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NEW DATA ON COMPOSITION AND DISTRIBUTION OF THE BARENTS SEA ICHTHYOFAUNA

by A.V.Dolgov

Polar Research Institute of Marine Fisheries and Oceanography (PINRO), 6 Knipovich Street, 1983763, Russia

ABSTRACT

On the basis of the materials of trawl surveys and PINRO research expeditions, as well as literature data, recent changes in the ichthyofauna of the Barents Sea and adjacent Norwegian Sea areas are described. Data on rare and observed for the first time species are presented. A corrected species list is given. Considerable changes, related to warming-up of the waters, in distribution of fish, especially of boreal Atlantic origin, are shown. The importance of collecting data on all species for fisheries investigations is noted and the necessity of conducting further fauna investigations is emphasized as this will allow to monitor the status of the Barents Sea ecosystem.

INTRODUCTION

Conservation of biodiversity in ‘any ecosystem requires precise knowledge about this ecosystem. The Barents Sea (and the adjacent areas of the Norwegian Sea) is one of the most thoroughly studied areas of the World Ocean. However, data on the species composition of this area have not been revised for a long time. Despite a series of reports containing data on the Barents Sea alongside with other areas (Andriyashev, 1954; Andriyashev, Chernova, 1994; Pethon, 1984, 1998), no special list of the Barents Sea fishes is available.

One of the sources of information about composition and distribution of ichthyofauna are trawl surveys during which large areas are studied at different depths. Since the early 1980s PINRO regularly carries out autumn-winter trawl surveys of the commercial species in the Barents Sea, covering areas from northern Spitsbergen to the Norwegian coast and Novaya Zemlya. Besides, in other seasons surveys of other species (redfish, haddock, Greenland halibut and its juveniles) are occasionally conducted. Since mid-1990s these surveys and cruises of research and fishing vessels involve a comprehensive investigation program including identification of all species occurring in catches, mass measurements and, in some cases, biological analysis. The results of these studies showed that ichthyofauna of the Barents Sea had considerably changed.

The objective of this paper is to compare literature data on species composition of the mentioned region with actual data; to make a preliminary list of fish species of the Barents Sea; to reveal changes in distribution of some species.

MATERIALS AND METHODS

By the Barents Sea we mean the area delimited by 82-84°N in the north; by the Murman and Norwegian coasts in the south (to 67°N); by Novaya Zemlya and Franz Josef Land in the east; by a continental slope (to approx.800-100 m depth) in the west.

Fishes were classified according to V.Eschmeyer (1990).

Occurrence of different species was estimated using Russian survey and other cruise data, as well as materials from the Russian-Norwegian database on feeding of the Barents Sea organisms (Mehl, Yaragina, 1992).

Maps of non-commercial fishes' distribution were made by the data of 2 trawl surveys conducted by PINRO: 1) trawl survey for demersal fishes stocks assessment, undertaken in October 1998-January 1999 in the area from the Norwegian coast to Spitsbergen (indicated as circles on the map); 2) trawl survey of young Greenland halibut, carried out in September 1999 (on the map - rhombs). Sites where rare species (sailray, Kolthoff's eelpout, Luetken's eelpout, megrim) were caught are shown by data from different research and research-fishing cruises.

RESULTS AND DISCUSSION

1. Composition of ichthyofauna

No updated list of 'the Barents Sea fishes is presently available. The report on arctic fishes, compiled by A.P.Andriyashev (1954) on the basis of the materials collected up to the 1950s, listed 149 Barents Sea (the Barents Sea, Norwegian and Spitsbergen coasts) fish species, including rare species and those for which no reliable data were available. To revise this paper, a preliminary list of arctic fishes was prepared (Andriyashev, Chemova, 1994) which, however, did not indicate the precise areas of occurrence. Hognestad and Vader (1979) give a species list for North Norway comprising 166 species some of which occurred only occasionally, in some cases - several decades ago or even in the last century. Pethon's report has a number of inaccuracies (in particular, it lacks the description of such species as *Triglops nybelini, Icelus spatula, Lycodes polaris).* Whitehead et al. borrowed most data on non-target species from the paper by Andriyashev (1954).

