



Atlantic Research Institute
of Marine Fisheries and Oceanography
(AtlantNIRO)

Russia

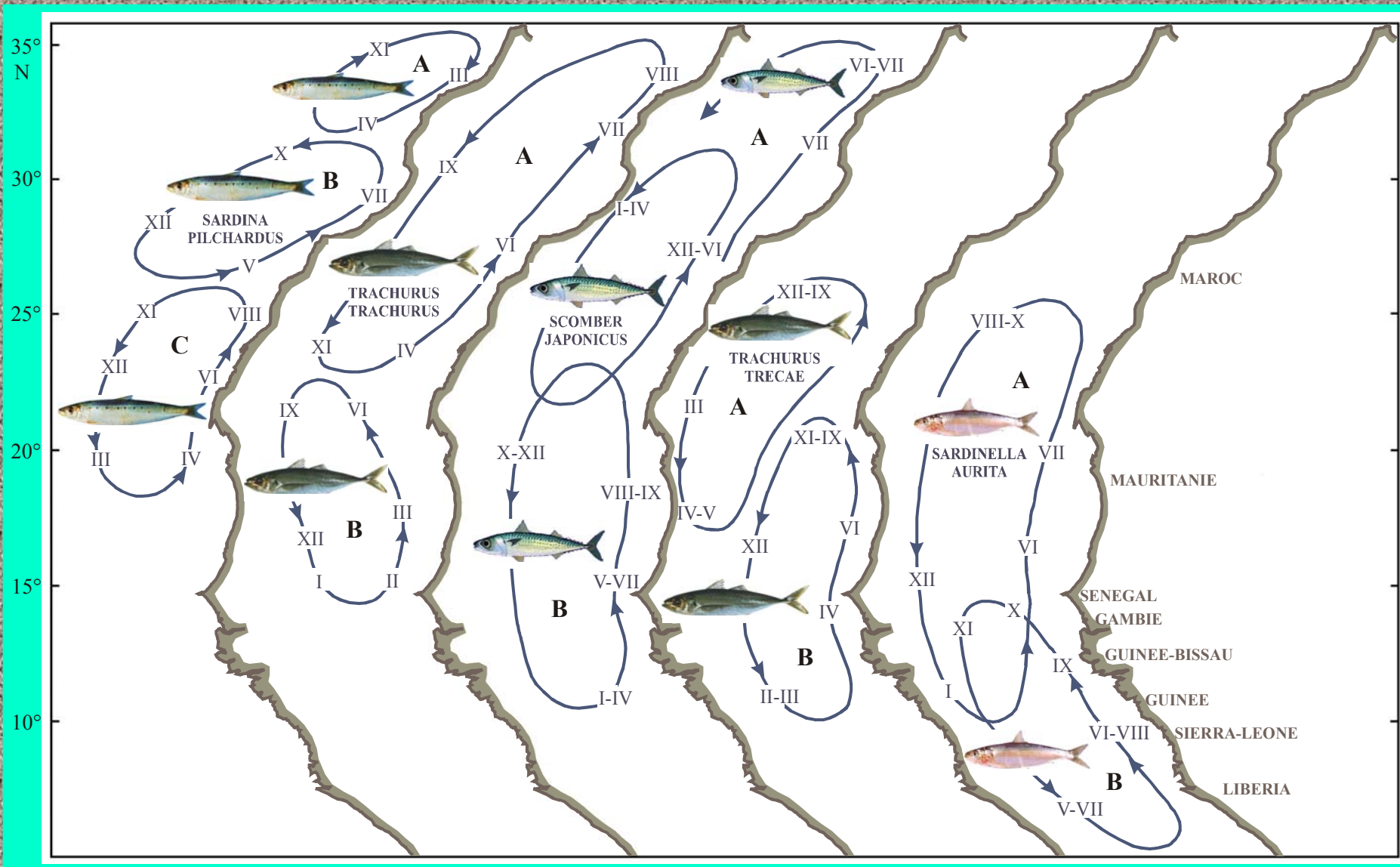
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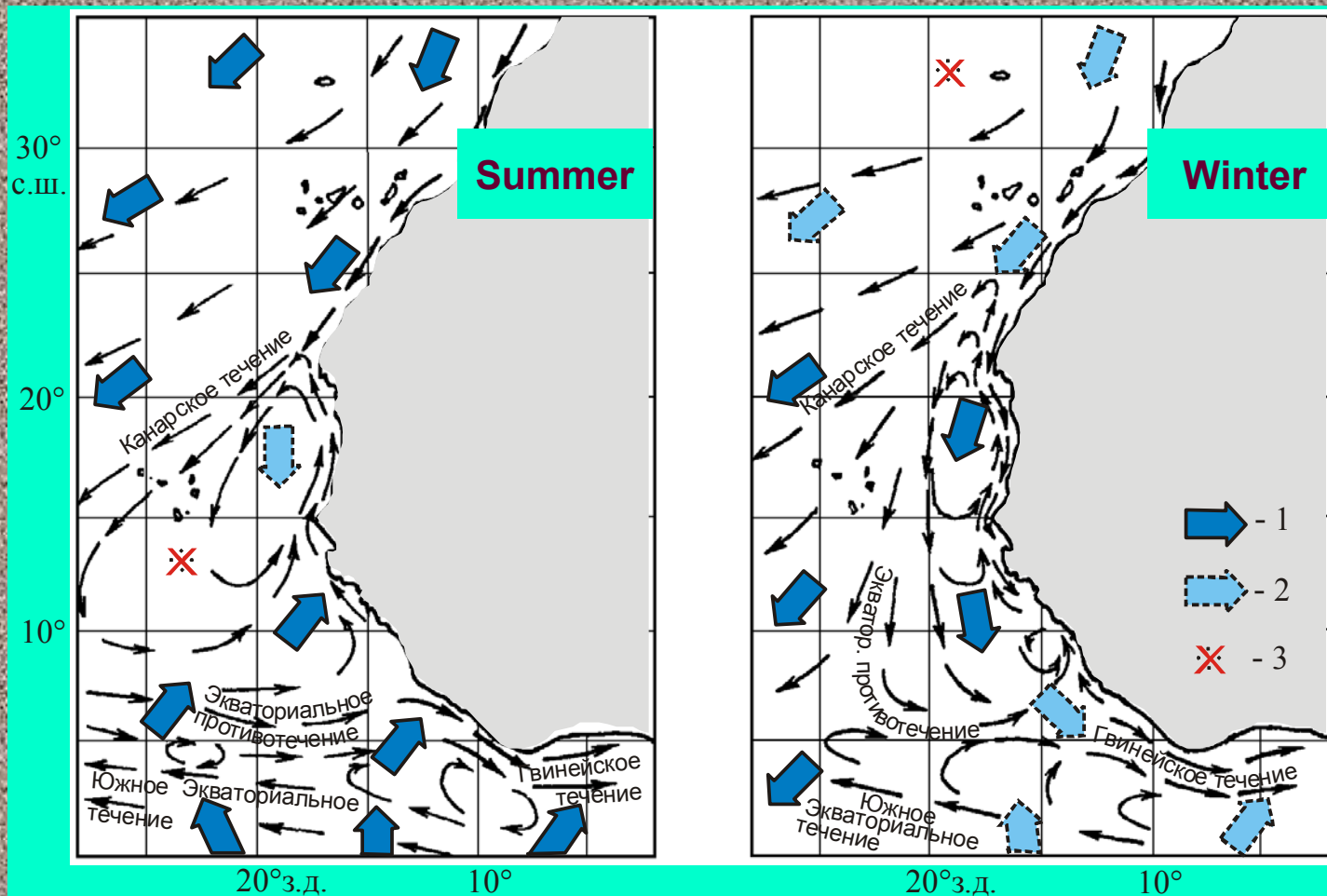


