Distribution of demersal fish in the south-western Barents Sea

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Abstract

The composition of the demersal fish fauna of the Barents Sea, and the ranges of most of the fish species, have been relatively poorly known. From 257 bottom trawl hauls distributed in a uniform grid pattern over the south-western part of the Barents Sea in summer 2000, all fish were identified. The sampled area included the Polar Front zone where warm Atlantic water meets cold (subzero) polar water. The material was used to map the distribution of the demersal fish species, and to analyse their distribution in relation to temperature, depth and salinity. Fifty-eight species were recorded. A fauna characterized by Gadidae and Scorpaenidae was found in the warmer part of the sea, whereas a cold-water fauna of mainly Cottidae, Zoarcidae and Stichaeidae was evident from the Polar Front zone and northwards. In logistic regression analyses temperature was the most important factor associated with the distribution of species (for 26 of the 27 species analysed), but associations with salinity (19 species) and depth (15 species) were also found. The mapping considerably revised the distribution in relation to previous knowledge for 37 species, and the new and more accurate range maps provided here may serve as baseline information for future monitoring of the fish fauna in the Barents Sea.

With its important fishing grounds, the Barents Sea is one of the well-researched areas of the oceans. However, the research on oceanography and fish stocks routinely carried out annually over many years, as well as special studies of parts of the ecosystem patterns and processes (see special issues of the journal *Polar Research*, volume 10, 1991, devoted to the "Pro Mare" project), have primarily been aimed at commercially valuable species (Fossheim et al. 2006). Far less effort has been made to study the biology and occurrence of species of no direct commercial importance, yet these constitute the majority of the species found in the area.

The main sources of knowledge about the fish fauna in the area have been regional faunas and surveys (Andriyashev 1964; Hognestad & Vader 1979; Whitehead et al. 1984, 1986a, b; Pethon 2005), and data on the distribution of certain fish species have been given in connection with taxonomic revisions (Chernova 1988, 1998, 2005a, b; Chernova & Borkin 1993). More recently, updates on newer observations have been published (Dolgov 2000, 2004, 2006), and a classification of the fish assemblages has been made (Burgos 1989; Fossheim et al. 2006). In spite of this, an ichthyological biodiversity survey based on full-scale species identification has been lacking for this productive and important sea.

During the fishery cruises carried out by the Institute of Marine Reasearch (IMR), Bergen, in the south-western part of the Barents Sea in summer 2000, a special effort was made to identify all fish species caught in bottom trawls, in order to obtain more precise information on the distribution of demersal fish in the area. With its relatively shallow waters (mostly between 150 and 400 m in depth) and soft bottom substrates, the Barents Sea is topographically uniform, whereas bottom temperatures vary over short distances as the warmer Atlantic water meets the cold Arctic currents (Loeng 1991). A sharp gradient from above-zero to subzero temperatures is displayed along the Polar Front, which runs roughly diagonally from south-east to north-west across the area. Fossheim et al. (2006) indicated a change in the composition of the demersal fish fauna across the Polar Front in the Barents Sea. Sampling both sides of the Polar Front zone, the IMR cruises in summer 2000 yielded material suitable for analysis of fish distribution in relation to presumably the most important environmental variables in the area. Here we report the distribution of demersal species based on the material from these cruises, and analyse the distribution of species in relation to oceanographic variables.

Material and methods

The cruises were conducted with the research vessels *Michael Sars* and *Johan Hjort* from 20 July to 19 August 2000, comprising 257 valid bottom trawl hauls in the area roughly within 70–76° N and 16–40° E (Fig. 1). A Campelen 1800 shrimp trawl, with 40-m sweeps and a cod-end equipped with a 22-mm mesh size inner lining, was used throughout the sampling period on both vessels. The trawl carried a rockhopper ground gear (Engås & Godø 1989) and strapping was used to stabilize the opening of the trawl. Vaco trawl doors were employed (6 m^2, 1500 kg), and the trawl was equipped with Scanmar sensors that measured the distance between the doors, the vertical opening of the trawl and contact with the bottom. The standard trawling time was 30 min at 3 knots. At 23 stations, however, a towing time of 15 min was employed.

Species were identified on board as far as possible. Individuals that posed identification problems were frozen and subsequently transferred to the Bergen Museum for taxonomic examination against specimens in the museum collections. Moreover, voucher specimens were taken to

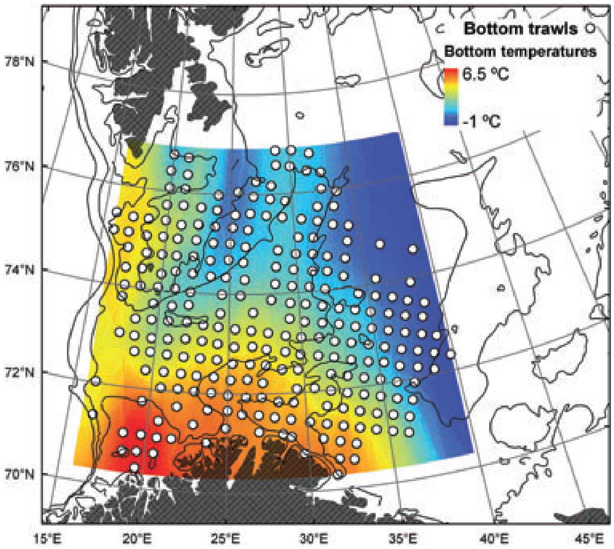

Fig. 1 Distribution of the bottom trawl stations in the western Barents Sea, summer 2000.

the museum for preservation and permanent storage. The main identification keys used were those of Andriyashev (1964), Whitehead et al. (1984, 1986a, b) and Pethon (1998), but special publications on Liparidae and Zoarcidae (Chernova 1988, 1991, 1998, 2005a, b) became available and were consulted after the cruise.

We analysed the occurrence of the various species in relation to average station gear depth, and to temperature and salinity measured by a conductivity–temperature–depth recorder (CTD) 8–10 m above the bottom immediately before the start of each trawl station. Many of the species had very high catches on single stations, causing a high degree of heteroscedacity. This bias can be handled with multivariate logistic regressions, which was therefore chosen. The analyses were performed (in SPSS 13.0) with a backward stepwise model building.

We examined the independent variables (temperature, salinity and depth) for multicollinearity by computing the variance inflation factor (VIF) for each variable, as the reciprocal of $1–R^2$ for the regression of each variable on both of the others. A VIF value of 4.0 or higher is customarily used as a criterion to suggest a multicollinearity problem. The VIF values for temperature, salinity and depth (1.804, 1.001 and 1.010, respectively) were far below the critical value.

To avoid overfit tea models, i.e. models in which significant relationships could occur due to noise, we employed a 10 : 1 ratio of data points of interest in relation to number of variables. Following this, only species with positive records at 30 or more stations were analysed, with the exception of *Icelus bicornis*, of which the 27 positive records was close to a 10 : 1 ratio.

We excluded the following pelagic species: *Mallotus villosus*, *Maurolicus muelleri*, *Clupea harengus*, *Nansenia groenlandica*, *Argenitna silus*, *Boreogadus saida* and *Arctozenus risso*, but included gadoid species that can be classified as pelagic, but spend much of the time close to the bottom: *Gadus morhua*, *Pollachius* spp., *Micromesistius poutassou*, *Trisopterus esmarkii* and *Gadiculus argenteus.*

Results

Altogether 58 demersal fish species were represented in the material (Table 1). Of these, eight species were distributed over practically the whole sampling area *G. morhua*, *Melanogrammus aeglefinus*, *Sebastes marinus*, *Artediellus atlanticus*, *Careproctus derjugini*, *Anarhichas lupus*, *A. minor* and *Hippoglossoides platessoides* (Fig. 2), whereas the other species were confined chiefly to either the southern and western waters influenced by the Atlantic current, or to the cold waters in the north and east near the Polar Front. In the south and west, 11 species showed a wide distribution extending well into the Bear Island

Table 1 Bottom fish caught on 257 trawl stations in the western Barents Sea in the summer of 2000.