In recent times some changes in the checklist of the Barents Sea species have taken place, including those related to description of new species. E.g., species composition of the family Liparididae (Chemova, 1991) and genus Gymnelus (Zoarcidae) (Chernova, 1998, 1999a, 1999b) in this area was completely revised. As a result, the number of species in these taxa made up 9 and 4 instead of 3 and 2, respectively. Besides, there is a possibility of finding new species of Careproctus and Liparis genera in the Barents Sea (Chernova, 1999, pers. comm.).

During our investigations 91 species occurred in catches and 68 species - in stomachs of different fishes (Table 1).

Thus, the list of species which can occur in the Barents Sea and adjacent areas of the Norwegian Sea, comprises presently 203 species, for 40 of which more precise distribution data are required.

2. Distribution

Comparison of our own and literature data on distribution of some species revealed considerable differences between these data observed in recent times. The species for which such differences are greatest can be divided into two groups.

Species of the first group are rare or poorly studied. Up to the early 1990s only some isolated cases of catching them in the Barents Sea were reported. Therefore new findings of Luetken's eelpout, Kolthoff's eelpout or Sadko's sculpin can not indicate any changes in distribution range of these species.

Changes in distribution of species from the second group, which comprises mostly boreal fishes, are related to northward extension of their distribution range caused by an increased advection of warm Atlantic waters. The northern boundary of distribution area of species formerly common in the Barents Sea shifted and their distribution area increased. E.g., Vahl's eelpout which, by A.P.Andriyashev's data, occurred up to 75°N, is now observed along the coastline of North Spitsbergen up to 80°N (fig.2). Catches of this species at the northern boundary of its distribution made up 1-2 specimens per hour trawling, among which occurred pre-spawning mature females. Ribbon barracudina entered still further northwards. It occurred in catches taken from North Spitsbergen to Franz Josef Land (fig. 1), while earlier it had not occurred north of the Bear Island. The same was observed in such species as Norway pout, moustache sculpin (figs. 1-2), blue whiting etc. Other species, due to expansion of their distribution area, appeared in the Barents Sea for the first time. E.g., sailray and megrim, which earlier did not occur above 66-67°N (Hognestad, Vader, 1979; Wheeler, 1982; Pethon, 1985), are now observed up to 70° and 74°N, respectively (figs. 1, 2).

3. Ichthyofauna research prospects

Interest in studies of the Barents Sea fish fauna played a key role in the expansion of such investigations. First attempts to study non-target species allowed to obtain new data on both biology (feeding, fecundity, maximum length etc.) (Dolgov, 1994) and distribution. Species were found which earlier had not occurred in the Barents Sea or were considered as rare, e.g. sailray (Dolgov, Igashov, in press), Kolthoff's eelpout (Dolgov, 1994), megrim (Dolgov, in press), Luetken's eelpout, Sadko's sculpin.

Every new expedition in the northern Barents Sea to the archipelagos Spitsbergen and Franz Josef Land extends the list of species inhabiting this area. By results of Russian investigations conducted in 1978-1984, the number of species typical of this region increased to 33 (Borkin, 1983, 1994). By preliminary data obtained in 1999, the list included 52 species and is still likely to grow (Smirnov et al., in press).

The most valuable data are obtained during trawl surveys. It is therefore essential to register all species occurring in catches. At the same time, large-scale investigations on feeding of the Barents Sea fishes, conducted since mid-1980s (Mehl, Yaragina, 1992), can serve as an additional source of information about both biology and distribution of non-target species. E.g., black seasnail which did not occur in trawl catches was found in stomachs of Greenland halibut. All specimens caught were egg-bearing females, and one can suggest the existence of pre-spawning aggregations of black seasnail and the possibility of its spawning.

CONCLUSION

Thus, it is obvious that in the recent decades the Barents Sea ichthyofauna has experienced considerable changes related to different factors, including warming-up of waters. This, naturally, had an impact on interrelations within the ecosystem of this region. Therefore such investigations must be continued and further expanded. This will allow to obtain new data on biology and distribution of the Barents Sea fishes, as well as to revise the composition of fish fauna of this area.