**Small pelagic fish stocks
in Canary Upwelling area related
to environment conditions
from 1994 to 2007**

**Chernyshkov P.
Bukatin P.
Timoshenko N.**

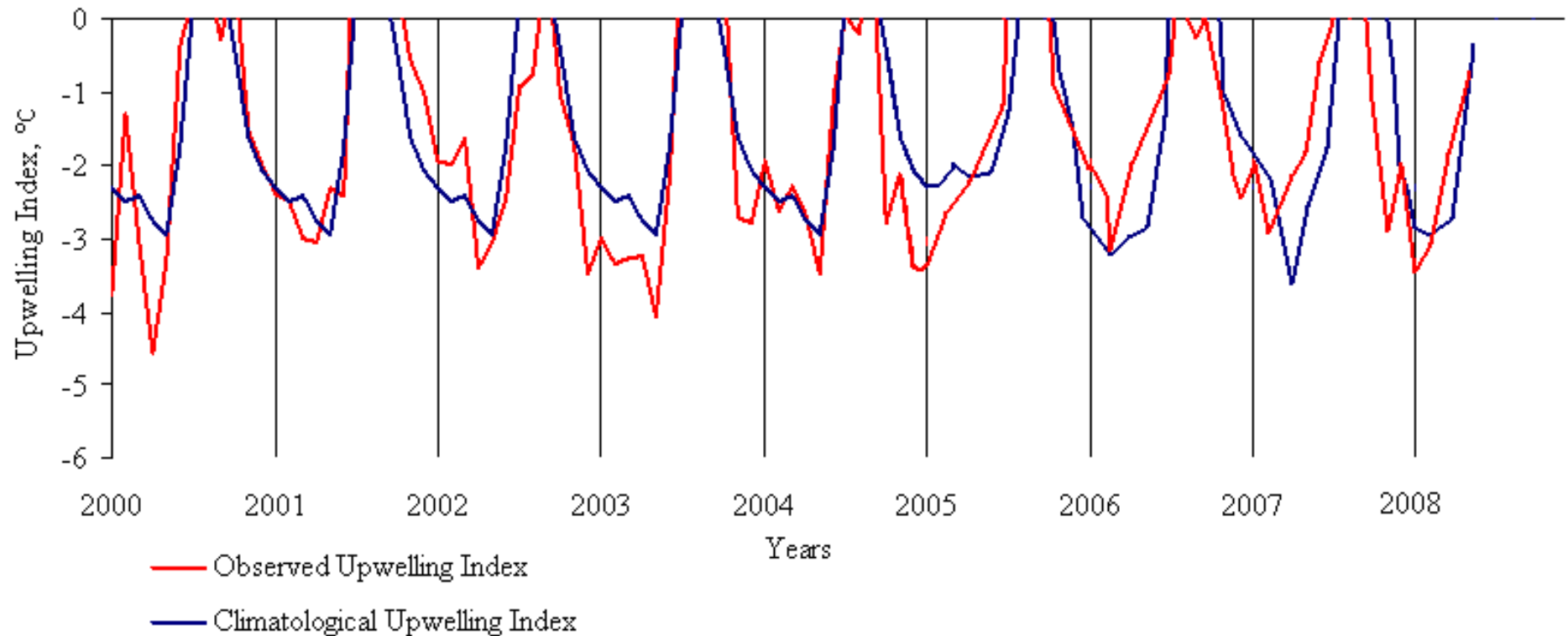


Migration areas and patterns for the Central Eastern Atlantic commercial pelagic fishes (Domanevsky, 1998)

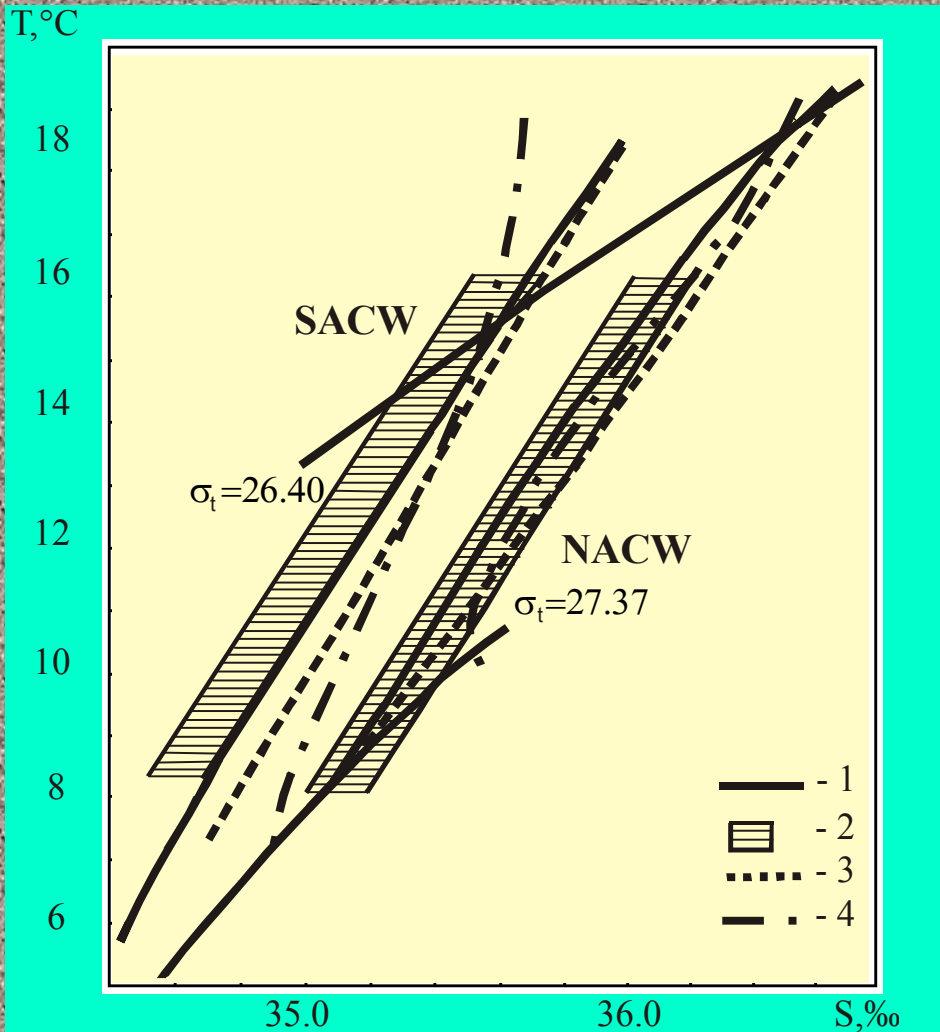


**Surface water circulation along Northwest Africa
in summer and winter (Mittelstaedt, 1983)**

- 1 – направление преобладающих ветров;
- 2 – ветра слабых и изменчивых направлений;
- 3 – отсутствие сильных ветров устойчивого направления



Monthly upwelling index variability off North-West African coast between 16°N and 21°N in 2000-2008. Negative values indicate intensive upwelling



**Determination of NACW and SACW
by different authors:**

- 1 – Swerdrup et al. (1942),
- 2 – Swerdrup (1952),
- 3 – Элейн (1970),
- 4 – Tomczak (1978)

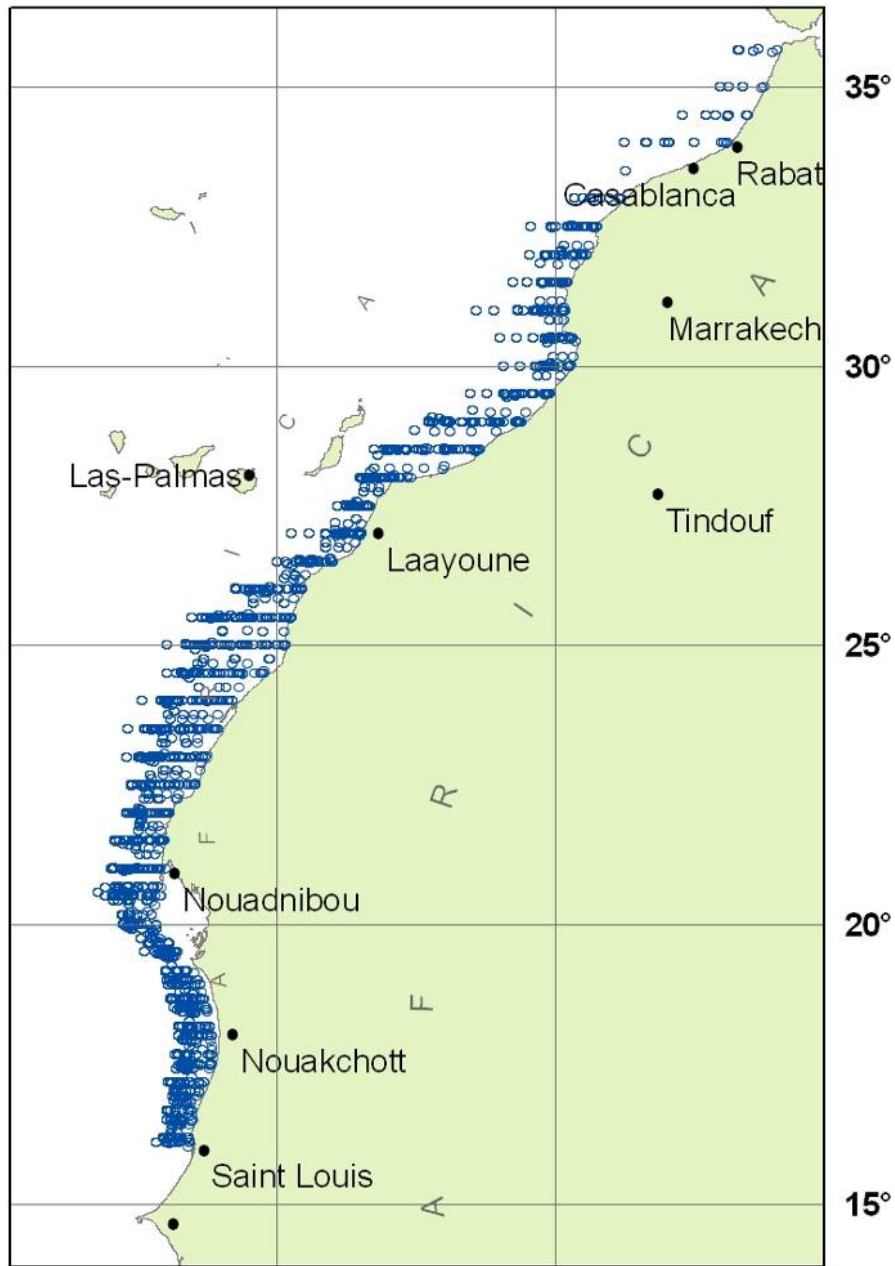
Volume of biological and oceanologic observations in AtlantNIRO expeditions carried out in the Central Eastern Atlantic (CEA) area under inter-governmental agreements between Russia and Kingdom of Morocco and Islamic Republic of Mauritania during 1994-2007