Taxon	*N* individuals	*N* stations	% of individuals	% of stations	Voucher specimens: *N* individuals	Voucher specimens: *N* lots
MYXINIDAE						
Myxine glutinosa Linnaeus, 1758	2	1	+	0.4		
CHIMAERIDAE						
Chimaera monstrosa Linnaeus, 1758	4	2	+	0.8	1	1
RAJIDAE						
Amblyraja hyperborea (Collett, 1879)	24	8	+	3.1		
Amblyraja radiata (Donovan, 1808)	1 039	168	0.4	65.4	4	3
Bathyraja spinicauda (Jensen, 1914)	12	10	+	3.9		
Dipturus batis (Linnaeus, 1758)	2	2	+	0.8		
Dipturus linteus (Fries, 1838)	1	1	+	0.4	1	1
Raja clavata Linnaeus, 1758	5	1	+	0.4		
Rajella fyllae (Lütken, 1887)	31	23	0.1	14.4	10	10
MACROURIDAE						
Macrourus berglax Lacepède, 1801	12	5	+	1.9		
PHYCIDAE						
Phycis blennoides (Brünnich, 1768)	1	1	+	0.4		
GADIDAE: GADINAE						
Gadiculus argenteus thori Schmidt, 1914	127	19	0.1	7.4		
Gadus morhua Linnaeus, 1758	31 047	245	12.9	95.3		
Melanogrammus aeglefinus (Linnaeus, 1758)	28 578	202	11.9	78.6	6	1
Micromesistius poutassou (Risso, 1827)	68 055	94	28.3	36.6		
Pollachius pollachius (Linnaeus, 1758)	1	1	+	0.4		
Pollachius virens (Linnaeus, 1758)	357	37	0.1	14.4		
Trisopterus esmarkii (Nilsson, 1855)	6 398	55	2.7	21.4		
GADIDAE: LOTINAE						
Brosme brosme Ascanius, 1772	84	18	+	7.0	4	2
Molva molva (Linnaeus, 1758)	4	2	+	0.8		
Molva dypterygia (Pennant, 1784)	6	1	+	0.4		
Enchelyopus cimbrius (Linnaeus, 1766)	35	21	+	8.2	2	2
Gaidropsarus argentatus (Reinhardt, 1837)	1	1	+	0.4	1	1
SCORPAENIDAE						
Sebastes marinus (Linnaeus, 1758)	2 005	89	0.8	34.6	2	2
Sebastes mentella (Travin, 1951)	18 454	136	7.7	52.9	15	4
Sebastes viviparus Krøyer, 1845	560	30	0.2	11.7		
COTTIDAE						
Artediellus atlanticus Jordan & Evermann, 1898	4 840	174	2.0	67.7	144	47
Gymnocanthus tricuspis (Reinhardt, 1830)	96	11	+	4.3	43	13
Icelus bicornis (Reinhardt, 1840)	200	27	0.1	10.5	24	15
Icelus spatula Gilbert & Burke, 1812	50	10	+	3.9	26	7
Myoxocephalus scorpius (Linnaeus, 1758)	16	7	+	2.7	11	7
Triglops murrayi Günther, 1888	5 715	93	2.4	36.2	387	57
Triglops nybelini Jensen, 1944	1 017	27	0.4	10.5	51	22
Triglops pingeli Reinhardt, 1837	975	26	0.4	10.1	57	17
AGONIDAE						
Leptagonus decagonus (Bloch & Schneider, 1801)	3 130	103	1.3	40.1	45	20
PSYCHROLUTIDAE						
Cottunculus microps Collett, 1875	111	60	+	23.3	22	14
CYCLOPTERIDAE						
Eumicrotremus spinosus (Fabricius, 1776)	117	22	+	8.6	49	22
LIPARIDAE						
Careproctus derjugini Chernova, 2005	697	130	0.3	50.6	166	82
Careproctus dubius Zugmayer, 1911	18	9	+	3.5	12	9
Liparis fabricii Krøyer, 1847	20	7	+	2.7	6	6
Liparis gibbus Bean, 1881	102	15	+	5.8	18	10

Table 1 *Continued*

Taxon	*N* individuals	*N* stations	% of individuals	% of stations	Voucher specimens: *N* individuals	Voucher specimens: *N* lots
ZOARCIDAE						
Gymnelus retrodorsalis Le Danois, 1913	120	18	+	7.0	31	15
Lycenchelys kolthoffi Jensen, 1904	19	2	+	0.8	17	2
Lycodes esmarkii Collett, 1875	28	11	+	4.3	1	1
Lycodes eudipleurostictus Jensen, 1902	83	19	+	7.4	32	16
Lycodes gracilis M. Sars, 1867	2 785	141	1.2	54.9	102	38
Lycodes pallidus Collett, 1879	101	17	+	6.6	23	11
Lycodes reticulatus Reinhardt, 1835	261	36	0.1	14.0	32	22
Lycodes rossi Malmgren, 1865	686	69	0.3	26.8	128	54
Lycodes seminudus Reinhardt, 1837	214	18	0.1	7.0	32	16
Lycodes squamiventer Jensen, 1904	3	3	+	1.2	1	1
STICHAEIDAE						
Lumpenus lampretaeformis (Walbaum, 1792)	2 826	102	1.2	39.7	205	63
Leptoclinus maculatus (Fries, 1837)	4 686	121	2.0	47.1	213	53
ANARHICHADIDAE						
Anarhichas denticulatus Krøyer, 1845	248	102	0.1	39.7	1	1
Anarhichas lupus Linnaeus, 1758	273	42	0.1	16.3	10	7
Anarhichas minor Olafsen, 1772	385	79	0.2	37.7	22	14
AMMODYTIDAE						
Ammodytes marinus Raitt, 1934	2	1	+	0.4		
PLEURONECTIDAE						
Hippoglossus hippoglossus (Linnaeus, 1758)	1	1	+	0.4		
Reinhardtius hippoglossoides (Walbaum, 1792)	624	90	0.3	35.0		
Hippoglossoides platessoides (Fabricius, 1780)	52 909	248	22.0	96.5	6	4
Glyptocephalus cynoglossus (Linnaeus, 1758)	5	2	+	0.8	1	1
Microstomus kitt (Walbaum, 1792)	25	5	+	1.9	2	2
Pleuronectes platessa Linnaeus, 1758	6	3	+	1.2		

Percentages <0.1% denoted by +.

Trough (Fig. 3): *Amblyraja radiata, Bathyraja spinicauda, Micromesistius poutassou, Pollachius virens, Sebastes mentella, Cottunculus microps, Lycodes esmarkii, L. eudipleurostictus, L. gracilis, Reinhardtius hippoglossoides* and, to some extent, *Macrourus berglax*. No less than 17 species were confined to the warmer coastal current along the mainland (Fig. 4): *Myxine glutinosa, Chimaera monstrosa, Rajella fyllae, Dipturus batis, D. linteus, Gadiculus argenteus, Trisopterus esmarkii, Pollachius pollachius, Molva molva, M. dypterygia, Gaidropsarus argentatus, Phycis blennoides, Sebastes viviparus, Microstomus kitt, Hippoglossus hippoglossus, Pleuronectes platessa* and *Glyptocephalus cynoglossus*. In spite of the few records north-west of Bjørnøya (Bear Island), two more species could be assigned to this category: *Brosme brosme* and *Enchelyopus cimbrius*. Being on the border of their range, several of the species from the coastal current zone were represented only by a single or a few individuals (*M. glutinosa, C. monstrosa, D. batis, D. linteus, P. blennoides, G. argentatus, M. molva, M. dypterygia, H. hippoglossus* and *G. cynoglossus*; see Table 1).