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Checklist of the Barents Sea fish species

	Occurence in trawl catches	Occurence in fish stomachs	Literature data	Final
Myxini				
Myxiniformes				
Myxinidae				
Myxine glutinosa Linnaeus. 1758.			+	+
Cephalaspidomorphi				
Petromyzontiformes				
Petromyzontidae				
Petromyzon marinus Linnaeus. 1758	+	+	+	+
Lampetra fluviatilis (Linnaeus. 17%)			+	+?
Lenthenteron japonicum (Martens. 1869)		+	+	+
Elasmobranchii				
Hexanchiformes				
Chlamidoselachidae				
Chlamydoselachus anguineus Gannan, 1884			+	+(r)
Lamniformes				
Lamnidae				
Lamna nasus (Bonnaterre, 1788)			+	+(r)
Cetorhinidae				
Cetorhinus maximus (Gunnerus. 1763)			+	+(r)
Alopiidae				
Alopias vulpinus (Bonnaterre. 1788)			+	+?
Carcharhiniformes				
Scyliorhinidae				
Galeus melastomus Rafinesque. 18 IO				+(r)
Scyliorhinus canicula (Linnaeus. 1758)				+(r)
Triakidae				
Galeorhinus galeus (Linnaeus. 1758)				+(r)
Prionas glauca (Linnaeus. 1758)				+?
Squaliformes				
Squatidae				
Etmopterus spinax (Linnaeus, 1758)			t	+?
Somniosus microcephalus (Bloch & Sclmeider 1801)	t		+	+
Squalus acanthias Linnaeus. 1758·	t		+	+
Rajiformes				
Rajidae				
Bathyraja spinicauda (Jensen. 19 14)	+		t	+
Raja batis Linnaeus. 1758	+		+	+
Raja clavata Linnaeus. 1758			+	
Raja fullonica Linnaeus. 1758			+	+
Raja fyllae Luetken. 1888	+	+	+	+
Raja hyperborea Collett. 1879	+		+	+
Raja lintea Fries, 1839	+.			+
Raja oxyrinchus Linnaeus. 1758			+	+

Raja radiata Donovan. 1808	+	+	+	+
Myliobatiformes				
Dasyatidae				
Dasyatis pastinaca (Linnaeus. 1758)			+ -	+?
Holocephali				
Chimaeriformes				
Chimaeridae				
Chimaera monstrosa Linnaeus. 1758	+		+	t
Teleostomi				
Notacanthiformes				
Notacanthidae				
Notacanthus chemnitzii Bloch. 1788			+	+(r)
Anguilliformes				
Anguillidae				
Anguilla anguilla (Linnaeus. 1758)			+	+(r)
Congridae				
Conger conger (Linnaeus. 1733)			+	+(r)
Clupeiformes				
Clupeidae				
Alosa alosa (Linnaeus. 1758)		+	+ -	+?
Clupea harengus Linnaeus. 1758	+	+	+	+
Clupea pallasi marisalbi Berg. 1923	+		+ -	+
Clupea pallasii suworovi Rabinerson. 1927	+		+	+
Sprattus sprattus (Linuaeus, 1758)			+ -	-?
3almoniformes				
4rgentinidae				
4rgentina silus (Ascanius. 1775)	+	+	+	
Argentina sphyraena Linnaeus. 1758		+	+ -	
Dsmeridae				
Mallotus villosus (Mueller. 1776)	+	+	+	
Salmonidae				
Salmo salar Linnaeus. 1758	-		+	
Salmo trutta Linnaeus. 1758			+	
Salmo gairdneri Richardson. 1836			+	
Salvelinus alpinus (Linnaeus. 1758)			+	
Oncorhynchus gorbusha (Walbaum. 1792)			+	r
Oncorhynchus keta (Walbaum. 1792)			+	+
Stomiiformes				
Sternoptychidae				
Argyropelecus hemigymnus Cocco. 1829		+	+ -	+?
Argyropelecus olfersi (Cuvier. 1829)	-		+ -	+?
Maurolicus muelleri (Gmelin. 1789)	-	+	+	+
Aulopiformes				
Paralepididae				
Arctozenus rissoi (Bonaparte. 1840)	-	+	+	+
Myctophiformes				
Myctophidae				
Benthosema glaciale (Reiuhardt. 1838)		+	+	t

