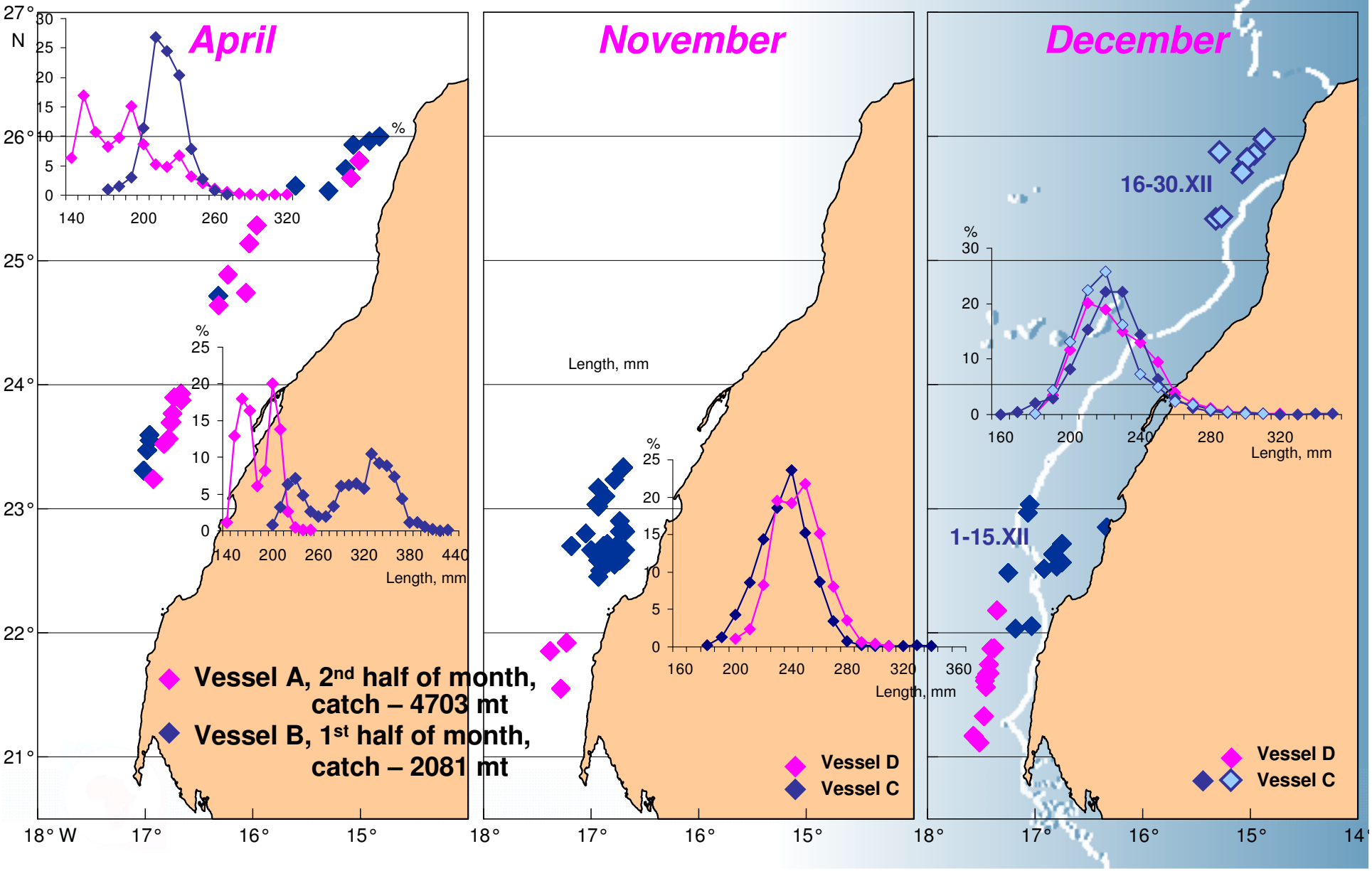
On possibilities of increasing the quality of estimates of the state and trends in inter-annual changes of pelagic fish stocks off the Northwest African coast