Species mainly distributed from the Polar Front northwards (Fig. 5) were *Amblyraja hyperborea, Gymnocanthus tricuspis, Myoxocephalus scorpius, Icelus bicornis, I. spatula, Triglops murrayi, T. nybelini, T. pingeli, Leptagonus decagonus, Eumicrotremus spinosus, Careproctus dubius, Liparis fabricii, L. gibbus, Gymnelus retrodorsalis, Lycenchelys kolthoffi, L. pallidus, L. reticulatus, L. rossi, L. seminudus, Lumpenus lampretaeformis, Leptoclinus maculatus* and *Anarhichas denticulatus*. Of these, three species were confined to the Bear Island Bank: *G. tricuspis, M. scorpius* and *E. spinosus*.

Of the 27 species numerous enough for analysis, none showed a random distribution in relation to the three factors (bottom temperature, depth and salinity) entered in a logistic regression analysis (Table 2): all the species showed a significant relationship to at least one of the factors, 15 species to two factors and nine species to all three factors. All but one of the 27 species showed a distribution related to temperature, whereas a relation to depth was found for 19, and to salinity for 15 of the species.

Of the 14 species associating with cold water, *A. denticulatus, C. derjugini* and *R. hippoglossoides* also associated with deeper water, and *T. pingeli, T. murrayi, T. nybelini, A. atlanticus, Leptoclinus maculatus, Lumpenus*

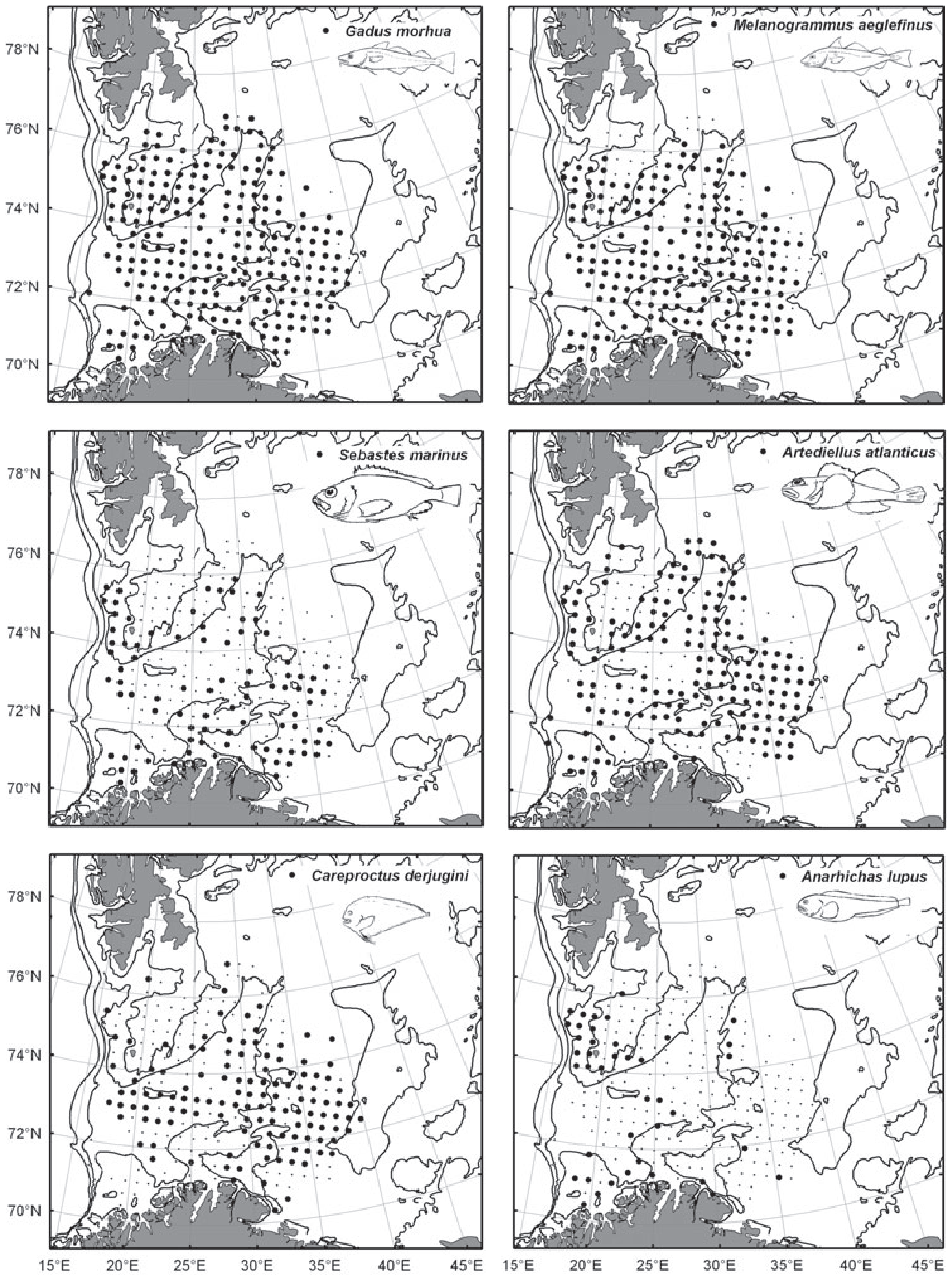

Fig. 2 Fish species with a wide distribution in the area sampled. Large dots and small dots indicate trawl stations with positive and negative registrations, respectively.

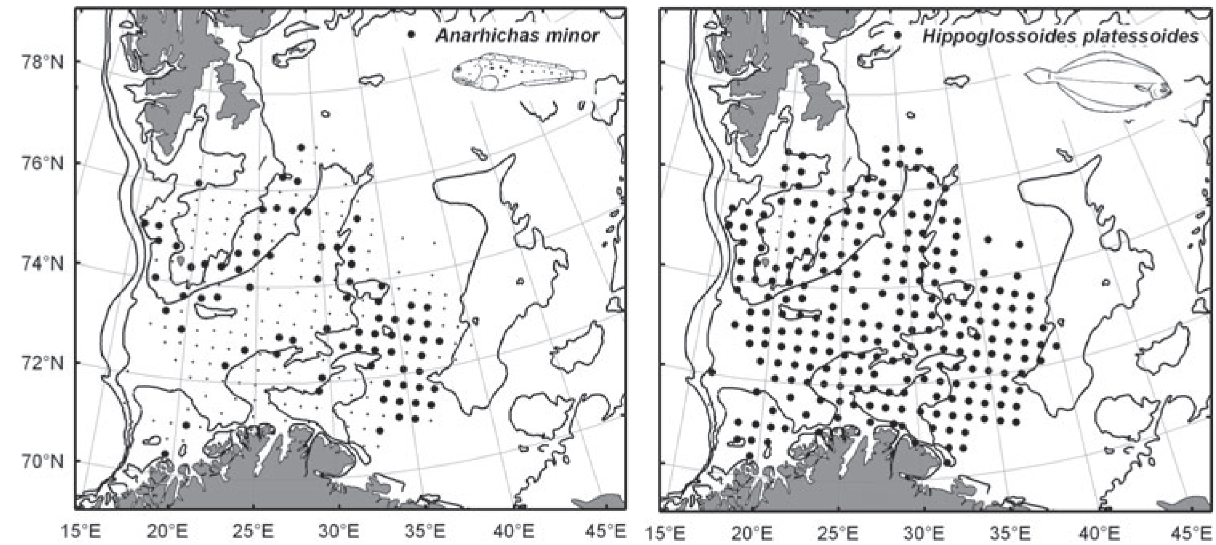

Fig. 2 *Continued*

Table 2 Occurrence of fish in relation to environmental variables, as shown by remaining variables in backwards stepwise logistic regression models.

