrak and Kattegat from 24th of January to 15th of February 2023 (Fig. 1). The dataset consists of species-specific spatial distribution, abundance and size data [6]. Size information was further used to estimate biomass using published size-weight regressions (see Table 1 and [3] for detail).

The dataset consists of 77,099 geo-referenced species-specific gelatinous macrozooplankton abundance and biomass records based on 12,093 individual records from samples and subsamples. We present maps to illustrate species-specific distribution pattern for the groups (i)

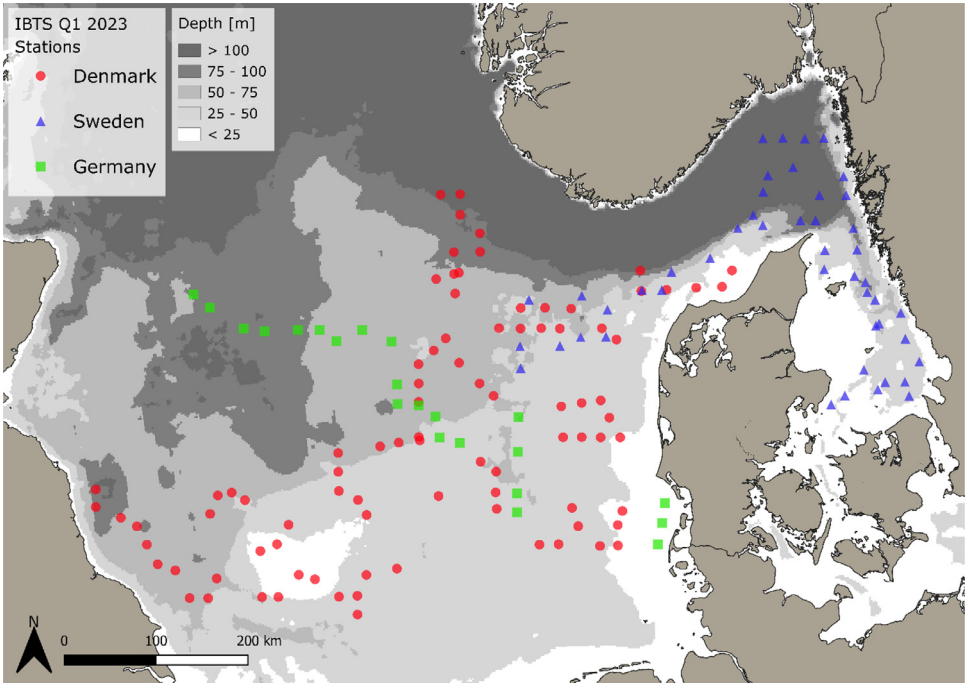

Fig. 1. Investigation area located in north-western Europe, specifically covering the North Sea and Skagerrak/Kattegat as transition zone to the Baltic Sea, where gelatinous macrozooplankton was investigated during the International Midwater Ring Net (MIK) survey [1], as part of the International Bottom Trawl Survey (IBTS) from 24 Jan to 15 Feb 2023. Samples (n = 158) from Danish (red circle, n = 89), Swedish (blue triangle, n = 47), and German (green square, n = 22) surveys are outlined. For color interpretation, the reader is referred to the web version of this article.

Table 1
Size-weight (biomass) regressions for two small Hydrozoan jellyfish species (Order: Leptothecata) based on taxonomy and shape, that were not reported in Køhler et al. [3].

Class	Order	Species	Regression	Ref.
Hydrozoa	Leptothecata	*Eutima* spp.*	$DW(mg)=0.03xD(mm)^{2.3}$	[7]
		*Melicertum octocostatum**	$DW(mg)=0.03xD(mm)^{2.3}$	[7]

* Same as *Tima bairdii* in [3], based on regression for *Aequorea vitrina* from [7]. Dry weight (DW) estimated to represent 4% of the wet weight (WW) [8].

hydrozoa, (ii) scyphozoa and (iii) ctenophora (Figs. 2-9). Further, wet weights for the above-mentioned groups as well as for the total gelatinous macrozooplankton community are presented (Fig. 10). The dataset includes 18 gelatinous macrozooplankton species with eleven hydrozoans: *Aequorea vitrina, Apolemia uvaria, Aglantha digitale, Agalma elegans, Clytia* spp., *Eutima* spp., *Leuckartiara octona, Melicertum octocostatum, Muggiaea atlantica, Nanomia cara, Tima bairdii*; two scyphozoans: *Cyanea lamarckii* and *Cyanea capillata* as well as five ctenophore species: *Beroe* spp., *Bolinopsis infundibulum, Pleurobrachia bachei, Pleurobrachia pileus* and the non-indigenous *Mnemiopsis leidyi*. Due to the difficulty to separate early life stages (ephyra) of the scyphozoan jellyfish species *Cyanea capillata* and *C. lamarckii*, both species were grouped and are recorded as *Cyanea* spp. only. The same applies for *P. bachei* and *P. pileus*, which were grouped as *Pleurobrachia* spp. due to uncertainty in their identification across investigations. For the Swedish investigation, small and rare hydrozoans apart from *A. digitale, A. uvaria, A. vitrina, Clytia* spp., *L. octona*, and *T. bairdii* were not quantified. Note: in 2022, *A. uvaria, Clytia* spp. and *L. octona* were not quantified and recorded in the Swedish dataset [4].

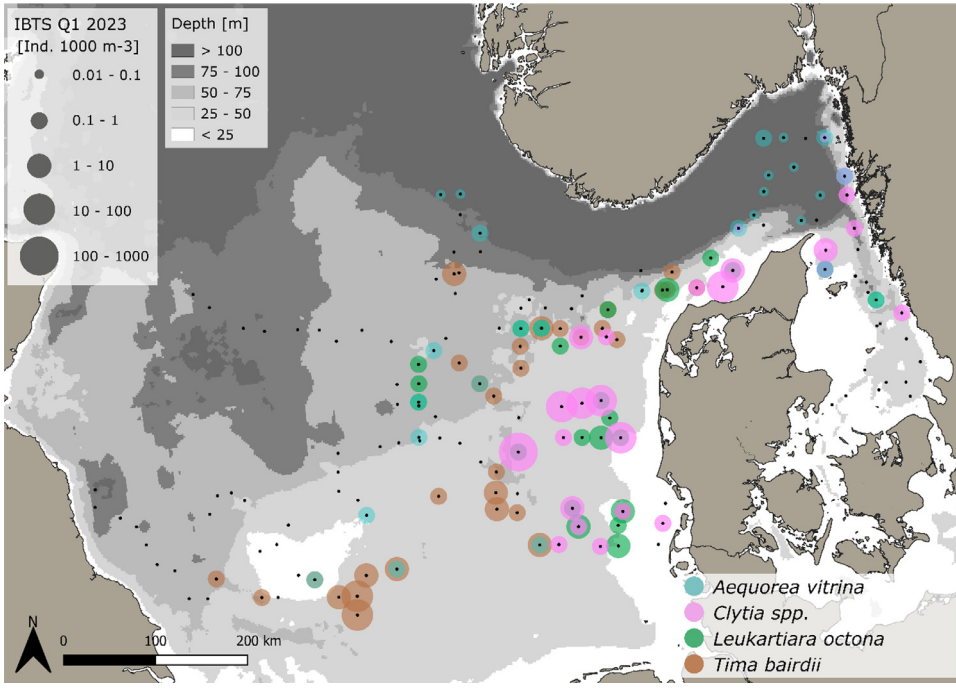

Fig. 2. Distribution and abundance (individuals 1,000 m^{-3}) patterns of the hydrozoan species *Aequorea vitrina* (turquoise), *Clytia* spp. (rose), *Leuckartiara octona* (green) and *Tima bairdii* (brown) in the North Sea and Skagerrak/Kattegat during January - February 2023. Black dots indicate sampling stations. For color interpretation, the reader is referred to the web version of this article.