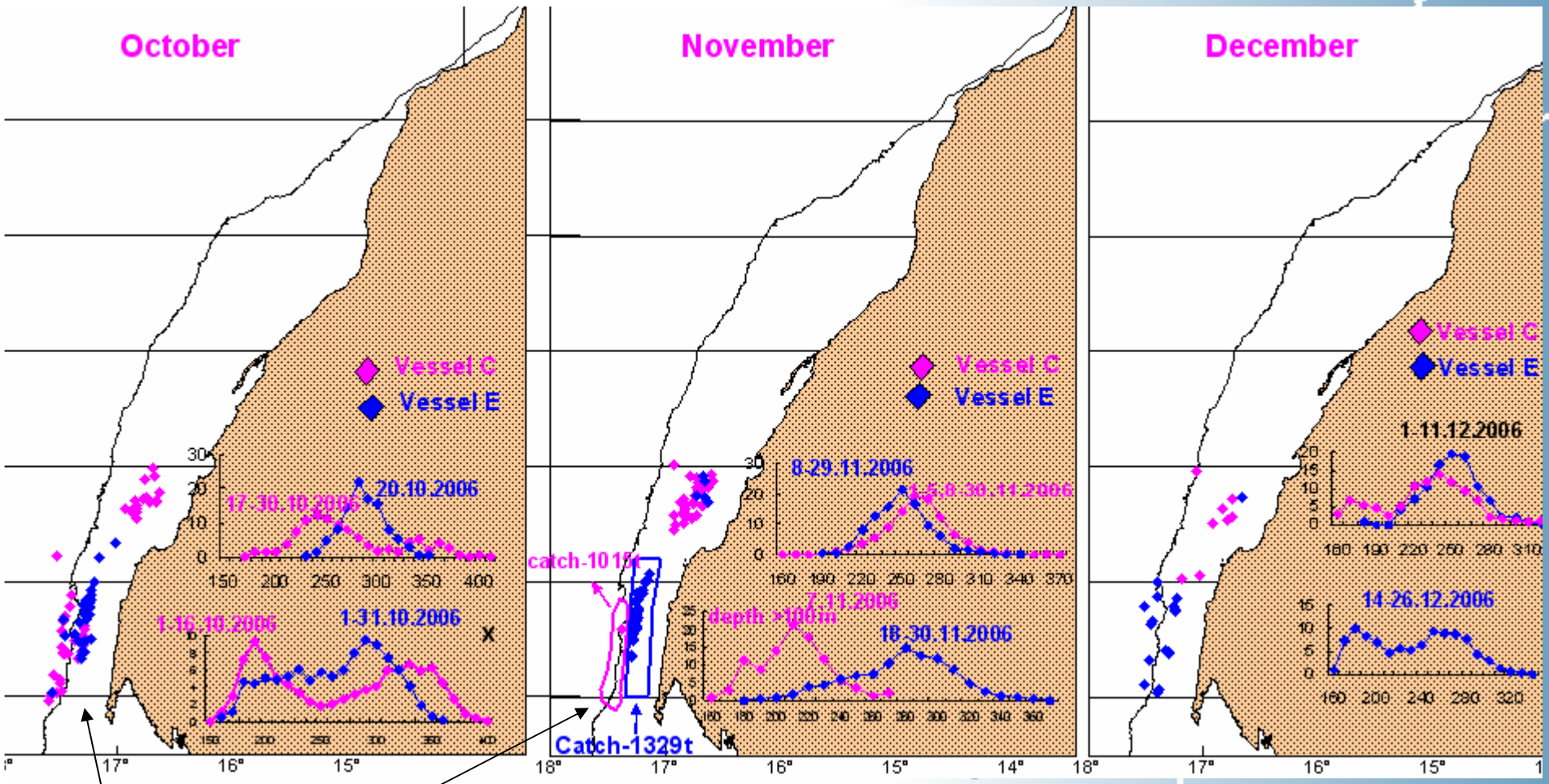
Nikolay Timoshenko, Pavel Chernyshkov

AtlantNIRO

Chub mackerel, 2006, commercial catches

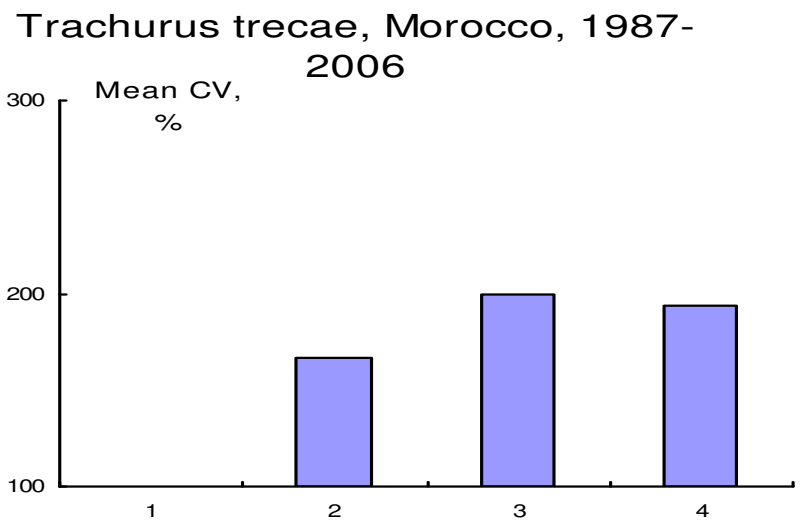


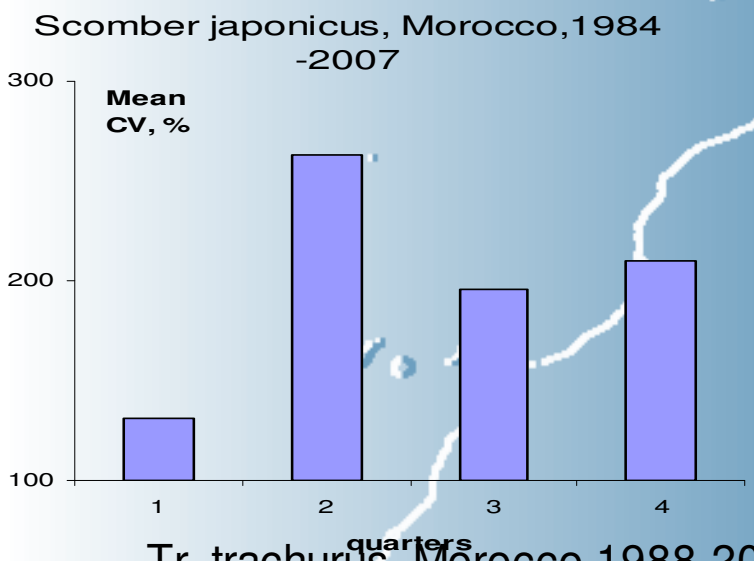
Tr. trecae, 2006, commercial catches

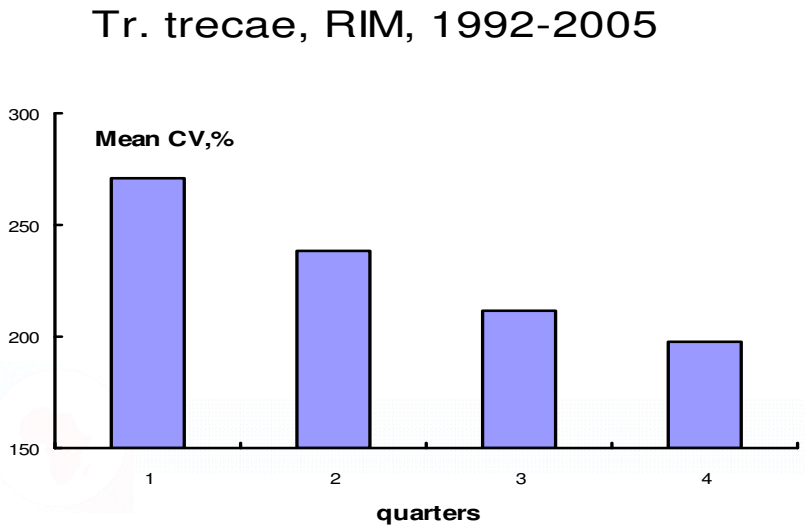


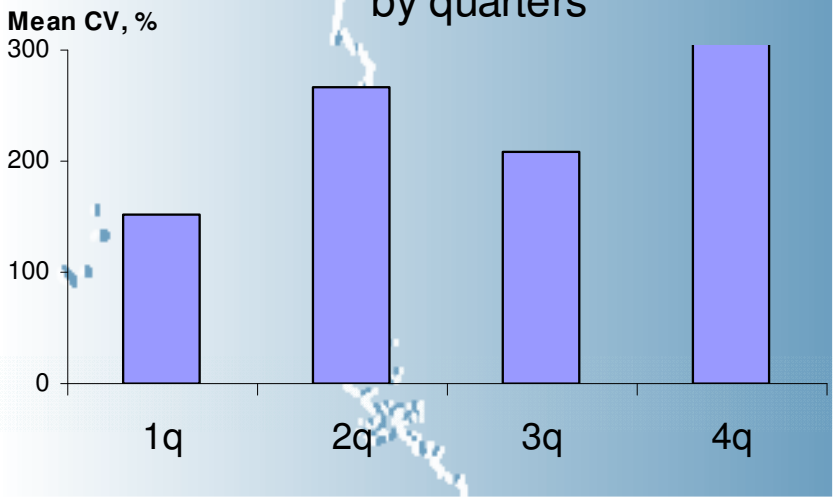
To weigh by depth zones, not by vessels

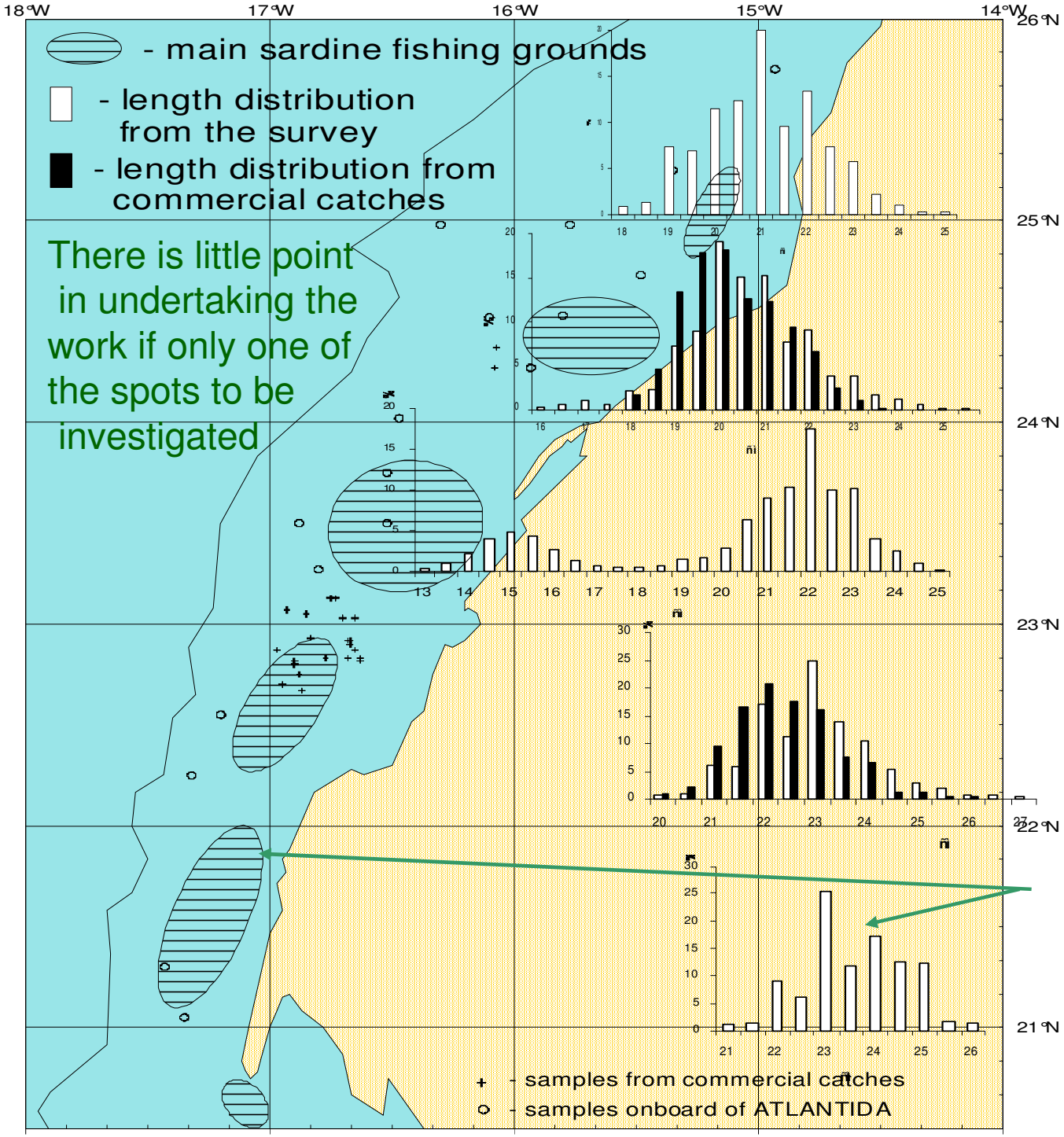
Coefficient of variation as gauge of lehgth variability in the catches











Length distributions of sardine in March 1995 on the commercial fishery and on R/V Atlantida

Two thousand tones were not inspected by observers. Shortage of large fish in the catch-at-age file might be made

Optimization of sampling from the fishery

Not a population, but the catch is as subject of investigation.

Simple random sampling to be realized from the trawl catch.

Weighting of length-compositions by the catches to be made.

Next step – splitting of the catch from the certain fishing ground into the length groups.

Trouble: number of fishing grounds is usually more than number of observers.

Location of fishing grounds may be forecasted, but is specific for each specie.

Proposal to consider: – use of long-term data on the variability of fish length by time and space to improve the observers activity;

– choice of priorities between the species;

– permanent data exchange

Disadvantages of CPUE data

CPUE series are affected by changes in fishing strategy of the fleet.

Volume of the water filtered by trawl for the day and for the hour is incremental at all times.

Daily catch become progressive smaller depending of processing capacity.