Species	Test parameters	Temperature	Depth	Salinity
Amblyraja radiata	*B*	0.180	0.007	
	Wald χ2	5.234	23.167	
	p	0.022	<0.001	
Gadus morhua	*B*	2.067	–0.011	
	Wald χ2	15.415	6.235	
	p	<0.001	0.013	
Melanogrammus aeglefinus	*B*	0.909	–0.006	6.965
	Wald χ2	32.732	6.636	20.295
	p	<0.001	0.010	<0.001
Micromesistius poutassou	*B*	1.205	0.024	
	Wald χ2	48.318	44.308	
	p	<0.001	<0.001	
Pollachius virens	*B*	1.123		
	Wald χ2	34.003		
	p	<0.001		
Trisopterus esmarkii	*B*	1.046		
	Wald χ2	44.861		
	p	<0.001		
Sebastes marinus	*B*	0.351	–0.007	7.844
	Wald χ2	15.453	10.278	13.379
	p	<0.001	<0.001	<0.001
Sebastes mentella	*B*	0.594	0.030	
	Wald χ2	28.691	49.101	
	p	<0.001	<0.001	
Sebastes viviparus	*B*	1.738	0.010	
	Wald χ2	24.824	5.217	
	p	<0.001	0.022	
Artediellus atlanticus	*B*	–0.333	–0.007	9.468
	Wald χ2	12.857	13.582	24.703
	p	<0.001	<0.001	<0.001

Table 2 *Continued*

Species	Test parameters	Temperature	Depth	Salinity
Icelus bicornis	*B*	–1.293		–5.484
	Wald χ2	27.655		17.453
	p	<0.001		<0.001
Triglops murrayi	*B*	–0.486	–0.018	5.379
	Wald χ2	27.722	36.867	15.686
	p	<0.001	<0.001	<0.001
Triglops nybelini	*B*	–1.149	–0.016	15.995
	Wald χ2	17.725	10.497	6.550
	p	<0.001	0.001	0.010
Triglops pingeli	*B*	–0.983	–0.009	
	Wald χ2	23.822	8.849	
	p	<0.001	0.003	
Leptagonus decagonus	*B*	–1.927		12.997
	Wald χ2	56.186		14.906
	p	<0.001		<0.001
Cottunculus microps	*B*	0.337	0.006	
	Wald χ2	12.431	11.944	
	p	<0.001	0.001	
Careproctus derjugini	*B*	–0.415	0.009	
	Wald χ2	23.254	29.381	
	p	<0.001	<0.001	
Lycodes gracilis	*B*	0.626		12.979
	Wald χ2	29.671		16.584
	p	<0.001		<0.001
Lycodes reticulatus	*B*	–1.362		7.075
	Wald χ2	25.322		4.278
	p	<0.001		0.039
Lycodes rossi	*B*	–2.599		32.431
	Wald χ2	35.053		14.607
	p	<0.001		<0.001
Lumpenus lampretaeformis	*B*	–0.367	–0.018	10.679
	Wald χ2	17.428	40.797	27.052
	p	<0.001	<0.001	<0.001
Leptoclinus maculatus	*B*	–1.024	–0.017	7.224
	Wald χ2	66.696	34.466	20.732
	P	<0.001	<0.001	<0.001
Anarhichas denticulatus	*B*	–0.283	0.005	
	Wald χ2	9.578	6.995	
	P	0.002	0.008	
Anarhichas lupus	*B*	0.495	–0.015	4.486
	Wald χ2	18.582	17.915	7.689
	p	<0.001	<0.001	0.006
Anarhichas minor	*B*	–0.223	–0.009	5.944
	Wald χ2	7.367	16.125	12.453
	P	0.007	<0.001	<0.001
Reinhardtius hippoglossoides	*B*	–0.416	0.025	
	Wald χ2	13.651	55.329	
	P	<0.001	<0.001	
Hippoglossoides platessoides	*B*			5.421
	Wald χ2			23.993
	P			<0.001

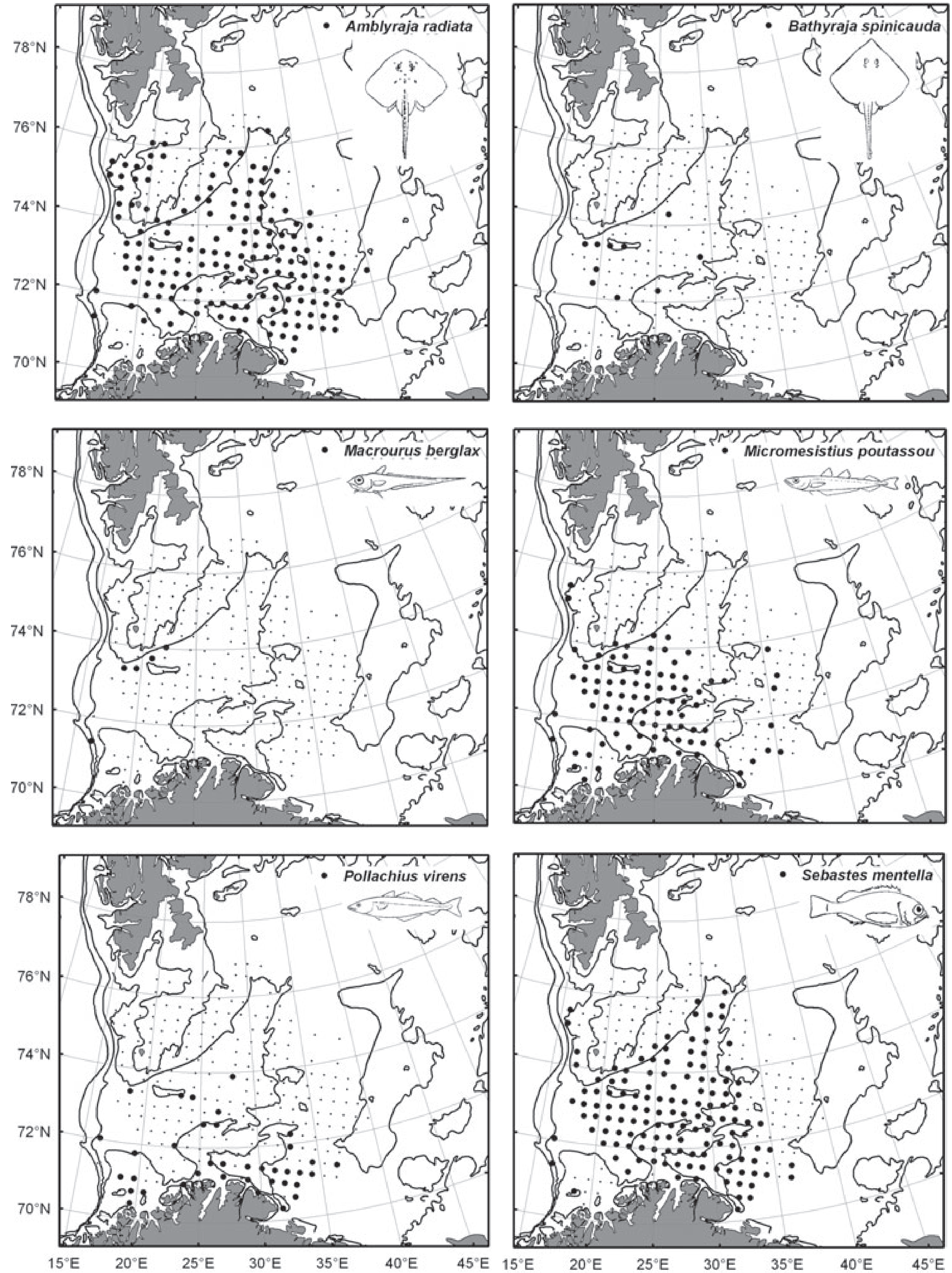

Fig. 3 Fish species with a wide distribution in the western part of the Barents Sea, strongly influenced by Atlantic water. Large dots and small dots indicate trawl stations with positive and negative registrations, respectively.