In the here presented dataset, sizes were measured for 5,566 individuals during the cruise, plus an additional 1,150 sized individuals based on picture analyses. For this, fresh material was imaged during the cruise including a scale bar and later analysed using imageJ (only for the Danish dataset). Size for the remaining records were assigned using average sizes of either the entire sample, sub-samples from that station or average sizes for the respective species from a close by station (see Tables 2, 3, 4 and methods for details). Sizes were subsequently used to estimate biomass by applying published size-weight (wet weight, WW) regressions, as reviewed and summarized in Køhler et al. [3] and Table 1. Data were visualized (Figs. 2-9) and a short data summary describing species-specific distribution characteristics across the sampled area are provided.

Aequorea vitrina (Hydrozoa - Leptothecata) present in the central and eastern North Sea as well as one record in the Kattegat (Fig. 2). 35 individuals were caught at 27 stations, leading to an average abundance across the entire sampling region and national datasets of 0.15 ± 0.08 *A. vitrina* 1,000 m^{-3} (±SD) ranging from 0.06 to 0.36 *A. vitrina* 1,000 m^{-3}. Standardizing, taking depth differences between stations into account, led to an average area specific abundance of 0.01 ± 0.004 *A. vitrina* m^{-2} (±SD), with a range from 0.003 to 0.02 *A. vitrina* m^{-2}. The average size (mm) for the entire dataset is 109.6 ± 29.8 (±SD) with a range of 31 to 155.2 mm. Specifics for the Danish and Swedish dataset are outlined in Tables 2 and 3, respectively.

Clytia spp. (Hydrozoa - Leptothecata) present from the central-east North Sea to the Kattegat (Fig. 2). 1,034 individuals were caught at 25 stations. Note: *Clytia* spp. was more abundant than during Q1 2022 [4]. It should be considered that the Swedish survey did not include *Clytia* spp. in the 2022 report and that the German stations were not sampled for gelatinous macrozooplankton in 2022. This might have impacted the density estimation and should be taken

Table 2
Gelatinous macrozooplankton abundance and size characteristics for the Danish Quarter 1–2023 dataset. Total number of animals (n) for each species, standardized per volume (1,000 m^{-3}) and area (m^{-2}) are provided as average (± SD) across the national stations, as well as their respective maximum. Sizes were estimated for all species from individual measurements or from sub-samples. For some stations, species-specific size information was missing and extrapolated from nearby stations. The number of stations (est. size) this was done for is provided in the last column and related to the total number of stations (total) this species was recorded at. N/A: no size information.

DK IBTS Q1 2023		n	Abundance (1000 m^{-3})		Abundance (m^{-2})		Size (mm)			Stations
Class	Species		av. ± SD	max.	av. ± SD	max.	av. ± SD	min.	max.	est.size/total
Hydrozoa	*Aequorea vitrina*	16	0.18 ± 0.08	0.36	0.01 ± 0.003	0.02	111 ± 32.4	31	155.2	1/14
	Agalma elegans	5	0.42 ± 0.29	0.62	0.02 ± 0.01	0.03	N/A	N/A	N/A	2/2
	Aglantha digitale	58,661	163.1 ± 258.1	1,638	7.24 ± 11.5	79.9	6.8 ± 2	2.5	15.8	54/72
	Clytia spp.	564	11.09 ± 17.39	62.1	0.27 ± 0.07	1.07	6.9 ± 1.8	2.8	12.4	4/13
	Eutima spp.	9	0.74 ± 0.17	0.93	0.01 ± 0.006	0.02	7.8	7.8	7.8	2/3
	Leuckartiara octona	51	0.68 ± 0.52	1.64	0.02 ± 0.01	0.05	8 ± 2.5	3.4	15.9	2/17
	Melicertum octocostatum	5	1.41	1.41	0.05	0.05	7.6	7.6	7.6	1/1
	Muggiaea atlantica	1,428	22.58 ± 38.18	115	0.78 ± 1.309	4.22	4.6 ± 1.6	3.7	12.5	0/16
	Nanomia cara	51	0.50 ± 0.49	2	0.04 ± 0.043	0.16	N/A	N/A	N/A	N/A
	Tima bairdii	269	2.29 ± 3.85	13.41	0.09 ± 0.14	0.51	21.6 ± 10.8	1.5	58.7	1/24
	Unidentified Hydromedusae	73	4.31 ± 2.72	7.91	0.08 ± 0.03	0.1	N/A	N/A	N/A	N/A
Scyphozoa	*Cyanea spp.*	996	13.49 ± 19.93	76.8	0.32 ± 0.436	1.59	15.7 ± 4.6	2.9	60.8	1/18
Ctenophora	*Beroe spp.*	27	0.53 ± 0.77	2.8	0.01 ± 0.01	0.03	16.7 ± 4.2	3.6	30.5	4/11
	Bolinopsis infundibulum	32	0.65 ± 0.61	1.92	0.04 ± 0.07	0.19	22.1 ± 0.9	12.8	36.8	4/7
	Mnemiopsis leidyi	2,300	57.7 ± 114	490.4	0.63 ± 0.99	4.22	24 ± 5	2.8	54.8	0/20
	Pleurobrachia spp.	4,368	11.83 ± 20.97	131.9	0.51 ± 0.853	4.52	13.9 ± 3.6	3.5	31.5	1/70

Table 3
Gelatinous macrozooplankton abundance and size characteristics for the Swedish Quarter 1 - 2023 dataset (see Table 2 for details).