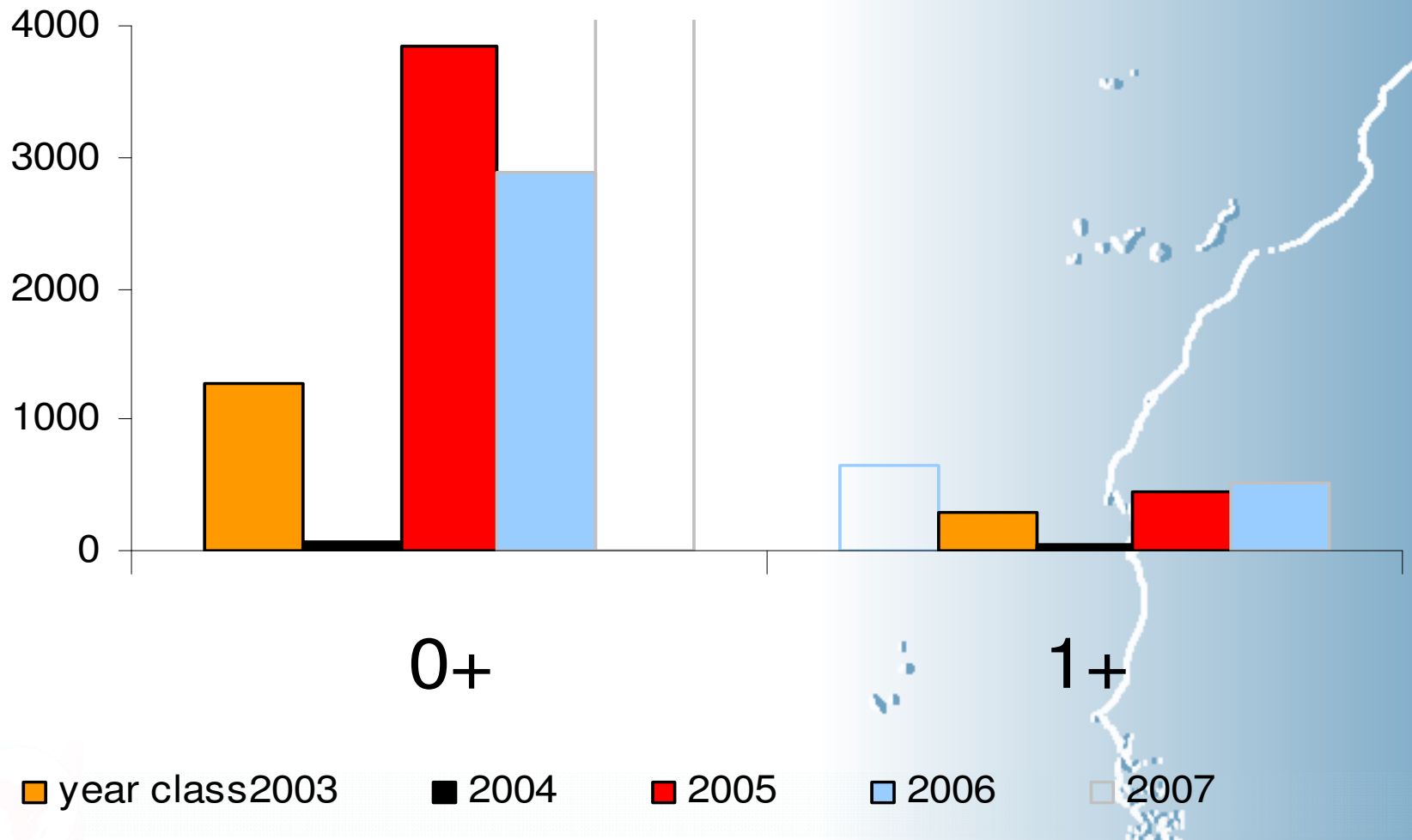
Upgrade of gear and equipment differs by vessels.

Proposal to consider: – use of traditional types of vessels with traditional equipment;