Notoscopelus kroyerii Mahngren. 186 I			+	t
Gadiformes				
Macrouridae				
Coryphaenoides rupestris Gunner-us, 1765			+	t
Macrourus berglax Lacepede, 18 10	+		+	t
Gadidae				
Arctogadus glacialis (Peters, 1874)			+	t
Boreogadus saida (Lepechin, 1774)	+		+	t
Eleginus navaga (Pallas, 18 11)	+		+	t
Gadiculus argenteus thori Schmidt. 19 14	+		+	t
Gadus morhua Linnaeus, 1758	+		+	t
Melanogrammus aeglefinus (Linnaeus, 1758)	+		+	t
Merlangius merlangus (Linnaeus, 1758)	+		+	t
Micromesistius poutassou (Risso, 1826)	+		+	t
Pollachius pollachius (Linnaeus, 1758)			+	t
Pollachius virens (Linnaeus, 1758)	+		+	t
Theragra finnmarchica Koefoed, 1956			+	+?
Trisopterus esmarkii (Nilsson, 1855)	+		+	t
Trisopterus luscus (Linnaeus, 1758)			•	+?
Trisopterus minutus (Linnaeus. 1758)			+-	+?
Lotidae				
Brosme brosme (Ascanius. 1772)	+		+	t
Ciliata mustela (Linnaeus, 1758)			+	t
Ciliata septentrionalis (Collett, 1875)			+	t
Enchelyopus cimbrius (Linnaeus. 1766)			+	t
Gaidropsarus argentatus (Reinhardt. 1838)	+		+	t
Gaidropsarus ensis (Reinhardt, 1837)			+-	+?
Molva dypterygia (Pennant? 1784)	+		+	t
Molva molva (Linnaeus. 1758)	+		+	t
kniceps raninus (Linnaeus, 1758)			+-	+?
Phycidae				
Phycis blennoides (Bruennich. 1768)			+-	+?
Merluccidae				
Merluccius merluccius (Linnaeus. 1758)			+	+(r)
Lophiiformes				
Lophiidae				
Lophius piscatorius Linnaeus. 1758	+		+	+(r)
4ntennariidae				
Histrio histrio (Linnaeus. 1758)			+	+(r)
Beloniformes				
Scomberesocidae				
Scomberesox saurus saurus (Walbaum. 1792)			+	+(r)
Belonidae				
Belone belone belone (Linnaeus. 1761)			+-	+(r)
Lampriformes				
Lampridae				
Lampris guttatus (Bruennich. 177 l)			+	+(r)
Trachipteridae				
Trachipterus arcticus (Bruennich. 177 1)			+	+(r)
Regalecidae				
Regalescus glesne Ascanius, 1772.			+	+(r)
Beryciformes				
Berycidae				