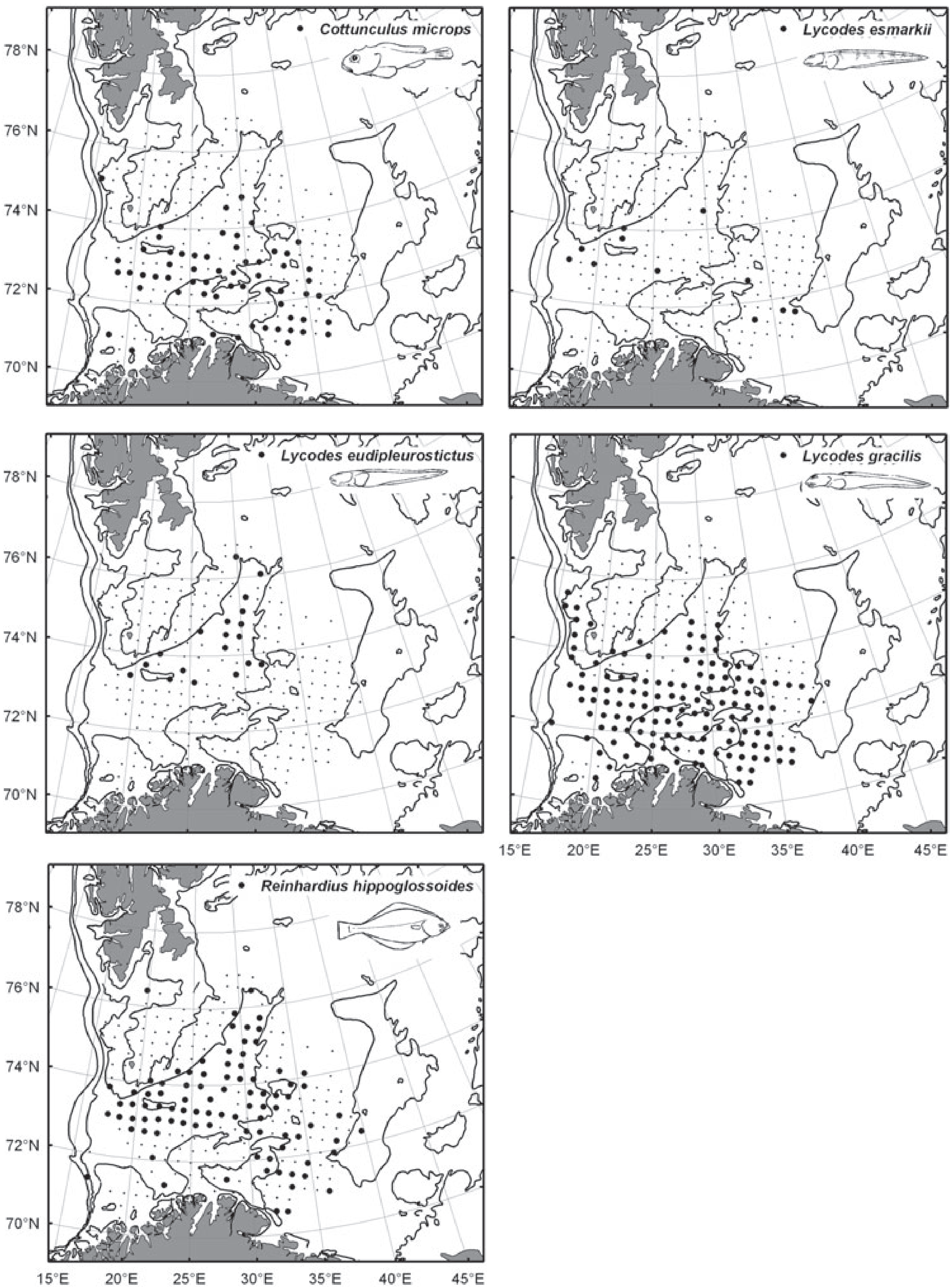

Fig. 3 *Continued*

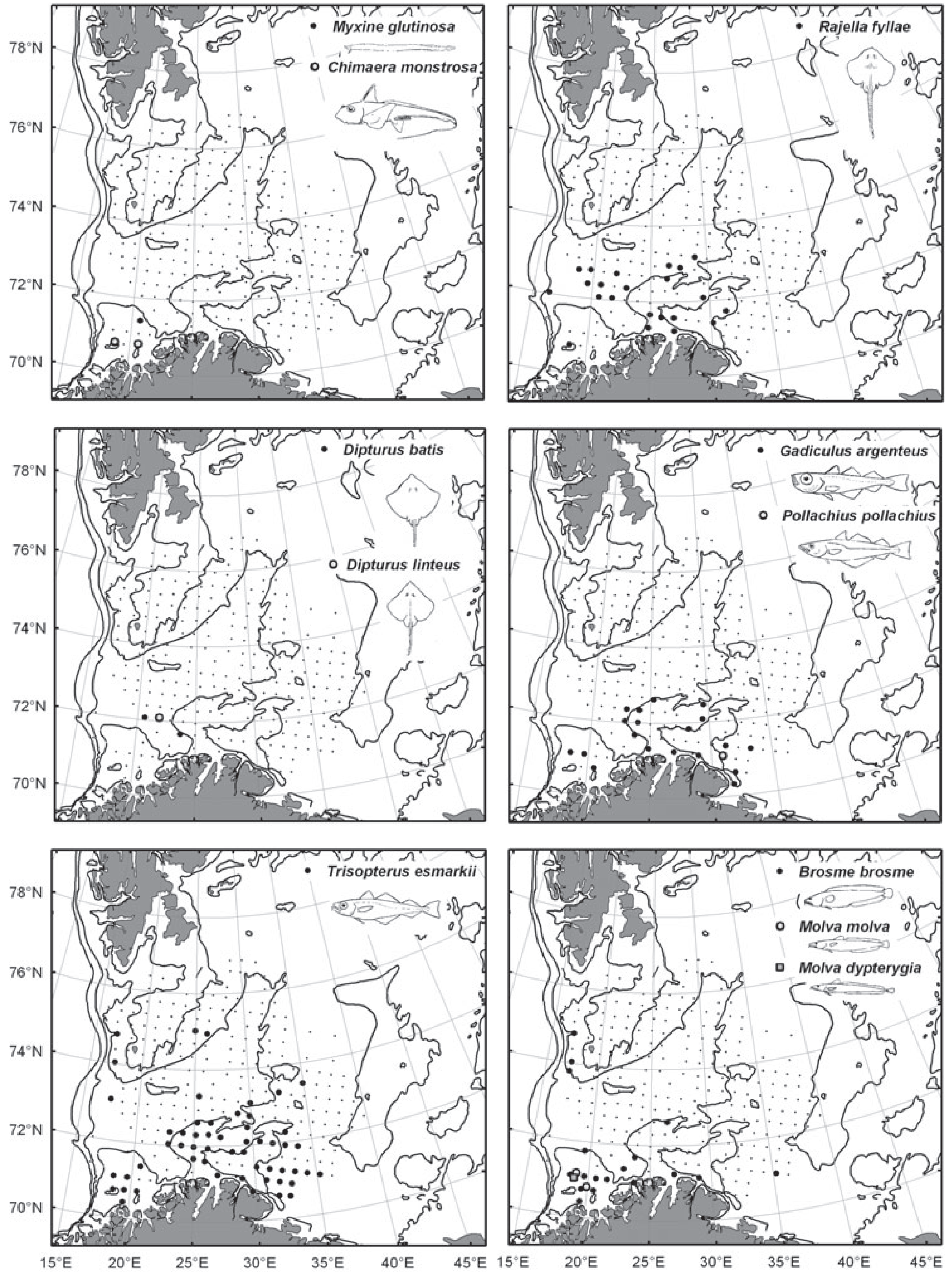

Fig. 4 Fish species found mainly in coastal current waters along the mainland. Large dots, circles and squares indicate trawl stations with positive registrations. Small dots indicate trawl stations with negative registrations.