– use of fishery independent indices

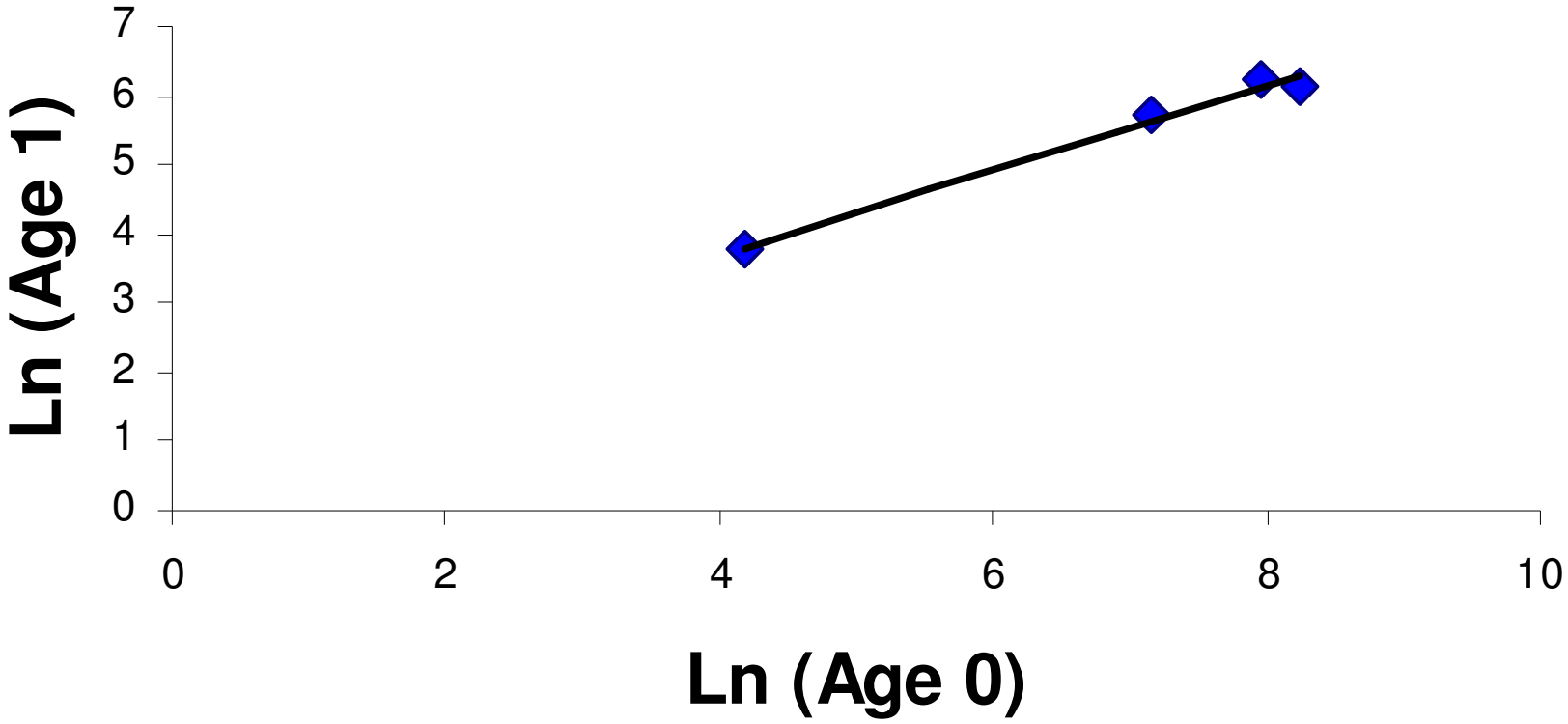
recruitment

Consistency of recruitment surveys in Tr. trecae. Indices $\times 10^{-6}$

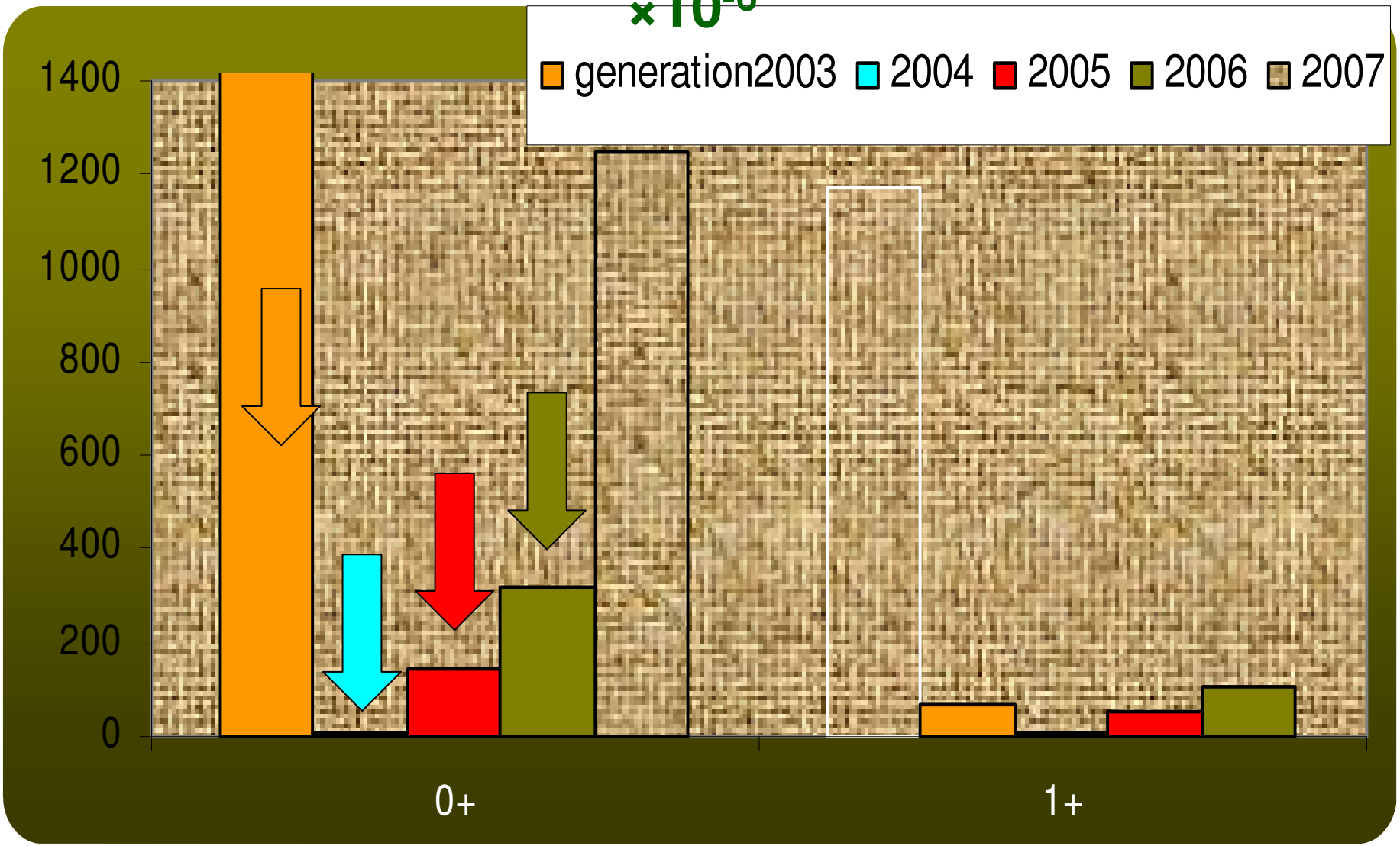


recruitment

Tr. trecae. Internal consistency within the recruitment survey. Relationship between log index-at-age within a cohort