SW IBTS Q1 2023		n	Abundance		Abundance	Size				Stations
Class	Species		(1000 m-3)		(m-2)	(mm)				
			av. ± SD	max.	av. ± SD	max.	av. ± SD	min.	max.	est.size/total
Hydrozoa	*Aequorea vitrina*	19	0.11 ± 0.07	0.3	0.01 ± 0.004	0.02	108 ± 28.1	40	143	2/13
	Aglantha digitale	3,327	18 ± 33.4	117	0.07 ± 1.17	3.56	5.3 ± 1	5	10	17/31
	Apolemia uvaria	22	0.12 ± 0.08	0.34	0.01 ± 0.002	0.01	N/A	N/A	N/A	N/A
	Clytia spp.	25	0.46 ± 0.41	1.19	0.02 ± 0.01	0.03	7.9 ± 2.4	5	15	5/10
	Leuckartiara octona	6	0.22 ± 0.09	0.34	0.01 ± 0.002	0.01	9.5 ± 2.7	5	15	2/5
	Tima bairdii	12	0.33 ± 0.15	0.48	0.01 ± 0.005	0.02	25	25	25	4/6
Scyphozoa	*Cyanea* spp.	9	0.22 ± 0.1	0.39	0.01 ± 0.004	0.02	115 ± 104	15	330	1/7
Ctenophora	*Beroe* spp.	7	0.16 ± 0.07	0.28	0.01 ± 0.002	0.01	25 ± 5.6	15	30	2/6
	Mnemiopsis leidyi	184	1.01 ± 1.21	4.71	0.05 ± 0.08	0.31	27 ± 10.6	10	55	12/23
	Pleurobrachia spp.	2,779	6.7 ± 10.8	48.9	0.41 ± 0.8	3.85	13.6 ± 3.2	5	25	20/42

Table 4
Gelatinous macrozooplankton abundance and size characteristics for the German Quarter 1 - 2023 dataset (see Table 2 for details).

GER IBTS Q1 2023		n	Abundance		Abundance		Size			Stations
Class	Species		(1000 m^{-3})		(m^{-2})		(mm)			
			av. ± SD	max.	av. ± SD	max.	av. ± SD	min.	max.	est.size/total
Hydrozoa	*Agalma elegans*	171	13.2 ± 9.9	27.5	0.62 ± 0.39	1.16	N/A	N/A	N/A	N/A
	Aglantha digitale	969	60.7 ± 74	179	2.7 ± 3.1	7.56	5.9 ± 3.5	3	14	2/5
	Apolemia uvaria	2	0.31 ± 0.05	0.35	0.02 ± 0.01	0.02	N/A	N/A	N/A	N/A
	Clytia spp.	445	72.7 ± 102	145	3.3 ± 4.6	6.53	6.1 ± 1.3	3	9	0/2
	Leuckartiara octona	1	0.33	0.33	0.01	0.015	17	17	17	0/1
	Muggiaea atlantica	23	2.2 ± 2.2	4.84	0.14 ± 0.11	0.25	3.9 ± 0	3	5	2/3
	Tima bairdii	3	0.91	0.91	0.04	0.04	29	25	34	0/1
Scyphozoa	*Cyanea* spp.	9	0.89 ± 0.85	1.86	0.01 ± 0.01	0.02	13 ± 9.1	2.5	28	0/3
Ctenophora	*Beroe* spp.	57	2.7 ± 5.2	12	0.05 ± 0.05	0.12	22 ± 19	9	51	3/5
	Bolinopsis infundibulum	31	2.6 ± 2.2	5.7	0.13 ± 0.1	0.26	43 ± 12	23	72	1/4
	Mnemiopsis leidyi	2	0.5	0.5	0.005	0.005	16	13	19	0/1
	Pleurobrachia spp.	188	2.8 ± 3	12.5	0.14 ± 0.19	0.83	20 ± 2.6	6	31	1/17

into consideration for analyses. Tables 2-4 highlight abundances from each country. The average abundance across the entire sampling region and national datasets is 11.76 ± 30.84 *Clytia* spp. 1,000m^{-3} (±SD), ranging from 0.05 to 145.08 *Clytia* spp. 1,000m^{-3}. This corresponds to an average area specific abundance of 0.41 ± 1.31 *Clytia* spp. m^{-2} (±SD) with a range from 0.003 to 6.53 *Clytia* spp. m^{-2}. The average size (mm) for the entire dataset is 7.2 ± 2 mm (±SD), ranging from 2.8 to 15 mm. Specifics for the respective national datasets (Denmark, Sweden, Germany) are outlined in Tables 2, 3 and 4, respectively.

Leuckartiara octona (Hydrozoa - Anthoathecata) were caught at 23 stations across the sampling area (Fig. 2), with a total number of 58 individuals (Tables 2-4). Note, this is almost three times the number encountered during 2022 [4]. Also note, the distribution pattern observed in 2023 (Fig. 2) is more widespread than observed in 2022 [4]. The average (±SD) density is 0.56 ± 0.49 with a range between 0.1 - 1.64 *L. octona* 1,000 m^{-3}, with an area specific abundance of 0.02 ± 0.014, ranging between 0.004 to 0.05 *L. octona* m^{-2}. Sizes range between 3.4 to 17 mm, with an average (±SD) size across stations of 8.8 ± 3.1 mm. The specifics for the Danish, Swedish and German dataset are depicted in Tables 2, 3 and 4, respectively.

Tima bairdii (Hydrozoa - Leptothecata) were caught at 31 stations throughout the North Sea, mainly in the central North Sea (Fig. 2). A total of 284 animals were caught. Note, this is three times as many as observed in 2022 [4]. The average abundance (±SD) across the entire sampling region is 1.87 ± 3.47 *T. bairdii* 1,000 m^{-3}, ranging from 0.15 to 13.41 *T. bairdii* 1,000 m^{-3}. The area specific abundance (±SD) across the entire dataset is 0.07 ± 0.124 *T. bairdii* m^{-2}, ranging from 0.003 to 0.51 *T. bairdii* m^{-2}. The average size (mm) across the entire datasets is 22.5 ± 9.7 mm (±SD), with a range from 1.5 to 58.7 mm, which is much smaller compared to 2022 [4]. The specifics for the Danish, Swedish and German dataset are outlined in Tables 2, 3 and 4, respectively.

Aglantha digitale (Hydrozoa - Trachymedusae) were caught at 108 stations throughout the entire sampling area stretching from the western North Sea to the Kattegat, but were most abundant in the central and western North Sea (Fig. 3). A total of 62,907 animals were caught, as estimated from samples, sub-samples and abundance groups. The average volume specific abundance across the entire dataset is 116.71 ± 221.66 *A. digitale* 1,000 m^{-3}, with a range between 0.07 – 1,638 *A. digitale* 1,000 m^{-3}. Standardizing for depth, average area specific abundance across the entire dataset is 5.16 ± 9.84 *A. digitale* m^{-2}, ranging between 0.007 to 79.92 *A. digitale* m^{-2}. The average size across the entire dataset is 6.3 ± 2 mm (±SD), with a range between 2.5 to 15.8 mm. The specifics for the Danish, Swedish and German dataset are outlined in Tables 2, 3 and 4, respectively.

Eutima spp. (Hydrozoa - Leptothecata) were present at only three Danish sampling stations in the eastern North Sea (Fig. 4). We refer to Table 2 for specifics. Note: *Eutima* spp. was not recorded in Q1 2021 [3] nor Q1 2022 [4]. Further, *Eutima* spp. was not quantified and hence not present in large quantities during the Swedish survey.

Melicertum octocostatum (Hydrozoa - Leptothecata) were present at one Danish sampling stations in the eastern North Sea (Fig. 4). We refer to Table 2 for specifics. Note: *M. octocostatum* were not recorded in Q1 2021 [3] nor Q1 2022 [4] but were recorded in Q3 2018 [5]. Further, *M. octocostatum* was not quantified during the Swedish survey.