Beryx decadactylus Cuvier. 1829			+	+(r)
Gasterosteiformes .				
Gasterosteidae				
Gasterosteus aculeatus Linnaeus. 1758	+		+	+
Pungitius pungitius (Linnaeus. 1758)			+	+
Spinachia spinachia (Liimaeus. 1758)			+	+
Syngnathiformes		+		
Syngnathidae				
Entelurus aequoreus (Linnaeus. 1758)			+-	+?
Nerophis lumbriciformis (Jenyns. 1835)			+-	+?
Syngnathus acus Linnaeus. 1758			f-	+?
Syngnathus typhle Linnaeus. 1758			+	t
Scorpaeniformes				
Scorpaenidae				
Helicolenus dactylopterus (Delaroche. 1809)			+-	+?
Sebastes marinus (Linnaeus, 1758)	+		t	t
Sebastes mentella Travin. 194 I	+		t	t
Sebastes viviparus Kroyer. 1 844	+		t	t
Triglidae				
Eutrigla gurnardus (Linnaeus, 1758)	+		+-	t
Chelidonichthys lucerna (Linnaeus, 1758)			+-	+?
Cottidae				
4rtediellus atlanticus atlanticus Jordan & Evermann, 1898	+		t-	t
Artediellus atlanticus europeus Knipowitch. 1907	+		+	t
4rtediellus scaber Knipowitsch. 1907			t	t
Gymnocanthus tricuspis (Reinhardt. 1832)	+		t	t
Icelus bicomis (Reinhardt. 1840)	+		t	t
Icelus spatula Gilbert & Burke. 1912	+		t	t
Myoxocephalus scorpius (Linnaeus. 1758)	+		t	t
Taurulus bubalis (Euphrasen, 1786)			+	+
Taurulus lilljeborgi (Collett. 1875)			+	t
Triglopsis quadricornis (Linnaeus. 1758)			+	t
Triglops murrayi Guenther. 1888	-		t	t
Triglops nybelini Jensen. 1944	-		+	t
Triglops pingeli Reinhardt. 1830	-		+	t
Psychrolutidae				
Cottunculus microps Collett. 1875	-			t
Cottunculus sadko Essipov. 1937	-		t-	
Qgonidae				
Agonus cataphractus (Linnaeus. 1738)			+	t
Leptagonus decagonus (Bloch & Schneider, 1801)	-		+	
Ulcina oh-ikii (Luetken. 1876)				t
Cyclopteridae				
Cyclopteropsis jordani Soldatov. 1929			i--	+?
Cyclopteropsis macalpini (Fowler. 191-l)			+	+
Cyclopterus lumpus Linnaeus. 1758	-		+	+
Eumicrotremus derjugini Popov. 1926	-		+	+
Eumicrotremus spinosus (Mueller. 1777)	-		+	+
Liparididae				
Careproctus longipinnis Burke. 19 12			+	+
Careproctus micropus (Guenther. 1887)	-		I-	+
Careproctus ranula (Goode and Bean. 1880)	-		t	+
Careproctus reinhardti (Kroyer. 1862)	-		+	+
Liparis fabricii Kroyer. 1847	-		+	+
Liparis gibbus Bean. 1881	-		+	+
Liparis liparis (Linnaeus. 1766)			+	+

Liparis montagui (Donovan. 1805)	+		+	+
Liparis tunicatus Reinhardt. 1837	+		+	+
Paraliparis bathybius (Collett. 1879)		+	+	+
Rodichthys regina Collett. 1879			+	+
Perciformes				
Bramidae				
Brama brama (Bonnaterre. 1788)			+	+(r)
Pterycombus brama Fries. 1837			+	+(r)
Taractes asper Lowe. 1843			+	+(r)
Callionymidae				
Callionymus lyra Linnaeus, 1758			+-	+?
Caran'gidae				
Trachurus trachurus (Linnaeus. 1758)			t	+(r)
Gempylidse				
Nesiarchus nasutus Johnson. 1862			+-	+?
Zoarcidae				
Gymnelis andersoni Chemova, 1998			+	t
Gymnelis esipovi Chemova, 1999			t	t
Gymnelis knipowitschi Chemova.' 1999			t	t
Gymnelis retrodorsalis Le Danois. 19 13			t	t
Gymnelis taeniatus Chemova. 1999			t	t
Lycenchelys kolthoffi Jensen. 1903			+	+
Lycenchelys muraena (Collett. 1878)			+	+
Lycenchelys platyrhinus (Jensen, 190 1)			+	+?
Lycenchelys sarsii (Collett, 187 1)			+	+
Lycodes esmarki Collett. 1875			+	+
Lycodes eudipleurostictus Jensen. 190 1			+	
Lycodes frigidus Collett, 1878			+	
Lycodes jugoricus Knipowitch. 1906			-.	-7
Lycodes luetkeni Collett. 1880			..	
Lycodes pallidus Collett, 1878				
Lycodes polaris (Sabine. 1824)				
Lycodes reticulatus Reinhardt. 1835				
Lycodes rossi Malmgren. 1864				
Lycodes seminudis Reinhardt. 1837				
Lycodes squamiventer Jensen. 1904			..	.?
Lycodes vahli gracilis Sars. 1867				
Lycodonus flagellicauda (Jensen. 190 I)				
Zoarces viviparus (Linnaeus, 1758)				
Stichaeidae				
Chirolophis ascanii (Walbaum, 1792)				
Lumpenidae				
Anisarchus medius (Reinhardt. 1838)				
Lumpenus fabricii (Valenciennes, 1836)				
Lumpenus lumpretaeformis (Walbaum, 1792)				
Leptoclinus maculatus (Fries. 183 7)				
Pholidae				
Pholis gunnellus (Linnaeus. 1758)			+	+
Anarhichadidae				
Anarhichas denticulatus Kroyer. 1845				
Anarhichas lupus Linnaeus. 1758				
Anarhichas minor Olafsen. 1772				
Ammodytidae				
Ammodytes marinus Raitt. 1934 .				
Ammodytes tobianus Linnaeus. 1758				
Hyperoplus lanceolatus (Sauvage, 1824)				