No	Name of vessel	Survey area	Survey period		Number of oceanologic stations	Observations type				
			start	finish		Plankton samples			Ichthyological studies	
						phyto-	zoo-	ichthyo-	mass measurements	biological analysis
1	ATLANTNIRO	21-35°N	17.01.1994	16.03.1994	192	376	180	180	11788	2384
2	ATLANTNIRO	21-36°N	05.07.1994	26.07.1994	85	314	89	121	21804	5686
3	ATLANTNIRO	21-36°N	25.01.1995	25.02.1995	109	291	92	114	35396	8755
4	ATLANTNIRO	16-34°N	19.07.1995	30.09.1995	101	196	65	65	19946	4519
5	ATLANTNIRO	16-31°N	06.06.1996	19.07.1996	96	119	43	43	20558	6191
6	ATLANTNIRO	16-33°N	08.01.1997	17.02.1997	125	211	80	80	23557	6670
7	ATLANTNIRO	18-34°N	21.06.1997	10.08.1997	125	195	121	121	37845	5742
8	ATLANTNIRO	21-33°N	26.02.1998	05.04.1998	75	123	56	56	25897	5837
9	ATLANTNIRO	16-32°N	21.06.1998	12.08.1998	114	162	84	84	29125	6167
10	ATLANTIDA	21-33°N	03.04.1999	01.05.1999	83	129	77	77	29665	3795
11	ATLANTIDA	16-33°N	05.07.1999	23.08.1999	115	207	91	91	33210	8079
12	ATLANTIDA	16-21°N	14.07.2000	30.07.2000	43	215	-	-	43840	10746
13	ATLANTIDA	16-21°N	06.08.2001	18.08.2001	35	240	85	85	30474	5565
14	ATLANTNIRO	16-33°N	14.10.2003	10.12.2003	122	231	77	77	96585	4205
15	ATLANTIDA	16-28°N	07.07.2004	26.08.2004	156	396	70	89	31029	7228
16	ATLANTIDA	16-33°N	24.11.2004	16.01.2005	120	233	78	83	51081	1546
17	ATLANTIDA	16-31°N	05.05.2005	17.06.2005	93	-	-	4	21721	2658
18	ATLANTNIRO	16-32°N	25.11.2005	07.01.2006	116	231	75	75	55162	775
19	ATLANTIDA	16-28°N	07.07.2006	21.08.2006	110	165	63	63	40671	5194
20	ATLANTIDA	21-32°N	15.12.2006	18.01.2007	74	144	48	48	48486	2680
21	ATLANTIDA	16-32°N	03.07.2007	25.08.2007	137	219	68	68	52789	9068
22	ATLANTIDA	21-32°N	21.11.2007	23.12.2007	115	231	82	82	51967	2846
TOTAL:					2341	4628	1624	1706	812596	116336