Agalma elegans (Hydrozoa - Siphonophorae) were caught at 6 stations in the central North Sea (Fig. 5). A total of 176 colonies were caught. The average abundance (±SD) across the entire dataset is 8.97 ± 10.15 *A. elegans* 1,000 m^{-3}, ranging from 0.21 to 27.51 *A. elegans* 1,000 m^{-3}. This corresponds to an area specific abundance (±SD) of 0.42 ± 0.43 *A. elegans* m^{-2}, ranging from 0.01 to 1.16 *A. elegans* m^{-2}. The specifics for the Danish and German dataset can be seen in Tables 2 and 4, respectively. Note: No size information. *A. elegans* was not quantified during the Swedish survey and hence not present in large quantities. Further, note that *A. elegans* was not recorded in Q1 2021 [3], Q1 2022 [4] nor Q3 2018 [5].

Apolemia uvaria (Hydrozoa - Siphonophorae) were caught at 22 stations in the northern central North Sea, the Skagerrak and the Kattegat (Fig. 5). A total of 24 colonies were caught. The average abundance (±SD) across the dataset is 0.14 ± 0.09 *A. uvaria* 1,000 m^{-3}, ranging from 0.03 to 0.35 *A. uvaria* 1,000 m^{-3}. The area specific abundance (±SD) is 0.01 ± 0.004

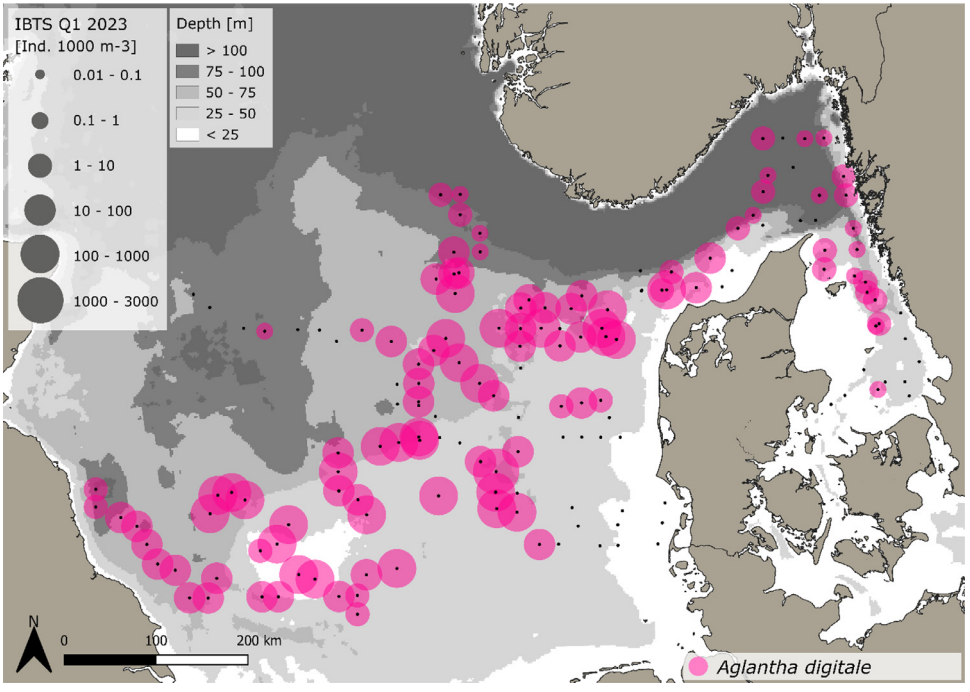

Fig. 3. Distribution and abundance (individuals 1,000 m^{-3}) patterns of the hydrozoan species *Aglantha digitale* across the North Sea and Skagerrak/Kattegat during January - February 2023. Black dots indicate sampling stations.

A. uvaria m^{-2}, ranging from 0.003 – 0.02 *A. uvaria* m^{-2}. The specifics for the Danish, Swedish and German dataset are depicted in Tables 2, 3 and 4, respectively. Note: No size information. *A. uvaria* was not recorded in Q1 2021 [3], Q1 2022 [4] nor Q3 2018 [5].

Muggiaea atlantica (Hydrozoa - Siphonophorae) were caught at 19 stations in the North Sea (Fig. 5). A total of 1,451 animals were caught. The average abundance (±SD) across all national datasets is 19.37 ± 35.69 *M. atlantica* 1,000 m^{-3}, ranging from 0.2 to 114.73 *M. atlantica* 1,000 m^{-3}. The area specific abundance (±SD) is 0.68 ± 1.22 *M. atlantica* m^{-2}, ranging from 0.01 – 4.22 *M. atlantica* m^{-2}. The average size across the dataset is 4.5 ± 1.4 mm (±SD), with a range between 3 to 12.5 mm measured as the main body axis. The specifics for the Danish and German dataset are outlined in Tables 2 and 4, respectively. Note: *M. atlantica* was not quantified during the Swedish survey.

Nanomia cara (Hydrozoa - Siphonophorae) were present at 14 Danish sampling stations in the central North Sea (Fig. 5), see Table 2 for abundance and size specifics. Note: *N. cara* was not quantified during the Swedish survey. Further, note that *N. cara* was not recorded in Q1 2021 [3], Q1 2022 [4] nor Q3 2018 [5].

Cyanea spp. (Scyphozoa) were caught at 28 stations in the eastern North Sea and the Skagerrak/Kattegat (Fig. 6). A total of 1,014 individuals were caught in Q1 2022 [4]. The reader is referred to Tables 2, 3, 4 to note the abundance difference especially the Danish investigation area has higher abundance estimates. The average volume specific abundance across the entire dataset is 8.82 ± 17.05 *Cyanea* spp. 1,000 m^{-3}, with a range of 0.1 – 76.83 *Cyanea* spp. 1,000 m^{-3}. Standardizing for depth, average area specific abundance across the entire dataset is 0.21 ± 0.38 *Cyanea* spp. m^{-2}, ranging between 0.005 to 1.59 *Cyanea* spp. m^{-2}. The average size across the entire dataset is 40.2 ± 66 mm (±SD), with a range between 2.5 to 330 mm which are both smaller and larger sizes than in Q1 2022 [4]. The specifics for the Danish, Swedish and German dataset are outlined in Tables 2, 3 and 4, respectively.