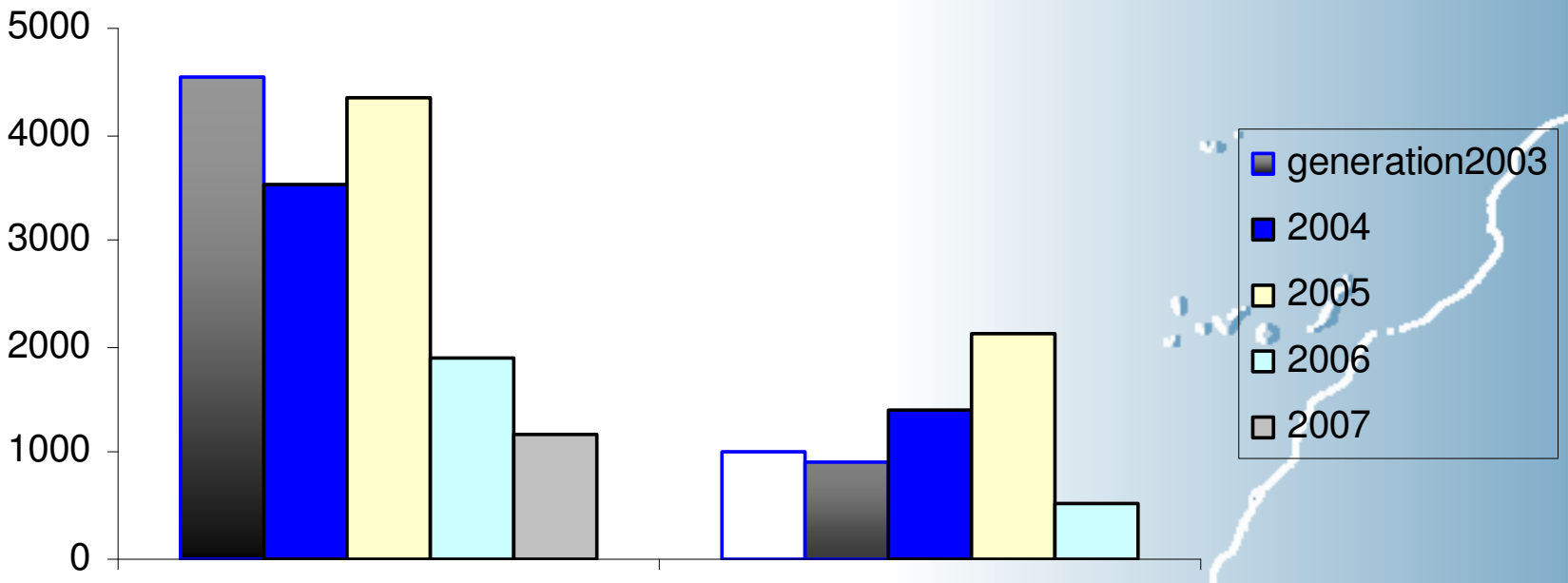


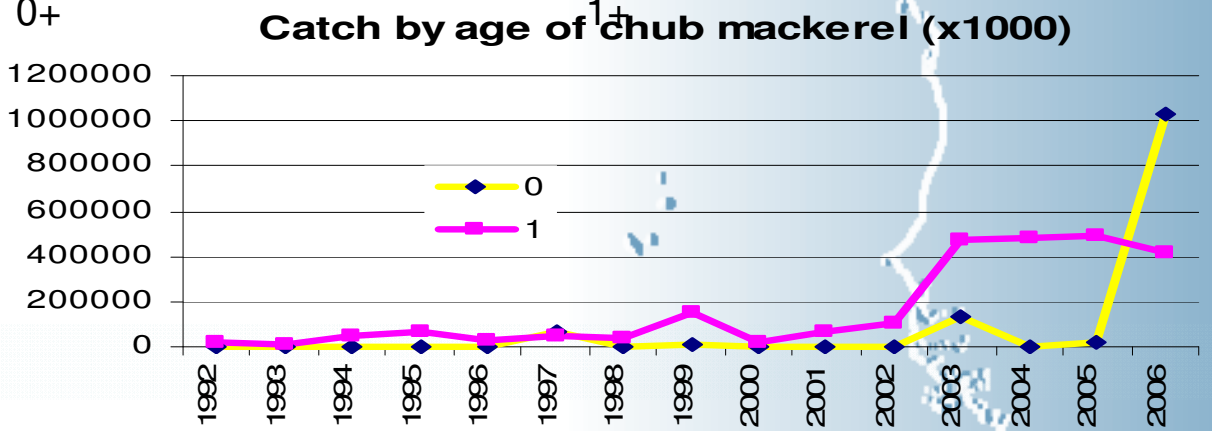
Consistency of recruitment surveys in Tr. trachurus. Indices



recruitment

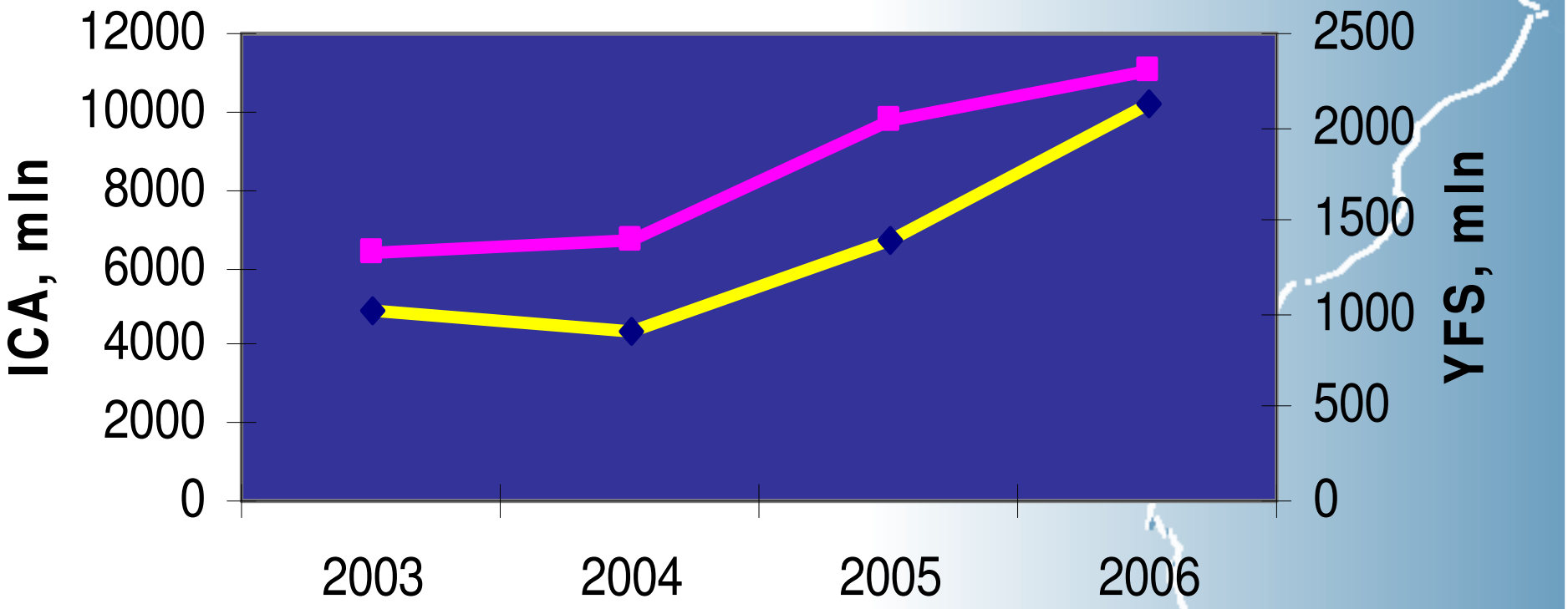
Consistency of recruitment surveys in Sc. japonicus. Indices $\times 10^{-6}$