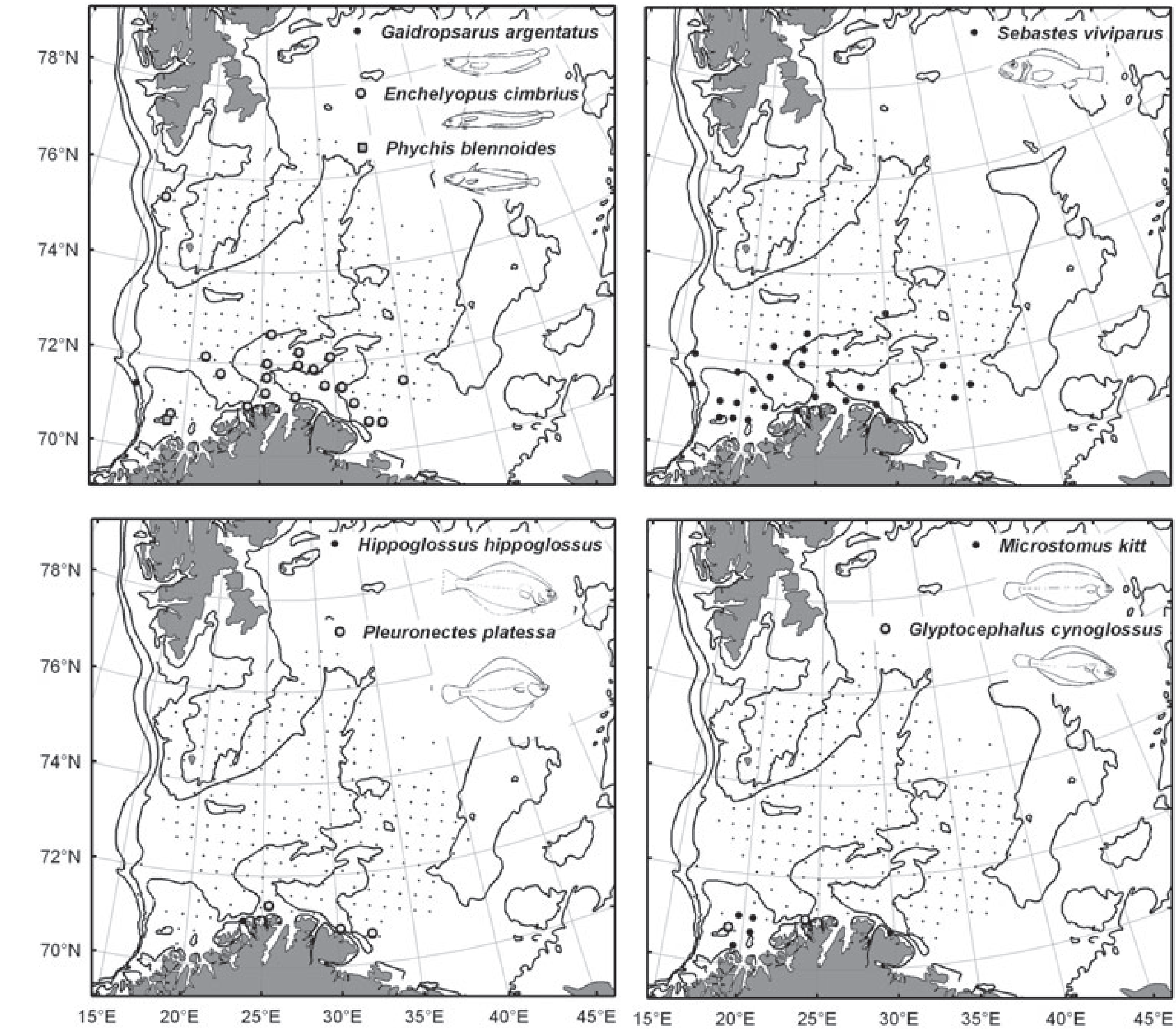

Fig. 4 *Continued*

lampretaeformis and *A. minor* associated with shallower water, the latter six species associating with higher salinity as a third variable. Three of the cold water species, *Leptagonus decagonus*, *Lycodes reticulatus* and *L. rossi*, associated with higher salinity as a second variable, and finally *I. bicornis* associated with lower salinity in addition to cold water.

Two of the 12 species associating with higher water temperatures, *P. virens* and *T. esmarkii*, showed no significant relationship to depth or salinity, whereas *A. radiata*, *M. poutassou*, *S. mentella*, *S. viviparus* and *C. microps* associated with deeper water in addition to higher temperatures. Four species with affinity to warmer water, *G. morhua*, *M. aeglefinus*, *S. marinus* and *A. lupus* associated with shallower water, and the three latter species also associated with higher salinity. *L. gracilis* associated with higher temperatures and salinity, whereas *H. platessoides* associated with higher salinity as a sole factor.

Discussion

The present study was based on a single cruise from one year only. This might limit the general conclusions that can be drawn from the material, especially regarding the distribution of more mobile species. On the other hand, this concentrated sampling facilitates comparability of the sampling stations, and thereby analysis. On account of this, combined with the dense grid sampling applied, the present study offers more precise distributional information for the species of which range maps have been based on more or less unspecified information, both regarding time periods and sampling methodologies.