Trichiuridae				
Aphanopus carbo Lowe. 1893			+-	+?
Bentodesmus elongatus (Clarke. 1879)			+-	+?
Xiphidne				
Xiphias gladius Linnaeus. 1758			+	+(r)
Scombridae				
Scomber scombrus Linnaeus. 1758			+	+(r)
Thunnus thunnus (Linnaeus. 1758)			+	+(r)
Sparidae				
Pagellus bogarevo (Bruennich. 1768)			+-	+?
Spondyliosoma cantharus (Linnaeus. 1758)			+-	+?
Centrolophidae				
Centrolophus niger (Gmelin. 1788)			+-	+?
Schedophilus medusophagus Cocco. 1839			+-	+?
Gobiidae				
Crystallogobius linearis (Dueben. 1845)			+-	+?
Gobiosculus flavescens (Fabricius. 1779)			+	+?
Pomatoschistus minutus (Pallas. 1770)			+	+?
Pomatoschistus norvegicus (Collett. 1902)			+	+?
Labridae				
Ctenolabrus rupestris (Linnaeus. 1758)			+-	+?
Moronidae				
Dicentrarchus labrax (Linnaeus. 1758)			+-	+?
Polyprion americanus (Bloch & Sclmeider, 1 80 1)			+-	+?
Mugilidae				
Chelon labrosus (Risso. 1826)			+-	+?
Pleuronectiformes				
Scophthslmidne				
Lepidorhombus whiffiagonis (Walbaum, 1792)			+-	+(r)
Phrynorhombus norvegicus (Guenther. 1862)			+	t
Psetta maxima (Linnaeus, 1758)			+	+?
Scophthalmus rhombus (Linnaeus. 1758)			+-	+?
Zeugopterus punctatus (Bloch. 1787)			+	+?
Pleuronectidae				
Glyptocephalus cynoglossus (Linnaeus. 1758)		-	+	+
Hippoglossoides platessoides (Fabricius. 1780)		-	+	+
Hippoglossus hippoglossus (Linnaeus. 1758)		-	+	+
Limanda limanda (Linnaeus. 1758)		-	+	+
Liopsetta glacialis (Pallas. 1776)				+
Microstomus kitt (Walbaum. 1792)		-	+	+
Platichthys flesus (Linnaeus. 1758)			+	+
Pleuronectes platessa Linnaeus. 1758		-	+	+
Reinhardtius hippoglossoides (Walbaum. 1792)		-	+	+
Tetraodontiformes				
Molidae				
Mola mola (Linnaeus. 1758)			+	+(r)

+ literature references are available. the species is found in catches or stomachs. occurs the Barents Sea

+ - controversial data: the species is regarded as occurring in the Barents Sea in some papers and absent in the Barents Sea - in other ones