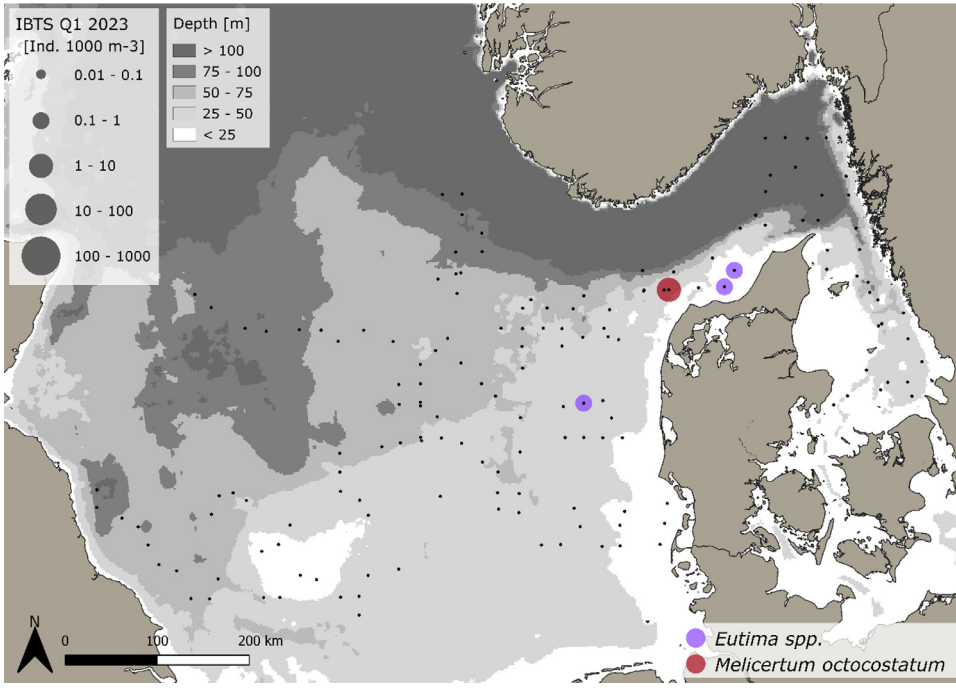

Fig. 4. Distribution and abundance (individuals 1,000 m^{-3}) patterns of the hydrozoans *Eutima* spp. (purple) and *Melicertum octocostatum* (red) in the North Sea during January - February 2023. Black dots indicate sampling stations. For color interpretation, the reader is referred to the web version of this article.

Beroe spp. (Ctenophora) were caught at 22 stations being spread out across the investigation area (Fig. 7). A total of 91 individuals were caught. Note: The number of animals caught, and the number of stations where *Beroe spp.* were present, is only half of that observed during Q1 2022 [4]. The average volume specific abundance across the entire dataset is 0.92 ± 2.53 *Beroe* spp. 1,000 m^{-3}, with a range of 0.08 – 11.95 *Beroe* spp. 1,000 m^{-3}. Standardizing for depth, average area specific abundance across the entire dataset is 0.02 ± 0.03 *Beroe* spp. m^{-2}, ranging from 0.004 to 0.12 *Beroe* spp. m^{-2}. The average size across the entire dataset is 20.2 ± 9.9 mm (±SD), with a range between 3.6 to 51 mm. The specifics for the Danish, Swedish and German dataset are depicted in Tables 2, 3 and 4, respectively.

Bolinopsis infundibulum (Ctenophora) were caught at 12 stations in the central North Sea (Fig. 8). Note: abundance estimates for lobate ctenophores are likely severely underestimated due to their extreme fragility, also in comparison to other, more rigid ctenophores such as *P. pileus* and *Beroe* spp. Irrespectively, by comparing trends within species groups and across years using the same gear and method, the data are very informative. However, this needs to be taken into consideration during further analyses. A total of 63 individuals were caught. Note, this is more than double the number of *B. infundibulum* caught in Q1 2022 [4]. The average volume specific abundance across the entire dataset is 1.35 ± 1.62 *B. infundibulum* 1,000 m^{-3}, with a range of 0.21 – 5.66 *B. infundibulum* 1,000 m^{-3}. The average area specific abundance across the entire dataset is 0.07 ± 0.086 *B. infundibulum* m^{-2}, ranging from 0.007 to 0.26 *B. infundibulum* m^{-2}. The average size across the entire dataset is 29.7 ± 12.5 mm (±SD), with a range between 12.8 to 72 mm. The specifics for the Danish and German dataset are outlined in Tables 2 and 4, respectively.

Mnemiopsis leidyi (Ctenophora) were caught at 43 stations in the eastern North Sea, the Skagerrak and the Kattegat (Fig. 8). See *B. infundibulum* for further information for species consid-

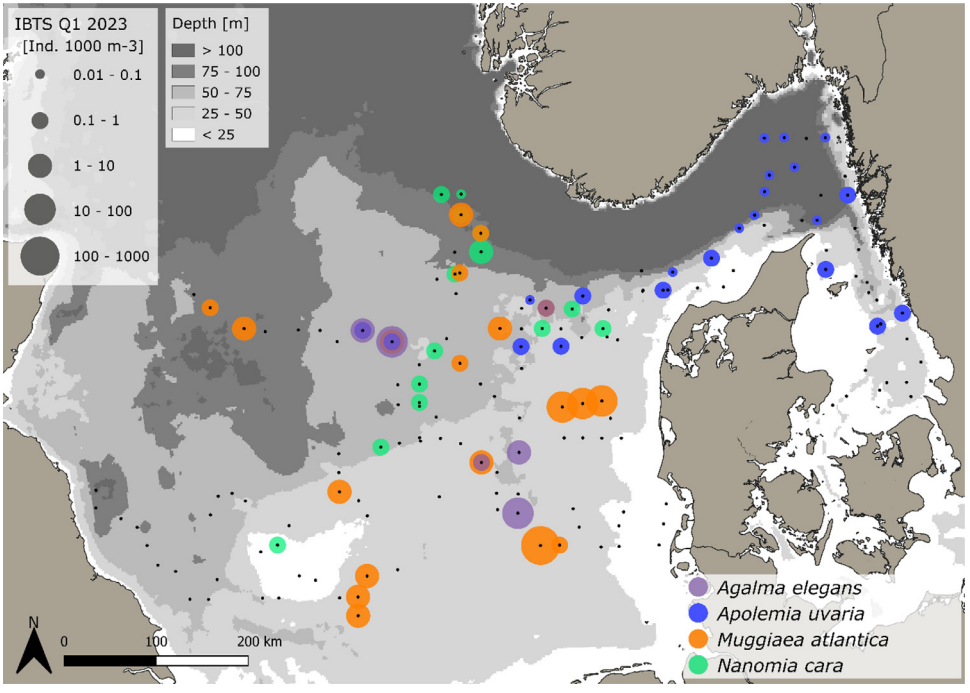

Fig. 5. Distribution and abundance (1,000 m^{-3}) patterns of the hydrozoans *Agalma elegans* (purple), *Apolemia uvaria* (blue), *Muggiaea atlantica* (orange) and *Nanomia cara* (green) in the North Sea and Skagerrak/Kattegat during January - February 2023. Black dots indicate sampling stations. For color interpretation, the reader is referred to the web version of this article.