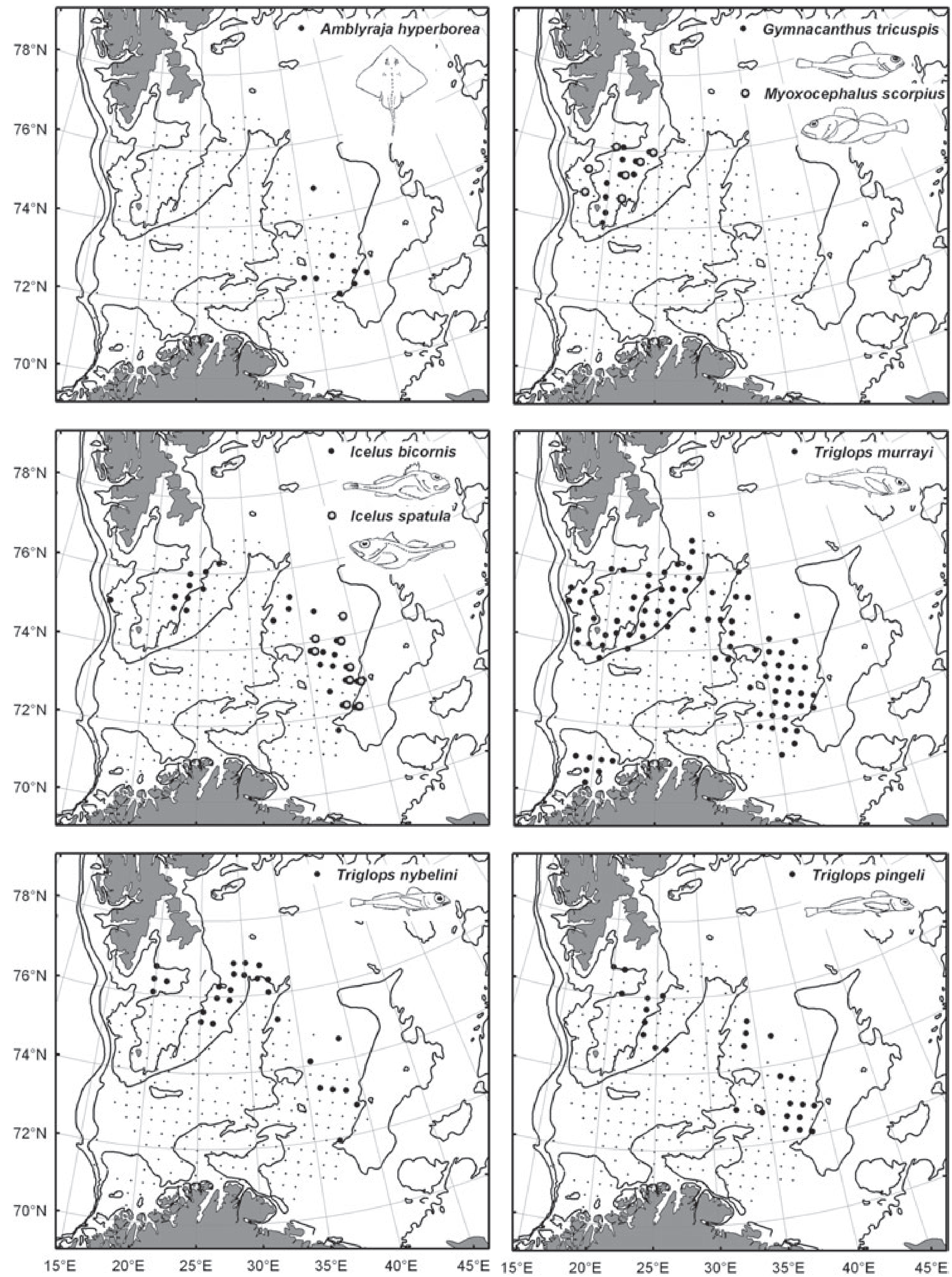

Fig. 5 Fish species with a distribution from the Polar Front and northwards. Large dots and circles indicate trawl stations with positive registrations. Small dots indicate trawl stations with negative registrations.