+? occurrence in the Barents Sea has to be confinned

+(r) occasional occurrence in the Barents Sea. the species is usually brought in by warm currents

the species is not mentioned as occurring in the Barents Sea

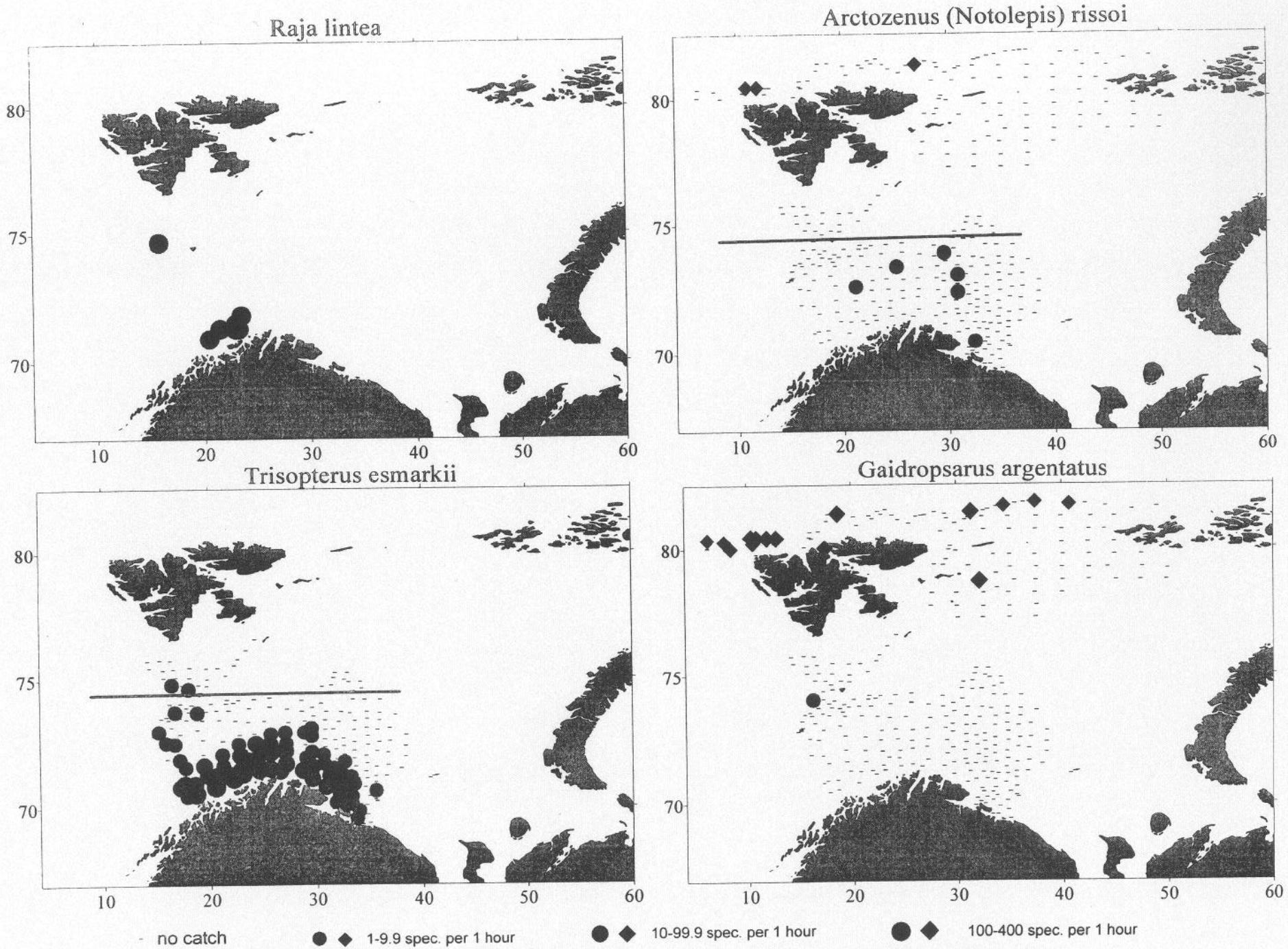

Fig.1 Distribution of sailray, ribbon barracudina, Norway pout and Arctic rockling and its northern border according A.P.Andryashev (1954)