- complex trawl-acoustic surveys

- surveys of pelagic fish recruitment

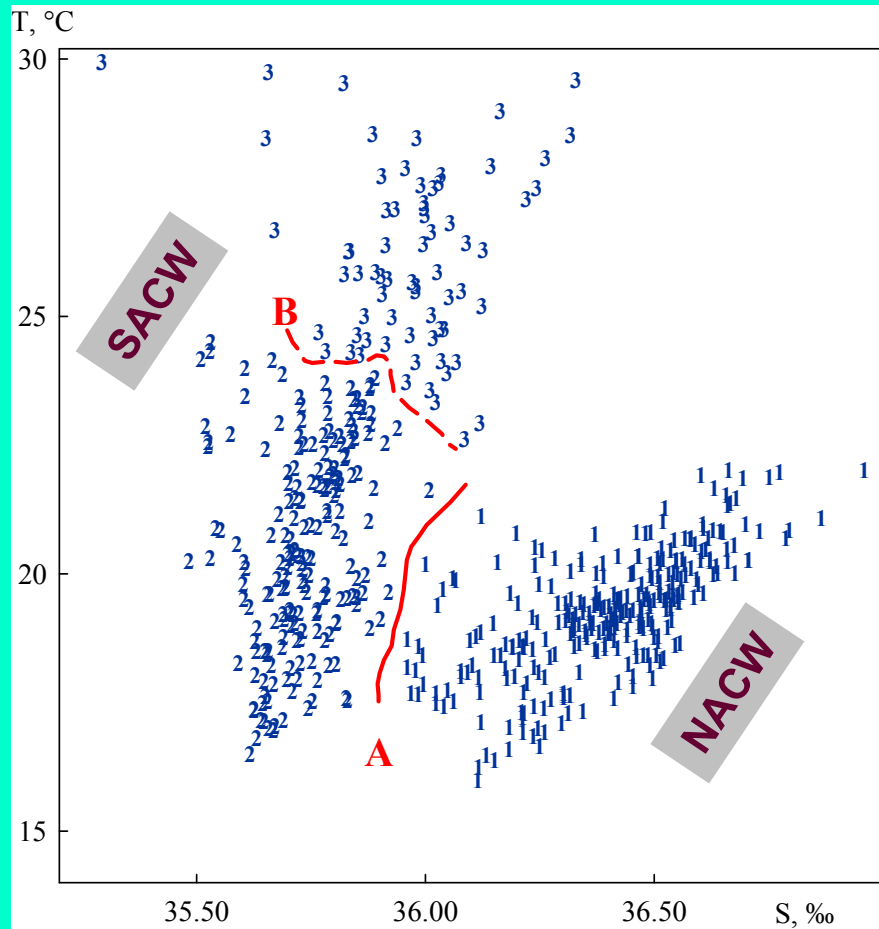
- bottom surveys



To the west of Greenwich **15°**

10°

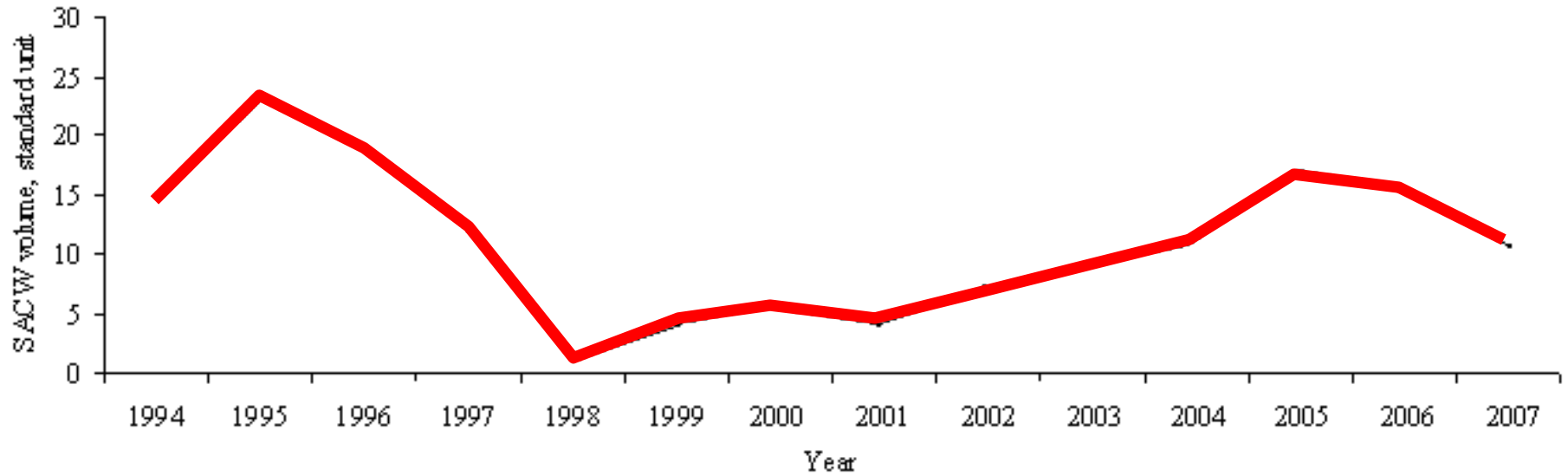
**Location of the CTD stations
during the AtlantNIRO
cruises in 1994-2007**



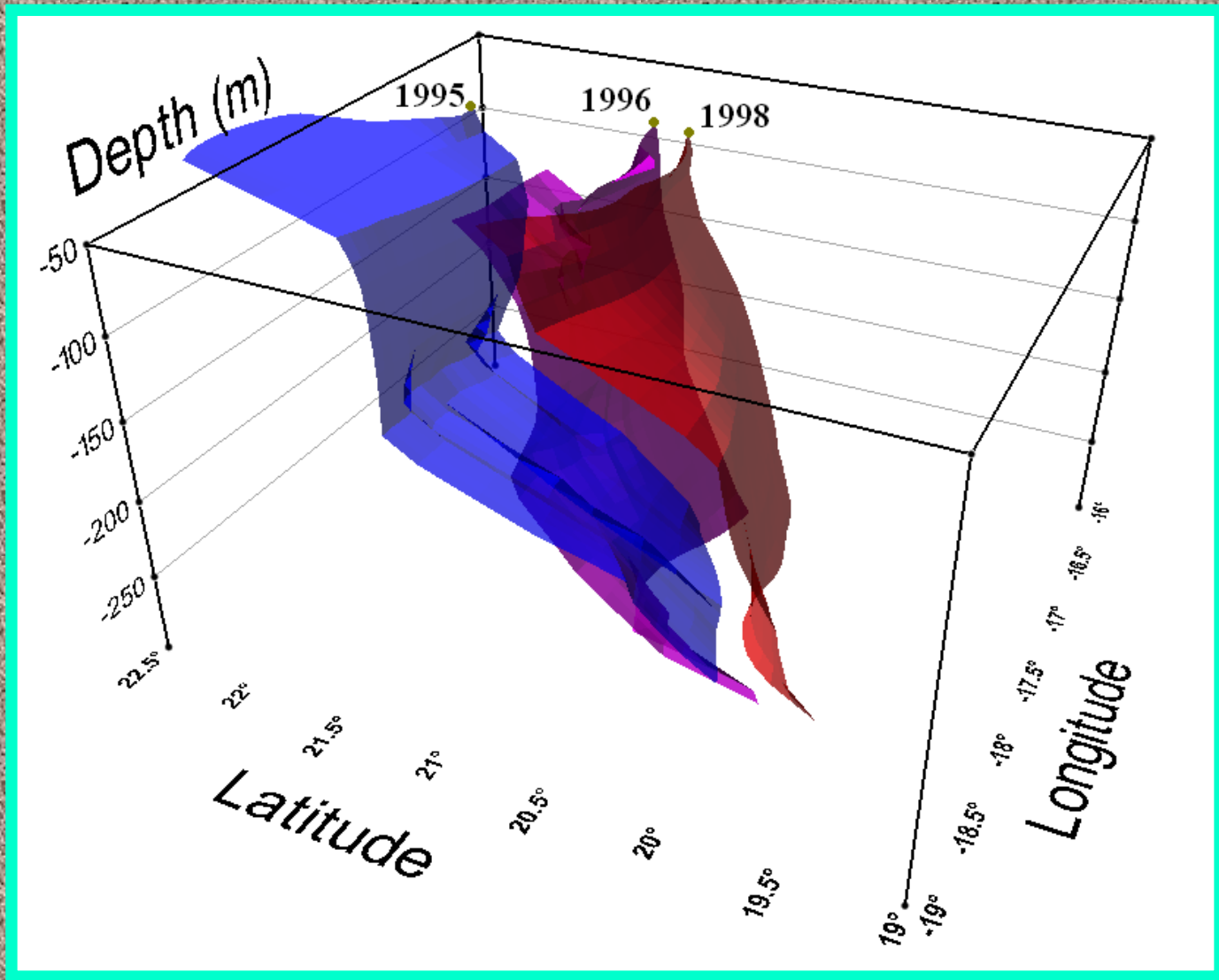
Temperature and salinity weighted means-based T,S-diagram for water masses within 0 and 100 m (bottom)

(Data of the 1994-2001 summer surveys conducted in the zones of Morocco and Mauritania)

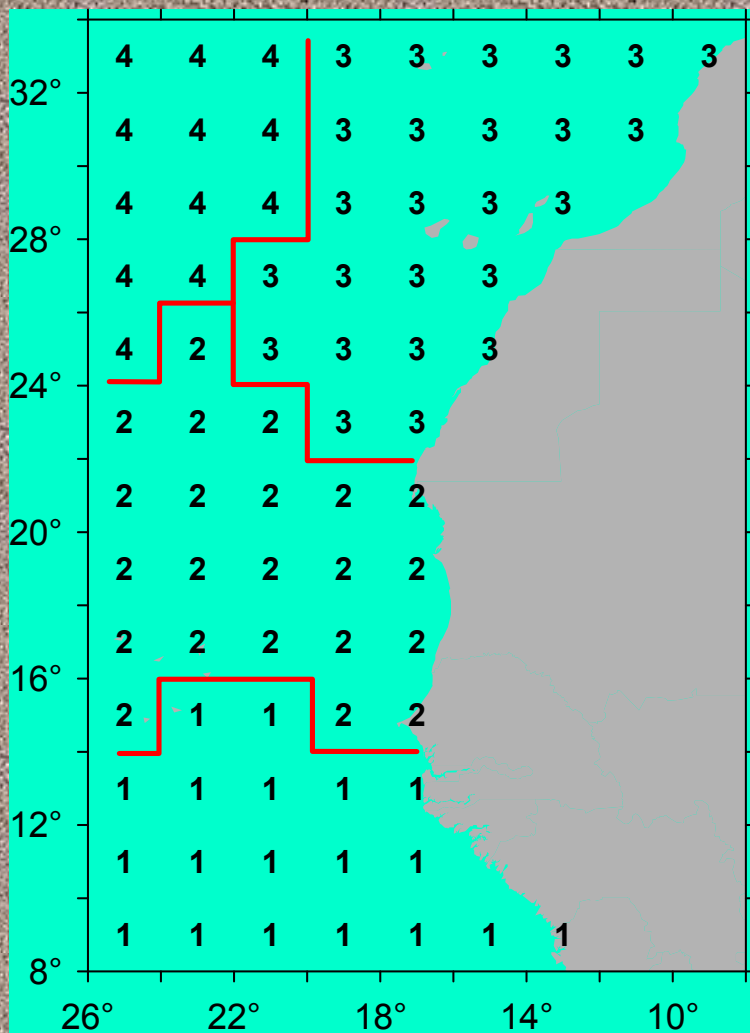
**Figures - class numbers;
lines A, B – boundaries between classes**