recruitment

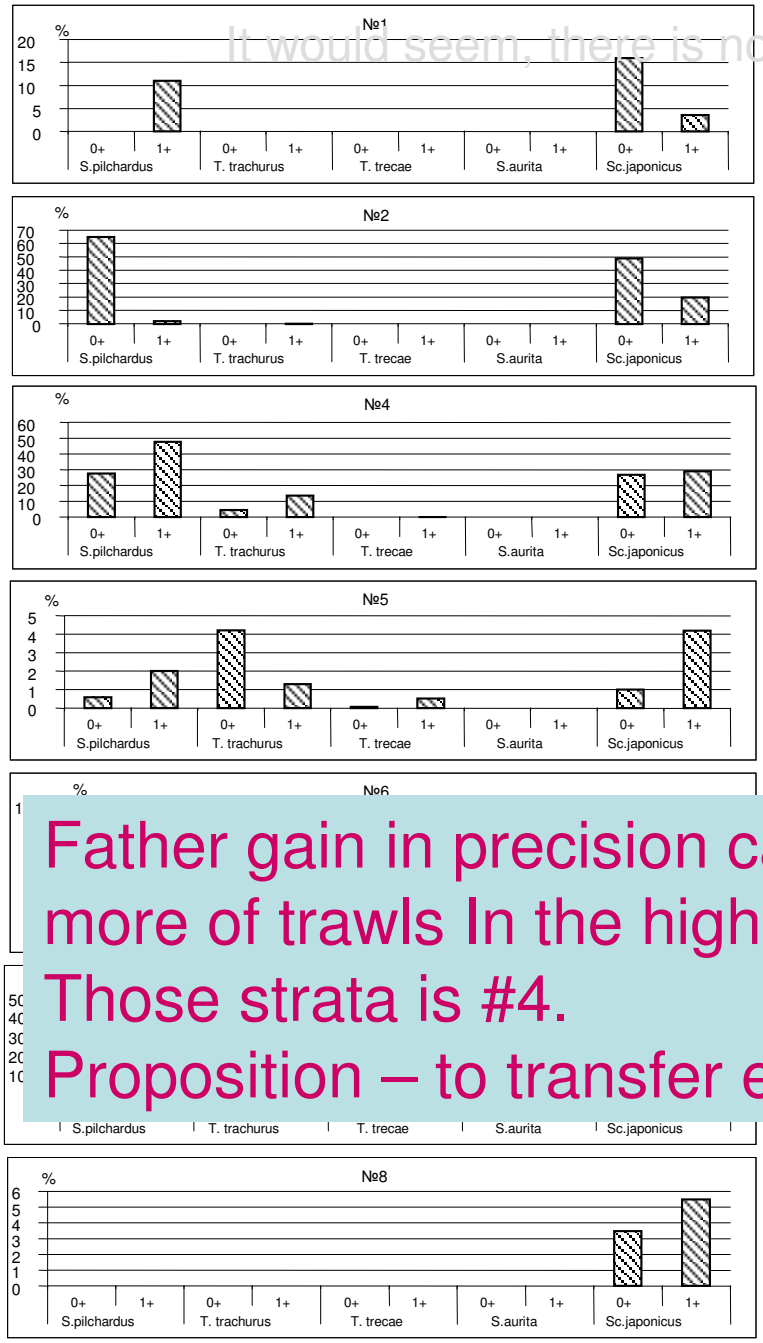
The independently of one another made assessments of 1-year old chub mackerel