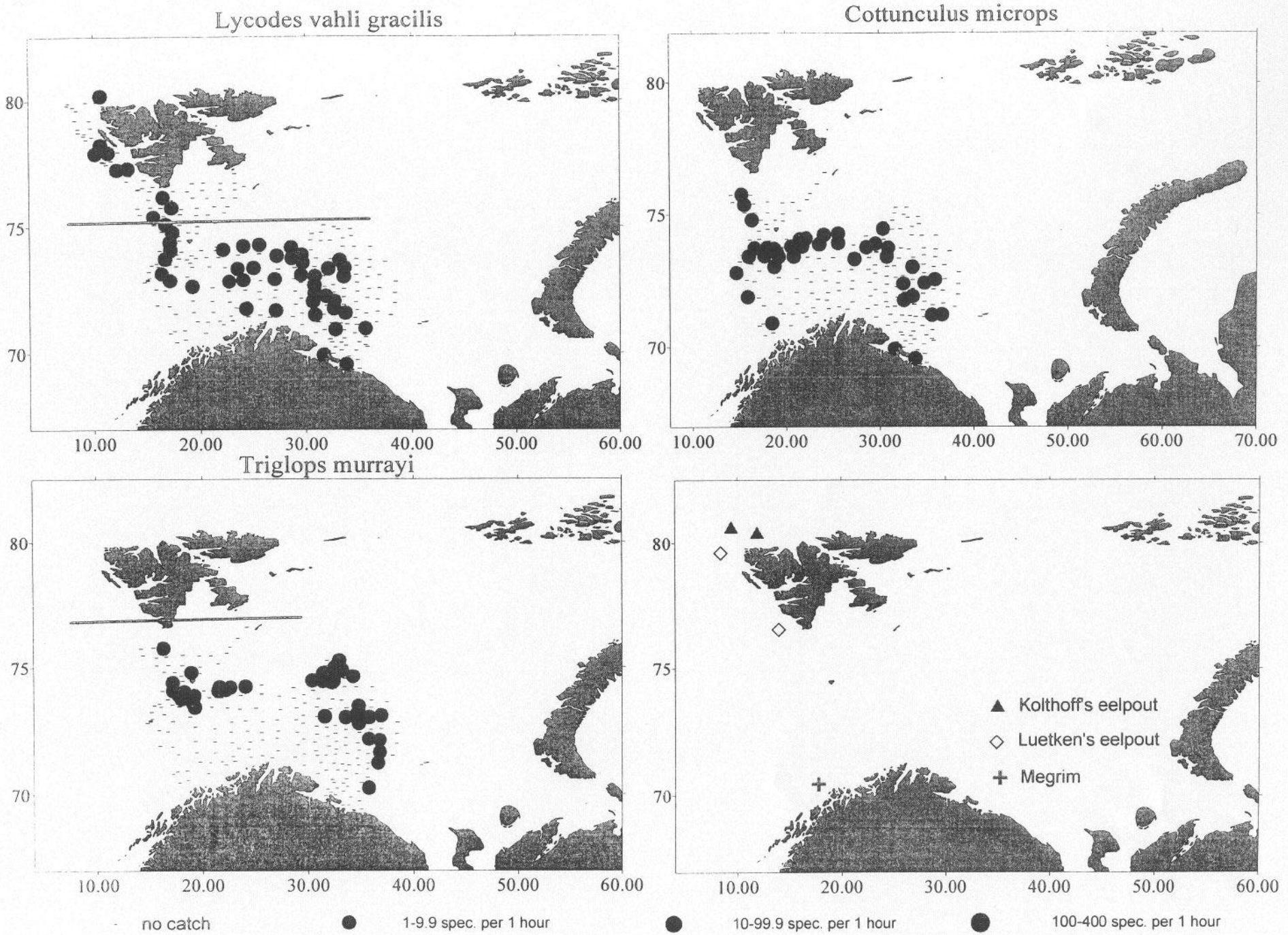

Fig.2 Distribution of Vahl's eelpout, polar sculpins, Moustache sculpin and rare species and its northern border according A.P.Andryashev (1954)