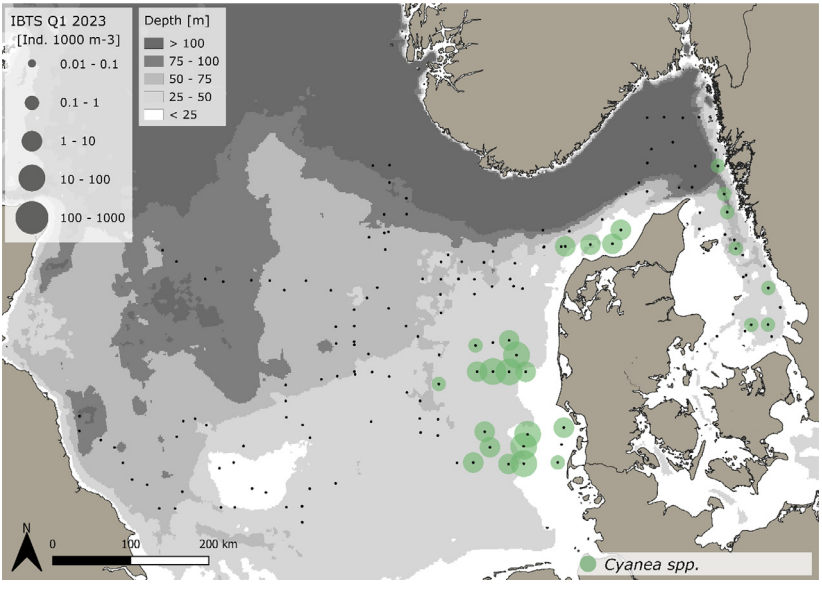

Fig. 6. Distribution and abundance (individuals 1,000 m^{-3}) patterns of the scyphozoan jellyfish *Cyanea* spp. in the North Sea and Skagerrak/Kattegat during January - February 2023. Black dots indicate sampling stations.

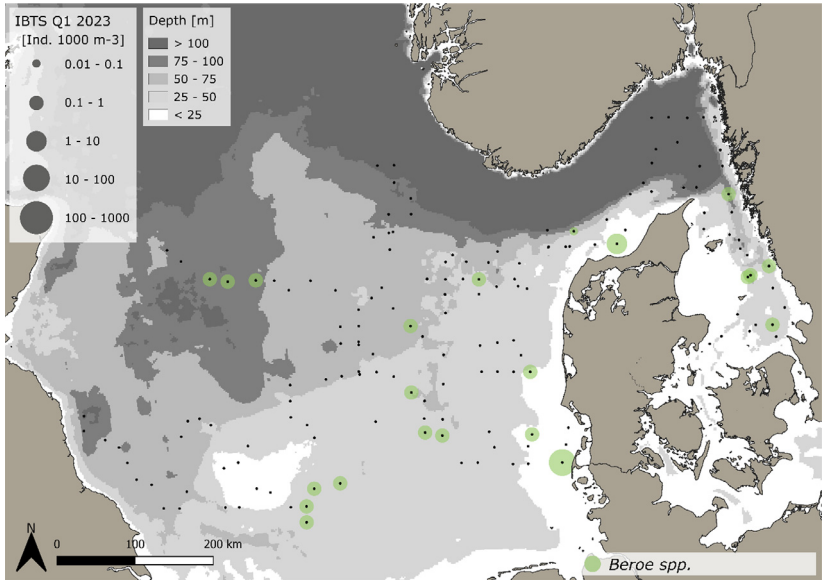

Fig. 7. Distribution and abundance (individuals 1,000 m^{-3}) patterns of the comb jelly (ctenophora) *Beroe* spp. in the North Sea and Skagerrak/Kattegat during January - February 2023. Black dots indicate sampling stations.

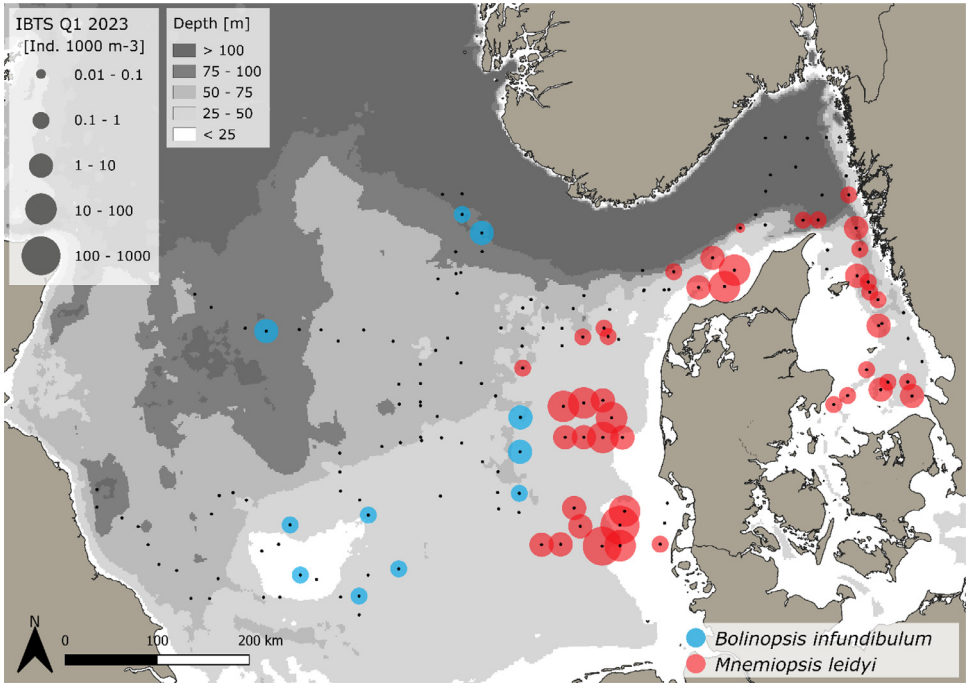

Fig. 8. Distribution and abundance (individuals 1,000 m^{-3}) patterns of the native comb jelly (ctenophora) *Bolinopsis infundibulum* (blue) and the non-indigenous species *Mnemiopsis leidyi* (red) in the North Sea and Skagerrak/Kattegat during January - February 2023. Black dots indicate sampling stations. Note: abundances are likely severely underestimated by this method, but trends across years using the same gear are informative. For color interpretation, the reader is referred to the web version of this article.