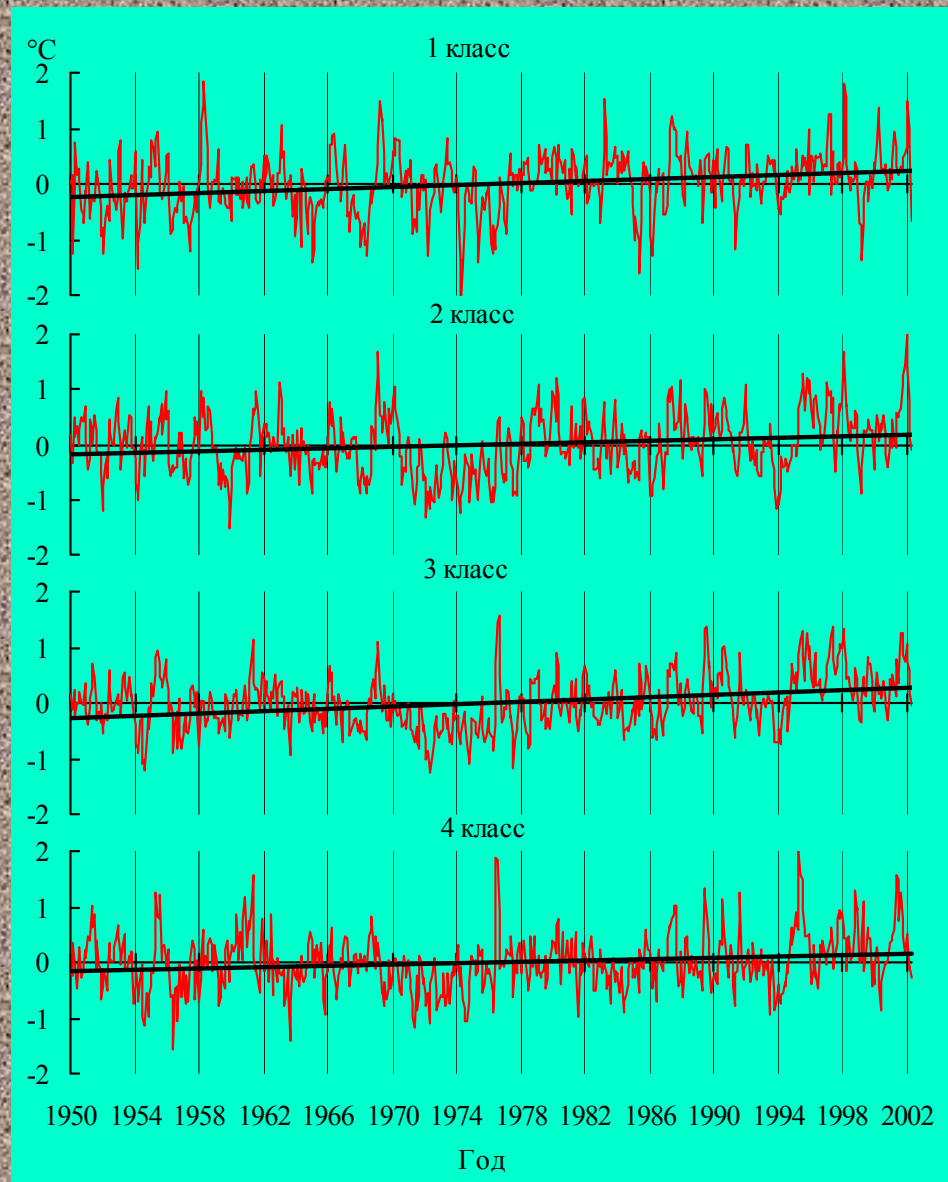
The SACW volume in the layer 50-250 m on the Moroccan shelf to the north of 21°N as revealed by T-S analysis



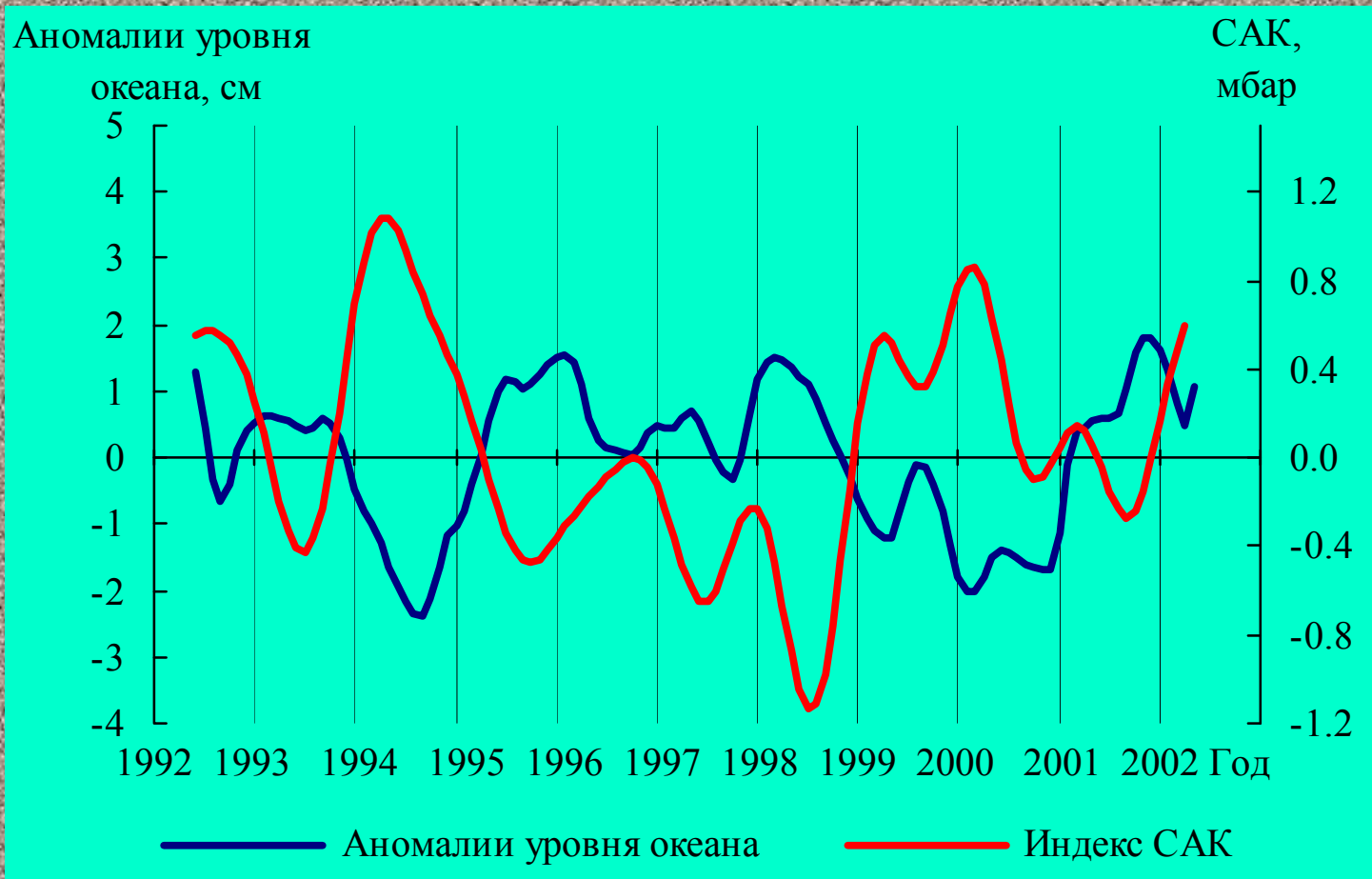
**NACW and SACW volume boundary location
in summer period (1995, 1996, 1998)**



The Central Eastern Atlantic zoning basing classification of the SST anomaly monthly means by space (figures mean class number)