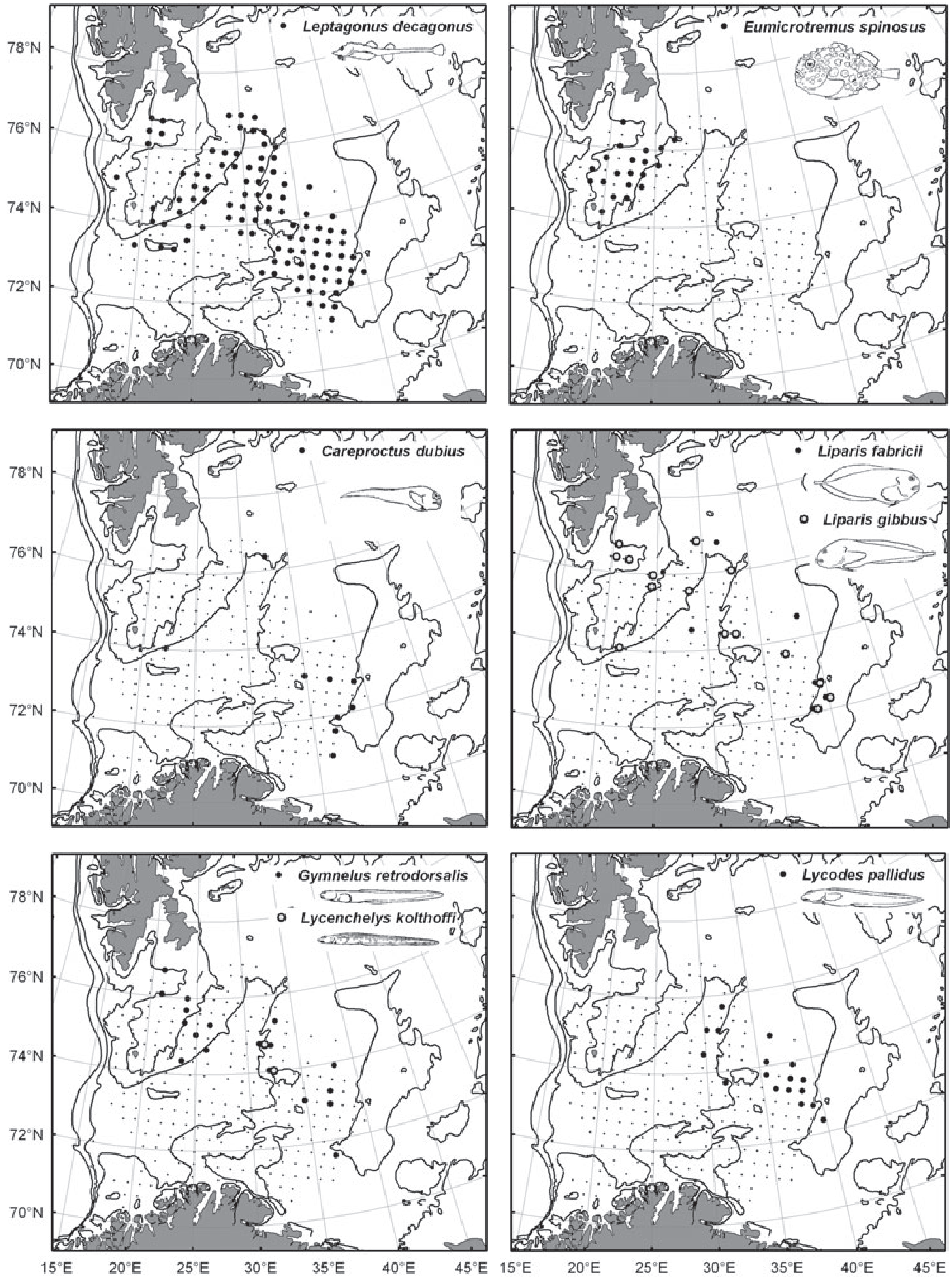

Fig. 5 *Continued*

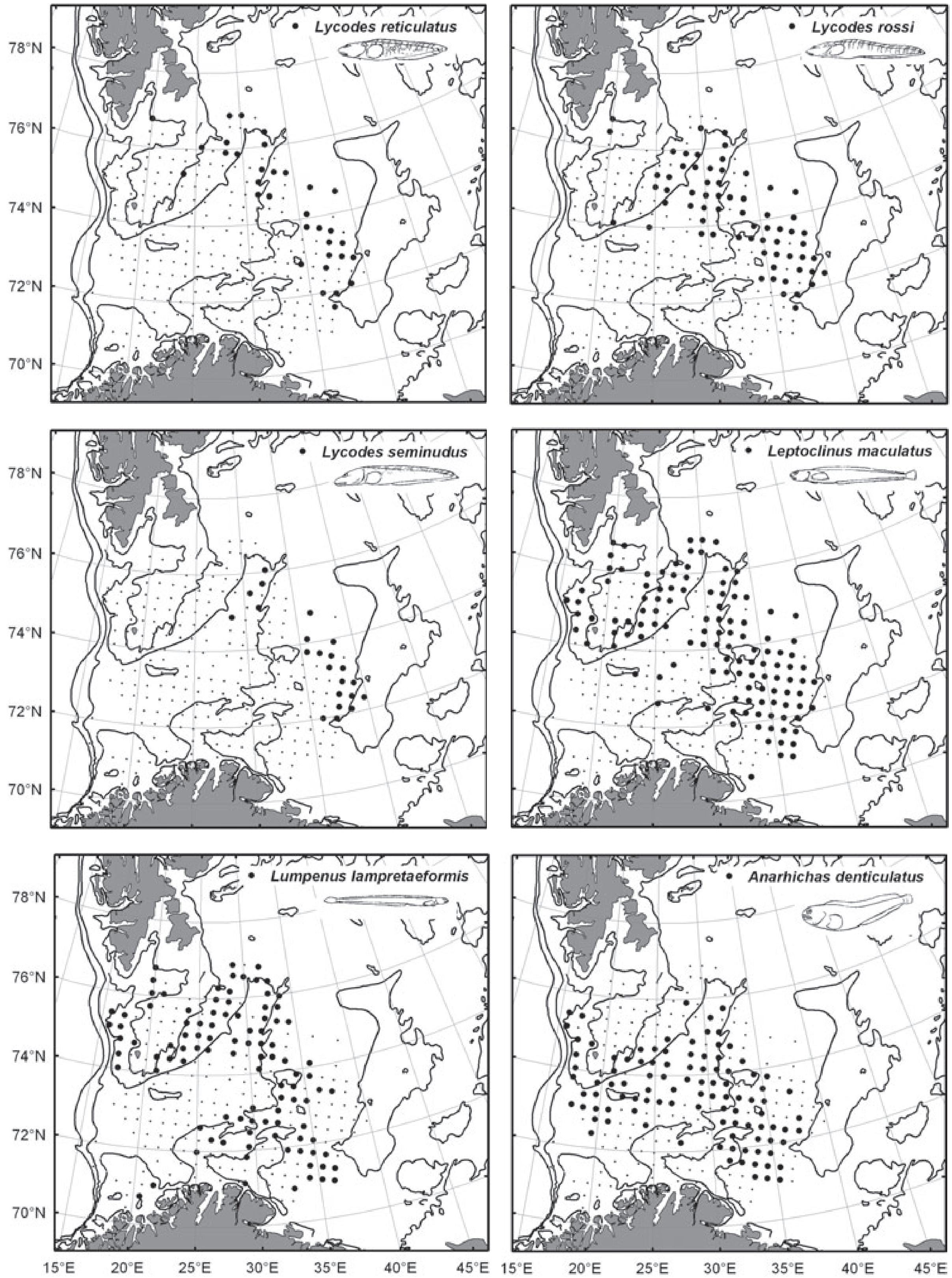

Fig. 5 *Continued*

As expected in an ocean area like the Barents Sea, with warmer water from the south meeting cold subzero polar water, the distribution of most of the fish species was associated with temperature. In general, a warm water fish fauna dominated by Gadidae and Scorpaenidae was found to the south of the Polar Front, whereas the true cold water fauna started to appear near the Polar Front and consisted primarily of several species of Cottoidea, Cyclopteroidea, Zoarcidae and Stichaeidae. For more details on the distribution and population changes of the commercially important gadoid and scorpaenoid species, and *Reinhardtius hippoglossoides*, see Bergstad et al. (1987), Stiansen et al. (2005), Aglen (2006), Hauge (2006), Høines (2006) and Nedreaas (2006).

Many species also showed an association with depth and/or salinity. Studying the variation in salinity in the south-westernmost part of the Barents Sea over a period of 29 years, Ingvaldsen et al. (2006) held that so far no effect on the occurrence of organisms has been found to be related to a recent increase in salinity. Our results indicate that an increased salinity might potentially affect several species, benefiting those that also associate with warmer water, such as *Melanogrammus aeglefinus*, *Sebastes marinus* and *Anarhichas lupus*, but the effect of salinity specifically could be difficult to reveal, as high salinity is typical of inflowing Atlantic water, which is warmer.

The distribution of non-commercial demersal fish has been poorly known in the Barents Sea, as revealed from the discrepancies between the distribution maps shown in the two standard handbooks most often used for the area: Whitehead et al. (1984, 1986a, b) and Pethon (2005). In these, the distribution maps disagree strongly

Table 3 Revision of ranges compared with the most recent handbook maps: (1) Whitehead et al. (1984, 1986a, b) and (2) Pethon (2005). Taxonomic revisions in Liparidae refer to (3) Chernova (1988) and (4) Chernova (2005a, b).

Species	Revised ranges (references used for comparison are given in parentheses)
Bathyraja spinicauda	Reduced in the north and south (1)
Amblyraja hyperborea	Reduced in the north, south and west (1); extended to the east (2)
Rajella fyllae	Reduced in the north (1)
Gadiculus argenteus thori	Extended to the north and east (2)
Micromesistius poutassou	Reduced in the north (1)
Pollachius virens	Reduced in the north (1)
Trisopterus esmarkii	Reduced in the north (1)
Brosme brosme	Reduced in the north (1)
Molva molva	Reduced in the north (1); extended north and east (2)
Molva dypterygia	Reduced in the north (1)
Sebastes viviparus	Reduced in the north, extended to the east (1); extended to the north and east (2)
Artediellus atlanticus	Extended to the east (1)
Gymnocanthus tricuspis	Reduced in the south and east (1)(2)
Icelus bicornis	Reduced in the south and west (1)(2)
Icelus spatula	Extended to the northwest (1)(2)
Myoxocephalus scorpius	Reduced in the south and east (1)(2)
Triglops murrayi	Extended to the east (1); reduced in the south (1)(2)
Triglops nybelini	Extended to the south (1)
Triglops pingeli	Extended to the south (1); reduced to the south and west (2)
Leptagonus decagonus	Reduced in the south and southwest (1)(2)
Cottunculus microps	Reduced in the south (1)(2) and north (1); extended in the north (2)
Eumicrotremus spinosus	Reduced in the south and east (1)
Careproctus derjugini	Previously unmapped in the area (4)
Careproctus dubius	Previously unmapped in the area (4)
Liparis fabricii	Extended to the southeast (1)
Liparis gibbus	Previously probably mapped by (1) and (2) as *Liparis liparis* (3)
Gymnelus retrodorsalis	Reduced in the south and west (2)
Lycodes eudipleurostictus	Extended to the east (1)(2) and north (2)
Lycodes pallidus	Reduced to the south (1)(2) and west (2)
Lycodes reticulatus	Reduced in the west (1)(2) and south (2)
Lycodes rossi	Reduced in the west and south (2)
Lycodes seminudus	Extended to the northwest (1); reduced to the south and west (2)
Leptoclinus maculatus	Reduced in the southwest (1)(2); extended from littoral areas (2)
Lumpenus lampretaeformis	Reduced in the west (1); extended from littoral areas (2)
Anarhichas denticulatus	Reduced in the south (1)(2); extended to the east (2)
Anarhichas minor	Extended to the north and east (2)
Hippoglossoides platessoides	Extended to the north (2)

for seven species in each of the families Gadidae and Zoarcidae, for two species in each of the families Rajidae, Cottidae and Stichaeidae, and for one species within the Macrouridae, Scorpaenidae, Psychrolutidae, Cyclopteridae and Pleuronectidae. Notable, but less dramatic, disagreements are found in the maps of an additional one species of Rajidae and one of Cottidae. Our data show better agreement with the maps of Pethon (2005) than with those of Whitehead et al. (1984, 1986a, b), which is not surprising, considering the time difference between those two sources, and the fact that Pethon's coverage is geographically more restricted than that of Whitehead et al., and therefore gives more detailed and accurate information for the specific area covered. Yet our maps seem to represent a considerable revision of the range in relation to one or both of these two handbooks for the species listed in Table 3. To what extent these differences may be attributed to population changes and/or actual shifts in ranges over the last decades is unknown.

Recent taxonomic revisions (Chernova 1988, 2005a, b) have altered the species composition in the Barents Sea within the family Liparidae from that given by Whitehead et al. (1984, 1986a, b) and Pethon (2005). *Liparis liparis* (Linnaeus, 1766) was not found in our material, but *L. gibbus* was. This agrees with the results from Chernova (1988). In her revisions of *Careproctus*, Chernova (2005a, b) removed *C. reinhardti*, *C. micropus* and *C. ranula* from the species list for the Barents Sea, and instead introduced six species to the Barents Sea–Svalbard area, five of them new to science. Resulting from limited material for each of her species, Chernova was unable to map their distribution. In our material we recorded *C. derjugini* as the most common and widespread species, and *C. dubius* as a less common species.

Published maps showing results from trawl stations in the same area as our study are available for *Dipturus linteus*, *Trisopterus esmarkii*, *Gaidropsarus argentatus*, *Lycodes gracilis*, *Cottunculus microps* and *Triglops murrayi* (Dolgov 2000), and they agree well with our maps for these species. These, along with those of Dolgov (2004), constitute a foundation for accurate distribution maps of the demersal fish species in a major part of the Barents Sea–Svalbard region. In light of expected climatic changes and increased economic development in the region, this mapping may serve as a basis for future monitoring of important components of the marine ecosystem in this area.

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