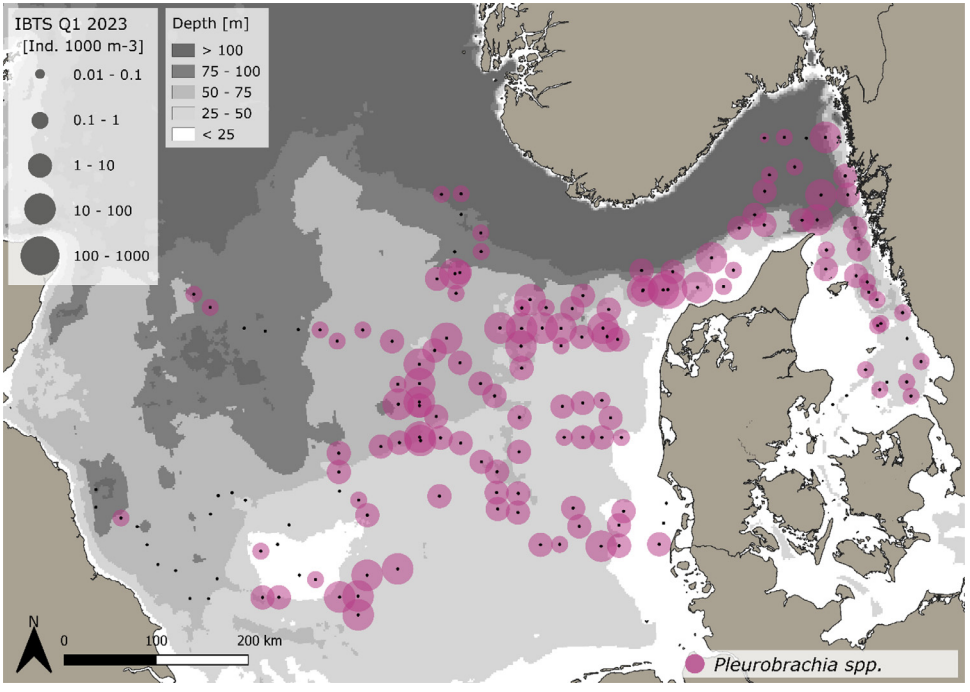

Fig. 9. Distribution and abundance (individuals 1,000 m^{-3}) patterns of the native comb jelly (ctenophora) *Pleurobrachia* spp. in the North Sea and Skagerrak/Kattegat during January - February 2023. Black dots indicate sampling stations.

erations needing attention during analyses. A total of 2,489 individuals were caught, which is ca. five times as many compared to Q1 2022 [4]. It is noted that the number of stations has increased from Q1 2022 to Q1 2023, but the reader is referred to the map indicating that *M. leidyi* is not present at the German stations (central North Sea) during this survey. The average volume specific abundance across the entire dataset is 13.42 ± 32.8 *M. leidyi* 1,000 m^{-3}, with a range of 0.1 – 170.21 *M. leidyi* 1,000 m^{-3}. The average area specific abundance across the entire dataset is 0. 31 ± 0.73 *M. leidyi* m^{-2}, ranging from 0.005 to 4.22 *M. leidyi* m^{-2}. The average size across the entire dataset is 25.1 ± 8.5 mm (±SD), with a range between 2.8 to 55 mm. The specifics for the Danish and Swedish dataset is outlined in Tables 2 and 3, respectively.

Pleurobrachia spp. (Ctenophora) were caught at 129 stations throughout the entire sampling area stretching from the western North Sea to the Kattegat, reaching highest abundances in the central-eastern North Sea and Skagerrak (Fig. 9). A total of 7,335 animals were caught. Note, this ca. twice the number compared to Q1 2022 [4], especially in the Swedish but also the Danish investigation area. The average volume specific abundance across the entire dataset is 8.97 ± 16.93 *Pleurobrachia* spp. 1,000 m^{-3}, with a range between 0.08 – 131.9 ind. 1,000 m^{-3}. Standardizing for depth, average area specific abundance across the entire dataset is 0.43 ± 0.78 ind. m^{-2}, ranging between 0.003 to 4.52 ind. m^{-2}. The average size across the entire dataset is 14.5 ± 3.9 mm (±SD), with a range between 3.5 to 31.5 mm. The specifics for the Danish, Swedish and German dataset are outlined in Tables 2, 3 and 4, respectively.

4. Experimental Design, Materials and Methods

Gelatinous macrozooplankton was collected in the western, central and eastern part of the North Sea as well as the Skagerrak and Kattegat (Fig. 1) during the North Sea - Midwater Ring Net (MIK) survey [1]. This ichthyoplankton survey is conducted during night-time as part of the

International Bottom Trawl Survey (IBTS) cruises. The primary goal of the MIK survey is to catch herring larvae to provide a recruitment index, of importance for the autumn spawning herring stock assessment in the North Sea. Additionally, it contributes with a general characterization of the ichthyoplankton community. Sampling for ichthyoplankton and gelatinous macrozooplankton was carried out on the Danish R/V DANA (DTU Aqua, Denmark), the Swedish R/V SVEA (SLU, Sweden), and the German R/V Walther Herwig III (TI, Germany) in the period from 24.1.2023 to 15.2.2023. Information on the physical characteristics of the investigation area can be assessed from the environmental database of the International Council for the Exploration of the Seas (ICES), where CTD profiles have been uploaded.

Plankton sampling was conducted after sunset from approx. 18:00–06:00 (local time) and ichthyoplankton as well as gelatinous macrozooplankton was assessed at 158 stations with 89, 47 and 22 stations investigated by Danish, Swedish and German partners, respectively. All partners followed the same sampling methodology, as outlined in the North Sea - Midwater Ring Net (MIK) reports [1,2] and as previously described [3–5]. In short, the 13 m long MIK net (Ø 2 m, 1.6 mm meshed apart from lower net end with 0.5 mm) was deployed in double oblique hauls from the surface to 5 meters above the bottom (maximum depth: 100 m) at a ship-speed of 3 knots. A calibrated flow-meter mounted in the centre of the net opening was used to estimate filtered water volumes during each cast, which was used to estimate abundances m^{-3}. Further, a scanmar was attached to the net to depict the maximum gear depth, which was used to estimate area specific abundances (m^{-2}) by multiplying the abundance m^{-3} with the maximum gear depth in m (see ICES MIK manual [2]).

Upon net retrieval, the net was carefully washed and the sample stored in a chiller containing cooled seawater until analysis on board. Gelatinous macrozooplankton and ichthyoplankton were analyzed alive using either (i) a light table (Danish and German surveys), (ii) a stereomicroscope (Danish and German surveys) or (iii) a magnifying lamp with dark background (Swedish survey).

During the Danish survey, all gelatinous zooplankton were identified to species or genera level, counted and measured to the nearest 0.1 mm with an electronic caliper. Rare taxa were measured with a conventional caliper to the nearest 0.5 mm. Sub-sampling was conducted for very abundant taxa or when very high densities were observed at a station. Each sub-sample included a target of at least 20 individuals of the species in question. Handling controls for sub-sampling showed a negligible impact on abundance estimations [3]. The sub-sampling factors have been used to extrapolate to total species counts per sample (see online Appendix 1). Similarly, for abundant taxa, sizes were estimated on a sub-sample only and extrapolated to the entire dataset (see Tables 2-4 for details). If species were in a too bad shape for size estimation, we either used average size of the same species present at that station or close by stations considering all national datasets. If average sizes from a close by station has been used for size estimations, this is depicted in the last column of the national data summary of Tables 2 to 4 (see Jensen et al. 2024 for detail [4]). During the Danish survey, a total 1,150 individuals were sized from images of life individuals. Those individuals are not part of the total count for life-size estimation across all datasets (n = 5,566 individuals) and average size estimations in Table 2, as we only assigned average sizes for those species in question to the final database. Pictures were taken of 1,150 individuals, grouped by taxonomy and including a ruler inside each picture to allow for later size estimation using the freeware imageJ. This procedure was only done during the Danish survey at 54 stations for *A. digitale*, one station for *Beroe* spp., *Eutima* spp., *L. octona* as well as at 4 stations for *Clytia* spp. and at 12 stations for *M. atlantica,* respectively.