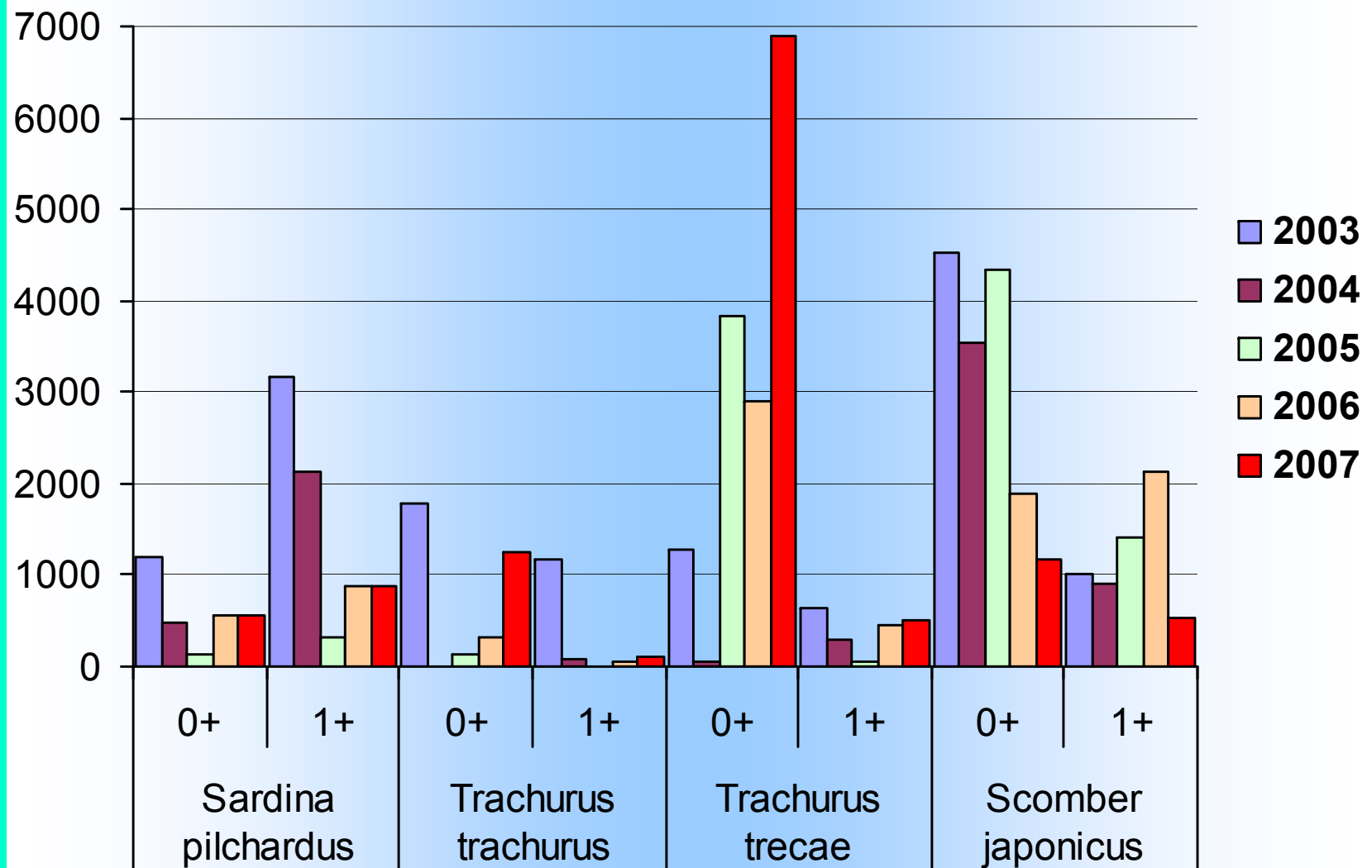
Temporal variability of the SST anomaly monthly means averaged by space classes



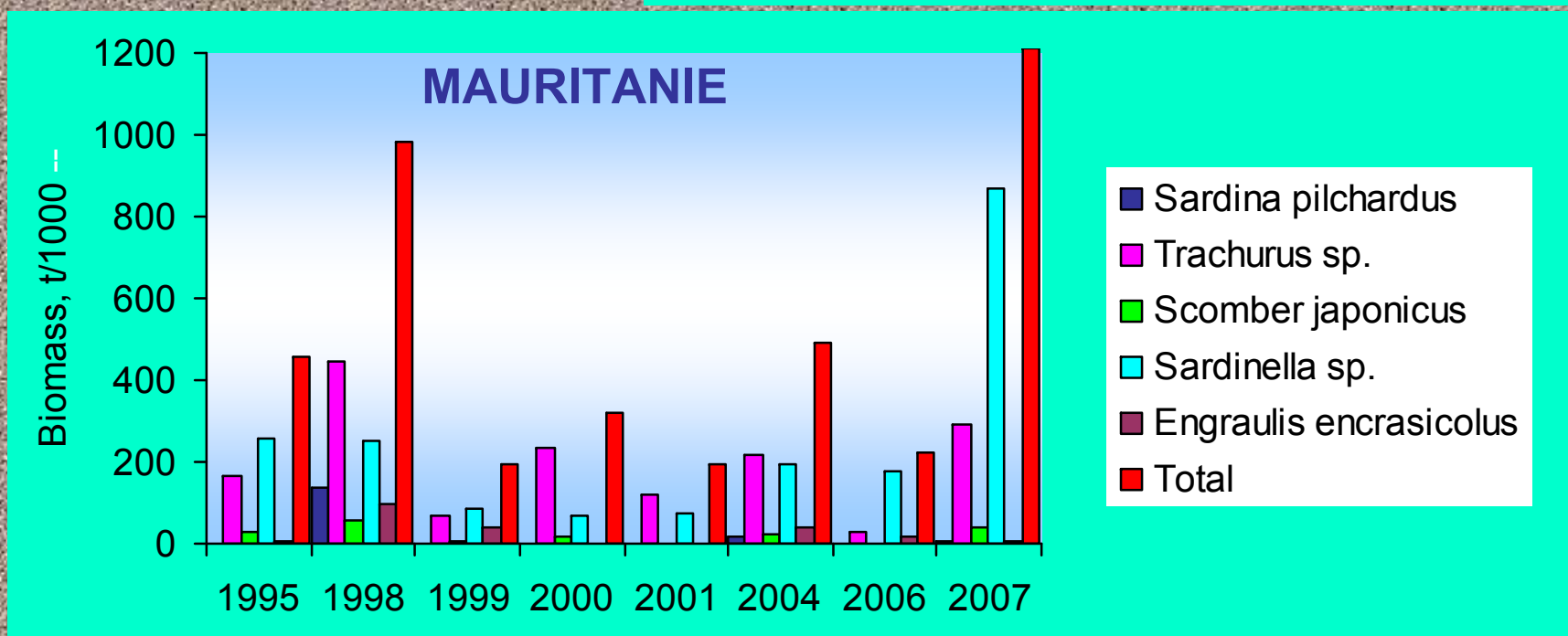
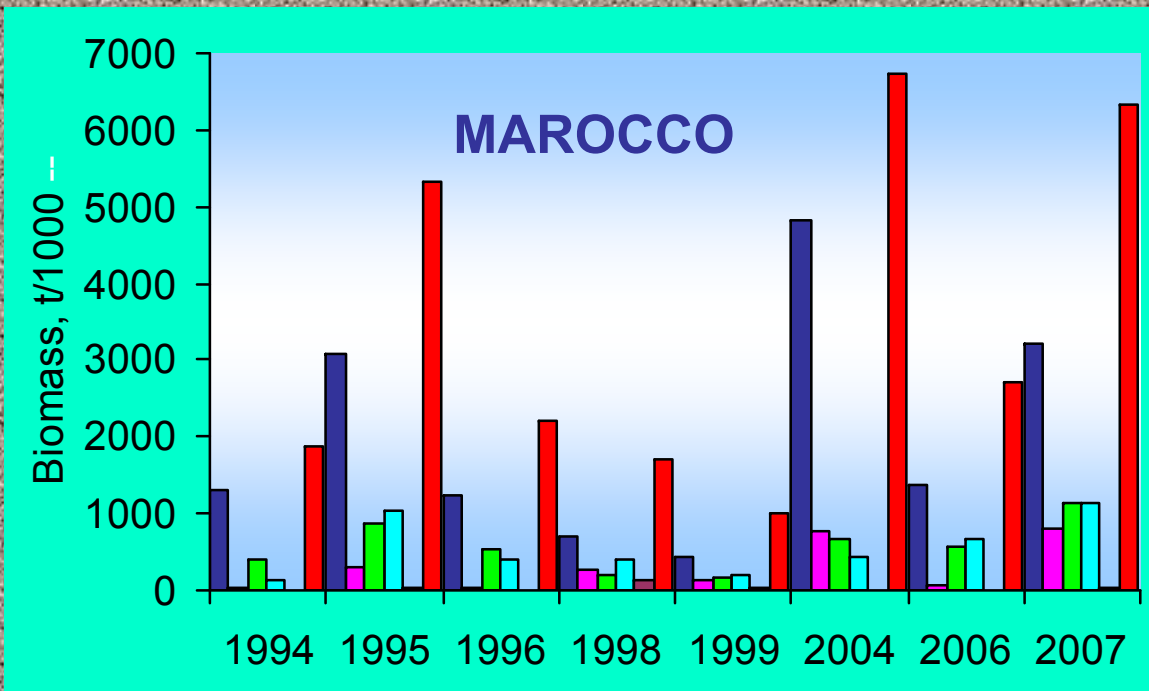
Variability of the sea level anomalies within the Canary Current; variability of the NAO index

Recruitment indices by ATLANTIDA surveys

$N \cdot 10^{-6}$



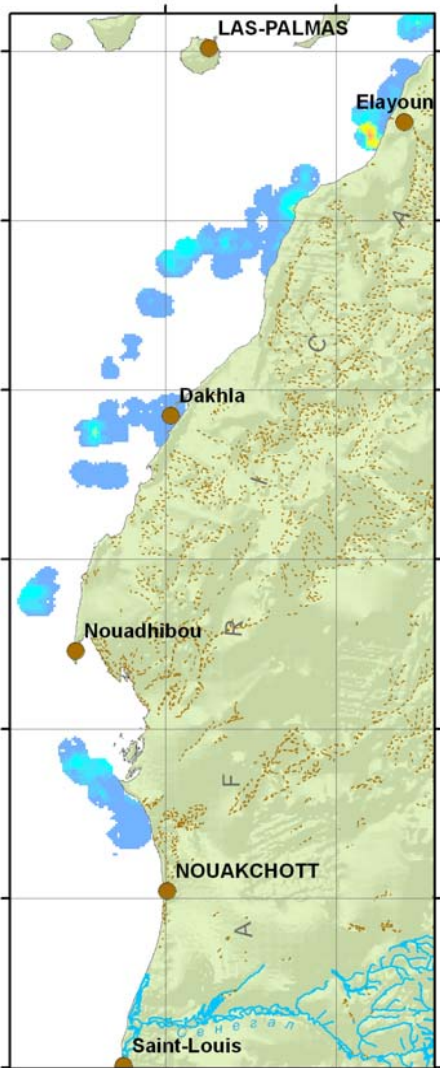
**Hydroacoustic estimates
of main pelagic fishes
by ATLANTIDA**



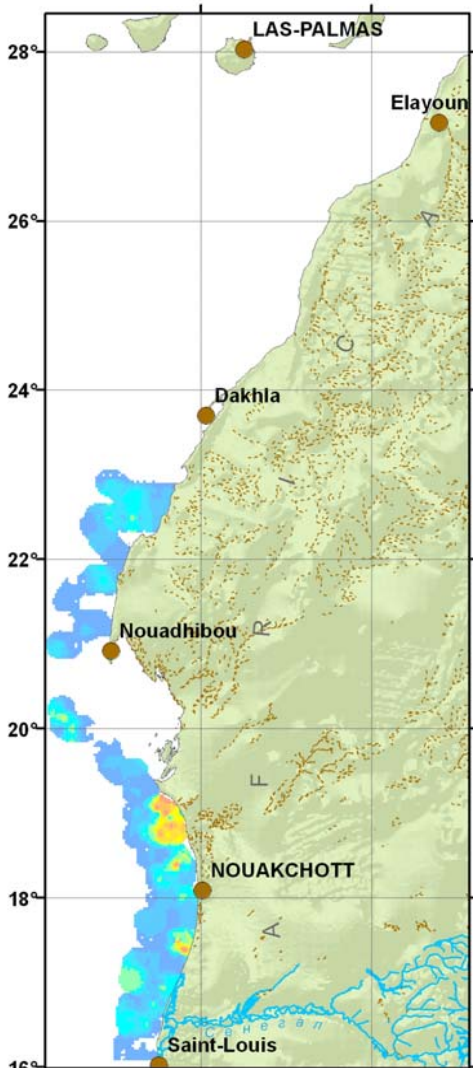
- Sardina pilchardus
- Trachurus sp.
- Scomber japonicus
- Sardinella sp.
- Engraulis encrasicolus
- Total

Fishery stocks density ((19 July 1995 - 30 September 1995))

Trachurus trachurus

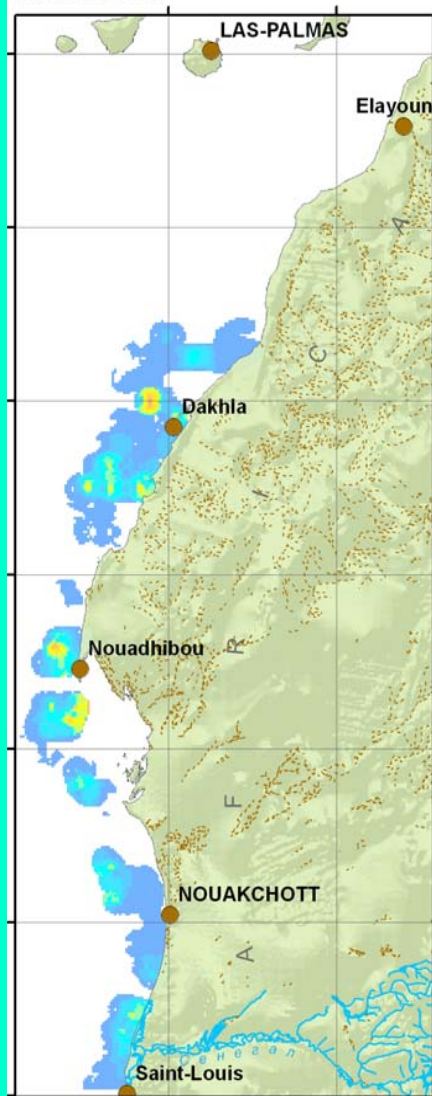


Trachurus trecae

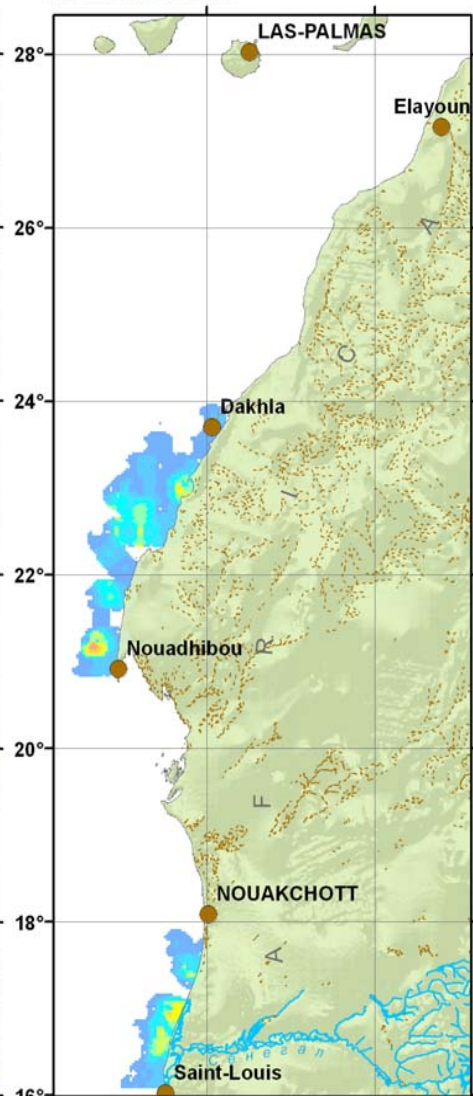


Fishery stocks density (19 July 1995 - 30 September 1995)

Sardinella aurita



Sardinella maderenis



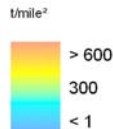
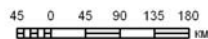
To the west of Greenwich 16° 14°

To the west of Greenwich 16° 14°

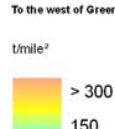
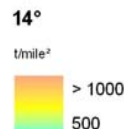
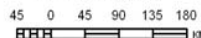
To the west of Greenwich 16° 14°