During the first four stations of the Danish survey, a total of 73 small sized hydromedusae were not identified and only counted. We assigned sizes to these counts by using the average size of a similarly small sized and shaped hydromedusae present in the region (*Clytia* spp.) in order to be able to estimate the biomass of these unidentified hydromedusae. We also used the same size-weight regression as applied for *Clytia* spp.

During the Swedish survey, all larger gelatinous zooplankton organisms were identified (>0.5 cm). For hydromedusae, abundant taxa such as *A. digitale, A. uvaria, A. vitrina, Clytia* spp., and *T. bairdii* were quantified only. Sizes were assessed using a conventional caliper measuring to the nearest 0.5 mm. For common and abundant species, the Swedish dataset also contained

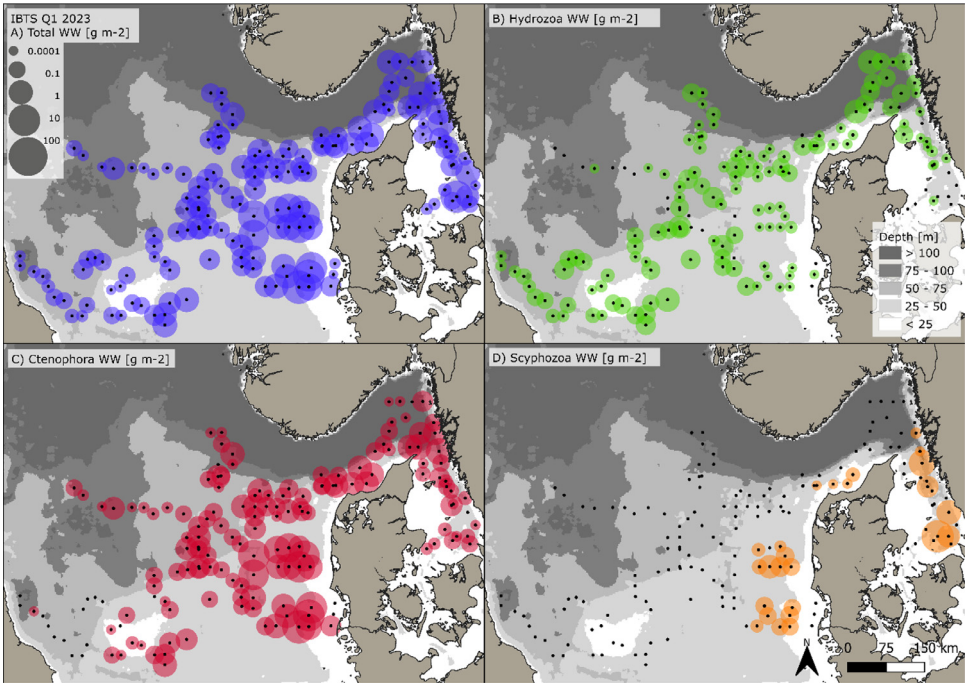

Fig. 10. Gelatinous macrozooplankton biomass distribution (wet weight g m^{-2}) from Danish, Swedish and German IBTS surveys across the North Sea and Skagerrak/Kattegat during January – February 2023 with A) total WW of all gelatinous macrozooplankton groups and split by groups with only, B) Hydrozoans, C) Ctenophora and D) Scyphozoans. Black dots indicate sampling stations.

abundance groups. Abundance groups consist of 1+ (>1–10 individuals), 2+ (11–100 individuals) and 3+ (101–1000 individuals). Abundance estimates were set as an average abundance for each abundance group, hence 5, 50, 500 individuals for the groups 1+ to 3+, respectively. Abundance groups were assigned 89 times throughout the Swedish investigation. As a control, during 39 times an abundance group has been assigned, this group was also confirmed by exact counts. Both estimates provided similar results.

During the German survey, the same methodology as outlined for the Danish survey had been followed. To validate species identifications, especially for small sized hydrozoan species, representative numbers of pictures from individual organisms were taken at all stations and later confirmed by a taxonomic expert. In cases where species ID had to be updated, the species ratio from picture analyses was used to update species records at the respective station.

The spatial abundance and biomass distribution of gelatinous macrozooplankton across sampling stations (Figs. 1–10) were visualized using the freeware program QGIS 3.36.2 Prizen (https://www.qgis.org/en/site/index.html). Latitude and Longitude of sampled stations are provided in decimal form and were plotted along with volume specific abundance (1000 m^{-3}), area specific abundance (m^{-2}) and area specific biomass (wet weight m^{-2}) data. All data are available in the supplement Appendix 1 and on Zenodo with the doi:10.5281/zenodo.14167122.

Limitations

The handling procedures likely underestimate the abundance of the total gelatinous macrozooplankton community, especially for fragile siphonophore and lobate ctenophore species.

Hence, this data should be compared to other gelatinous macrozooplankton datasets generated by using a similar methodology. Hence, our here presented estimates represent a conservative quantification of the gelatinous macrozooplankton community in the extended North Sea area. Missing values for small sized hydrozoan species should be interpreted in light of differing analyses methods during the respective national surveys. As such, species not present should not *per se* be interpreted as true absence for small sized hydrozoan species.

Ethics Statement

The authors have read and follow the ethical requirements for publication in Data in Brief and confirming that the current work does not involve human subjects, animal experiments, or any data collected from social media platforms.

Credit Author Statement

Camilla J. D. Jensen: Data base compilation of national datasets with data quality control; data presentation including presentation of summary statistics; producing illustrations; writing of first manuscript draft and commenting on subsequent manuscript drafts. **Marie Meffre:** Data generation and responsible for Danish macrozooplankton sampling; laboratory work; data entry and initial dk database compilation. **Malin Werner:** Data generation and responsible for Swedish macrozooplankton sampling; compilation of Swedish national dataset; quality control of Swedish national dataset; commenting and editing final manuscript draft. **Bastian Huwer:** Conceptualization; responsible for Danish night-time sampling activities; supervision of macrozooplankton data generation on the ship; background data generation; commenting and editing final manuscript draft. **Hermann Neumann**: Data generation and responsible for German macrozooplankton sampling; compilation of German national dataset; quality control of German national dataset; commenting and editing final manuscript draft. **Cornelia Jaspers:** Conceptualization; methodology; data base compilation of national datasets with data quality control; re-analyses and supervision of data generation, data presentation and summary statistics; editing of illustrations; editing/writing first and writing final manuscript draft. **All authors** read, commented and approved the final database and manuscript draft.

Data Availability

Jaspers, C., Meffre, M., Werner, M., Neumann, H., & Jensen, C. J. D. (2024). Jensen, Meffre et al. 2024 - Gelatinous macrozooplankton in the North Sea: Biodiversity and distribution pattern (Original data) (zenodo).

Acknowledgements

We thank Svend Koppetsch, Karolina Wikström, Anders Wernbo and Maria Ovegård who took part in Data generation during national Swedish macrozooplankton sampling.

This work was supported by the Villum and Velux Foundations [grant number 25512] to CJ and ACTNOW “Advancing understanding of Cumulative Impacts on European marine biodiversity, ecosystem functions and services for human wellbeing” [Horizon Project No 101060072] to CJ.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary Materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.dib.2025.111432.

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