To the west of Greenwich 16° 14°

Scale 1 : 4 500 000

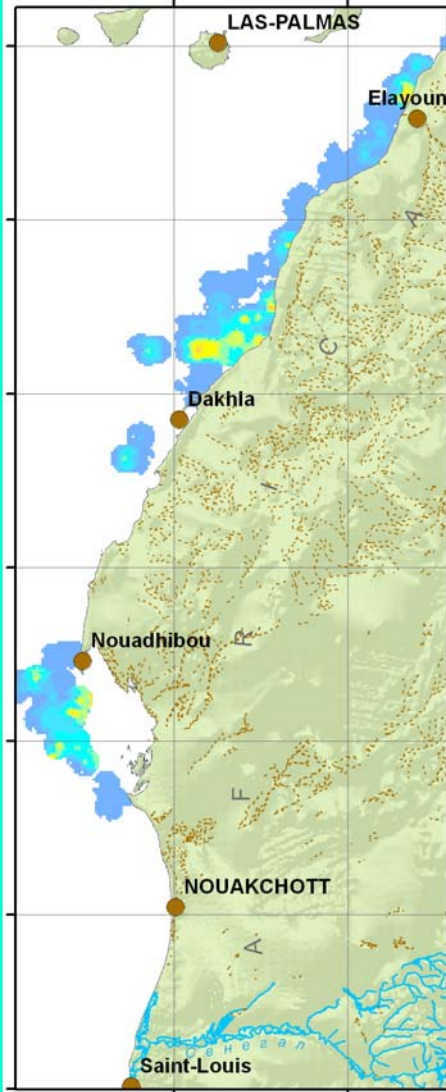


Scale 1 : 4 500 000

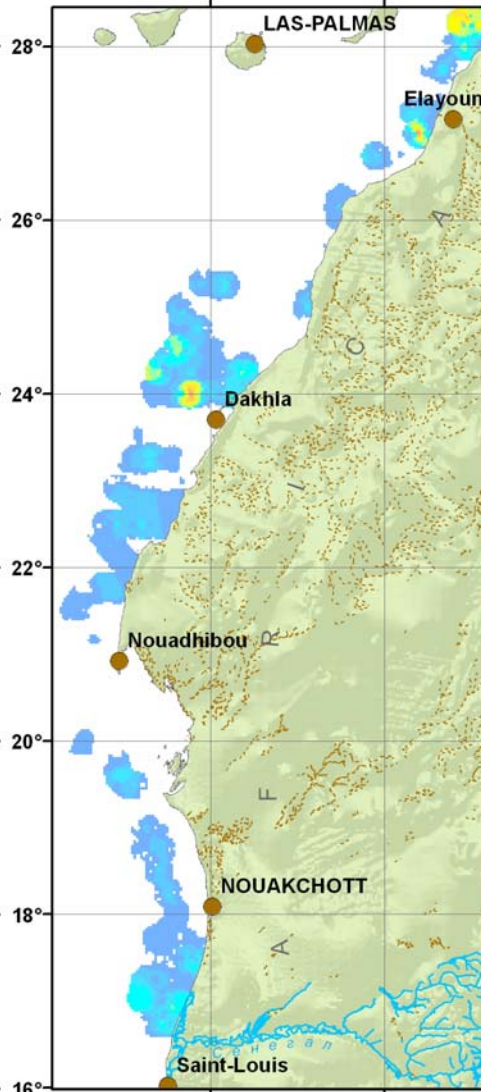


Fishery stocks density (19 July 1995 - 30 september 1995)

Sardinella pilchardus



Scomber colias

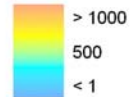


To the west of Greenwich

16°

14°

t/mile²



Scale 1 : 4 500 000

45 0 45 90 135 180

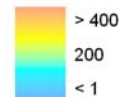
KM

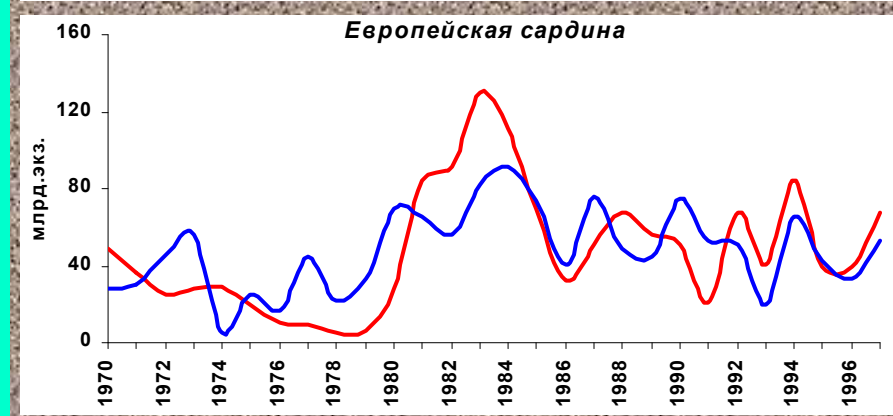
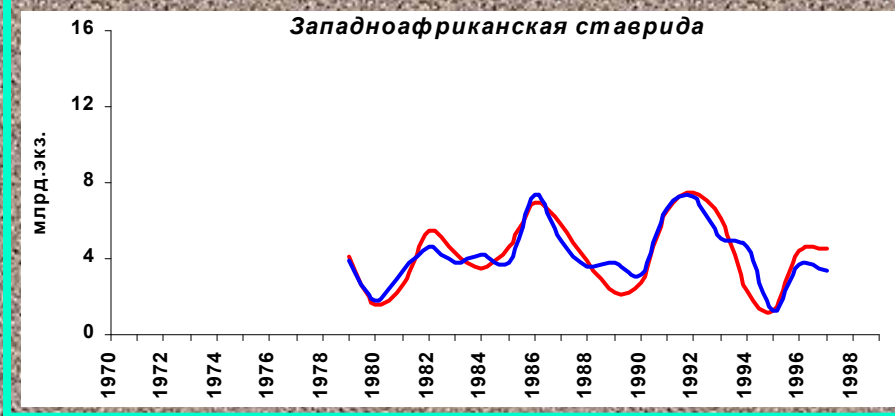
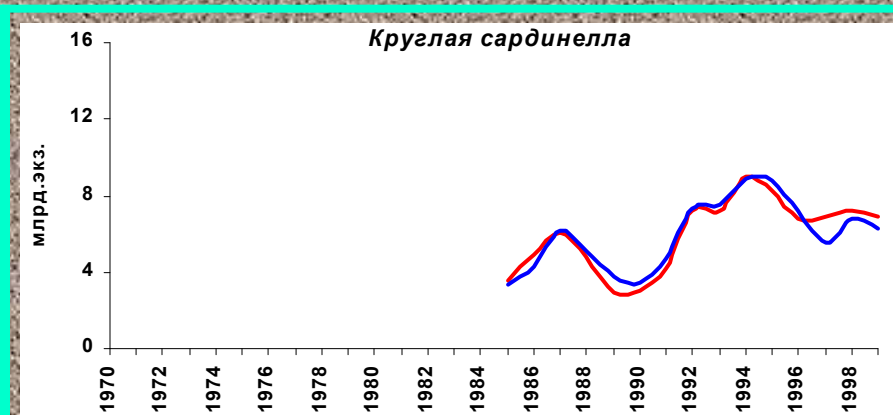
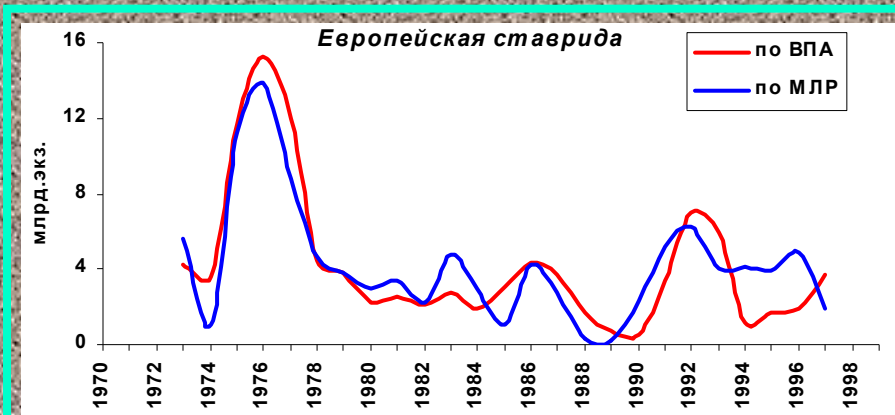
To the west of Greenwich

16°

14°

t/mile²





VPA method and multiple regression model-based approximation of the interannual variations in the recruitment abundance of four fish species from the Central Eastern Atlantic

CONCLUSION

1. The results allow concluding that the northward advection of SACW, along with the coastal upwelling process, influences significantly on the Mauritania waters productivity. Intensification of the NECC and SACW advection lead to increase of the zooplankton species diversity, biomass and abundance.

2. This study has demonstrated the efficiency and consistency of the analysis of the satellite altimetry data in an investigation of the structure and both spatial and temporal variability of the main water masses and currents off Northwest African coast.

3. This study has demonstrated quantitatively the dependence of instrumentally obtained abundance indexes on the peak spawning timing and dates of the registration surveys for the recruitment of pelagic species off North-West African coast. The observed shifts in the date of peak spawning may be explained by environmental variability.

4. It is proposed that the time shift of the spawning has to be taken into account for the purposes of registration survey planning and their results interpretation.

5. Further investigations of the relations between environmental conditions and spawning activity will result in more correct defining of the recruitment level.

ACKNOWLEDGEMENT

The authors highly appreciate the collaboration all of the scientists from INRH (Morocco), IMROP (Mauritania), AtlantNIRO (Russia) which took part in the scientific surveys onboard R/V Atlantniro and R/V Atlantida in 1994-2008