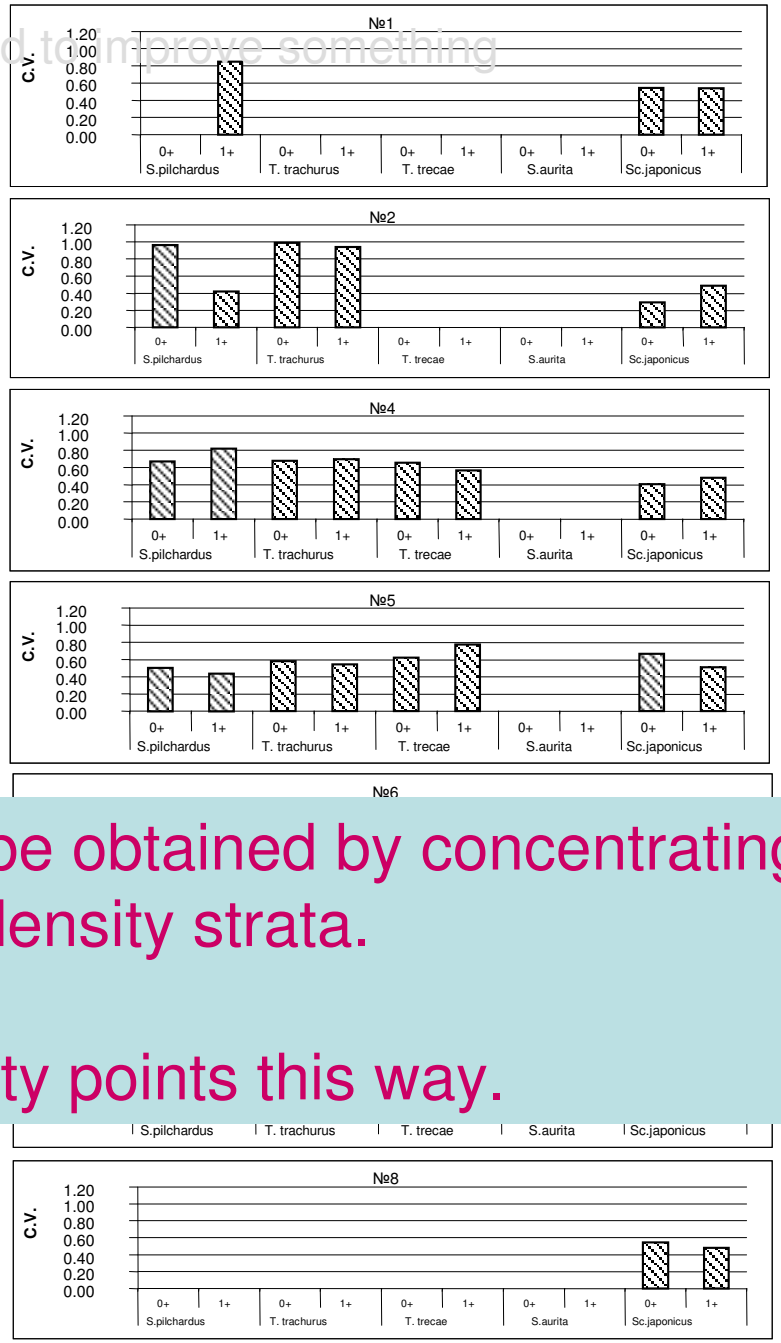


Number in the strata as % of total number

CV in the strata

recruitment





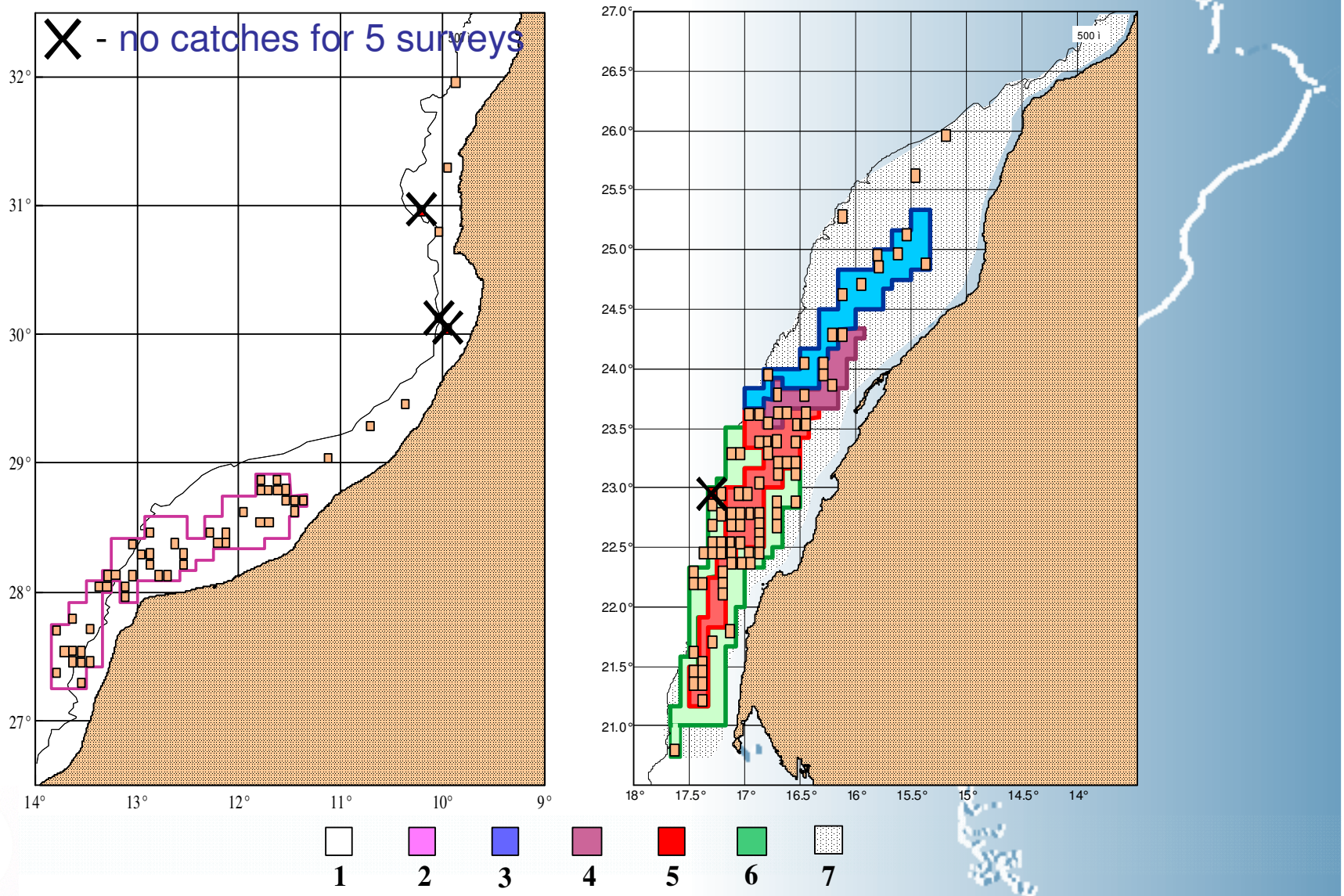
Father gain in precision can be obtained by concentrating more of trawls In the higher density strata.

Those strata is #4.

Proposition – to transfer empty points this way.

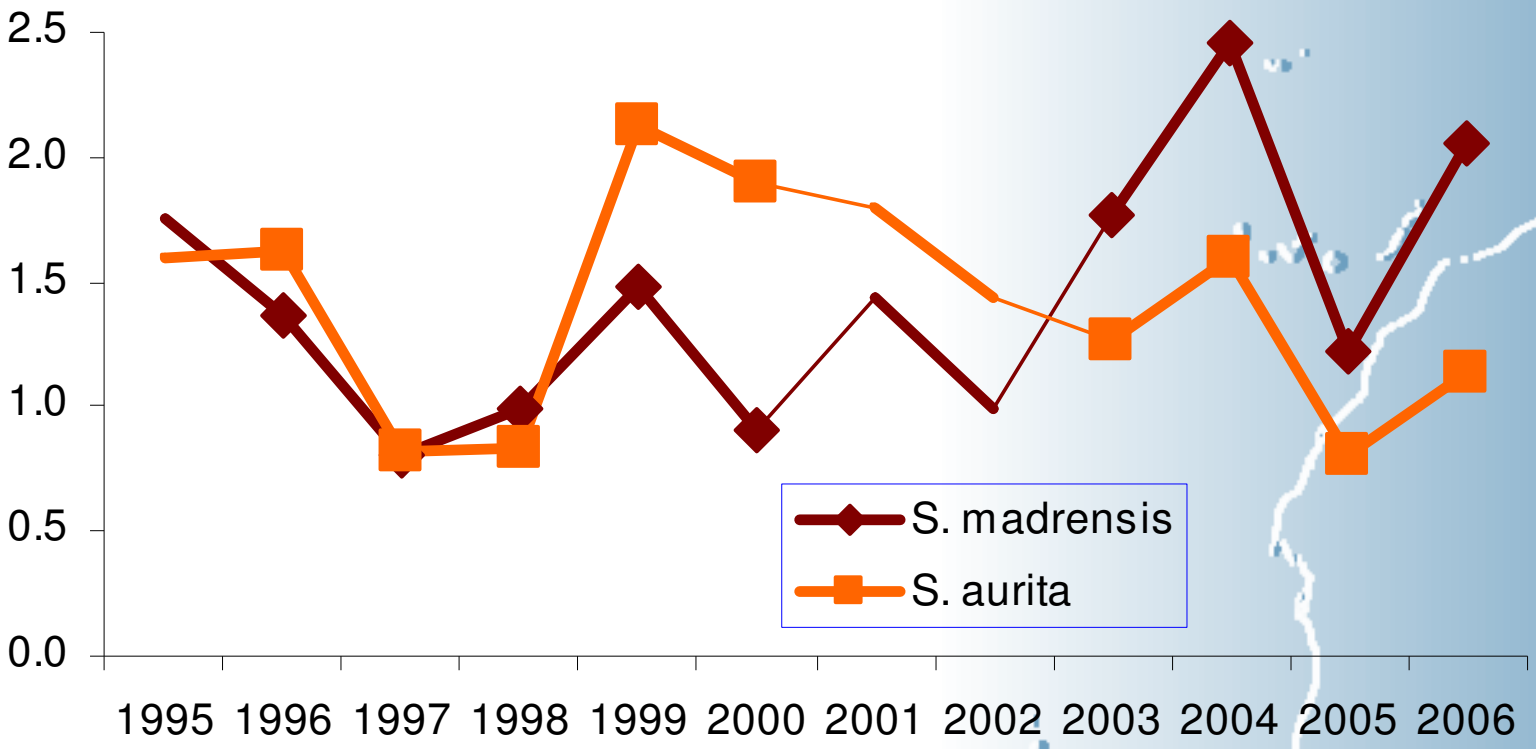
recruitment

The stratums of more uniform fish density and trawl stations by young fish survey



acoustic

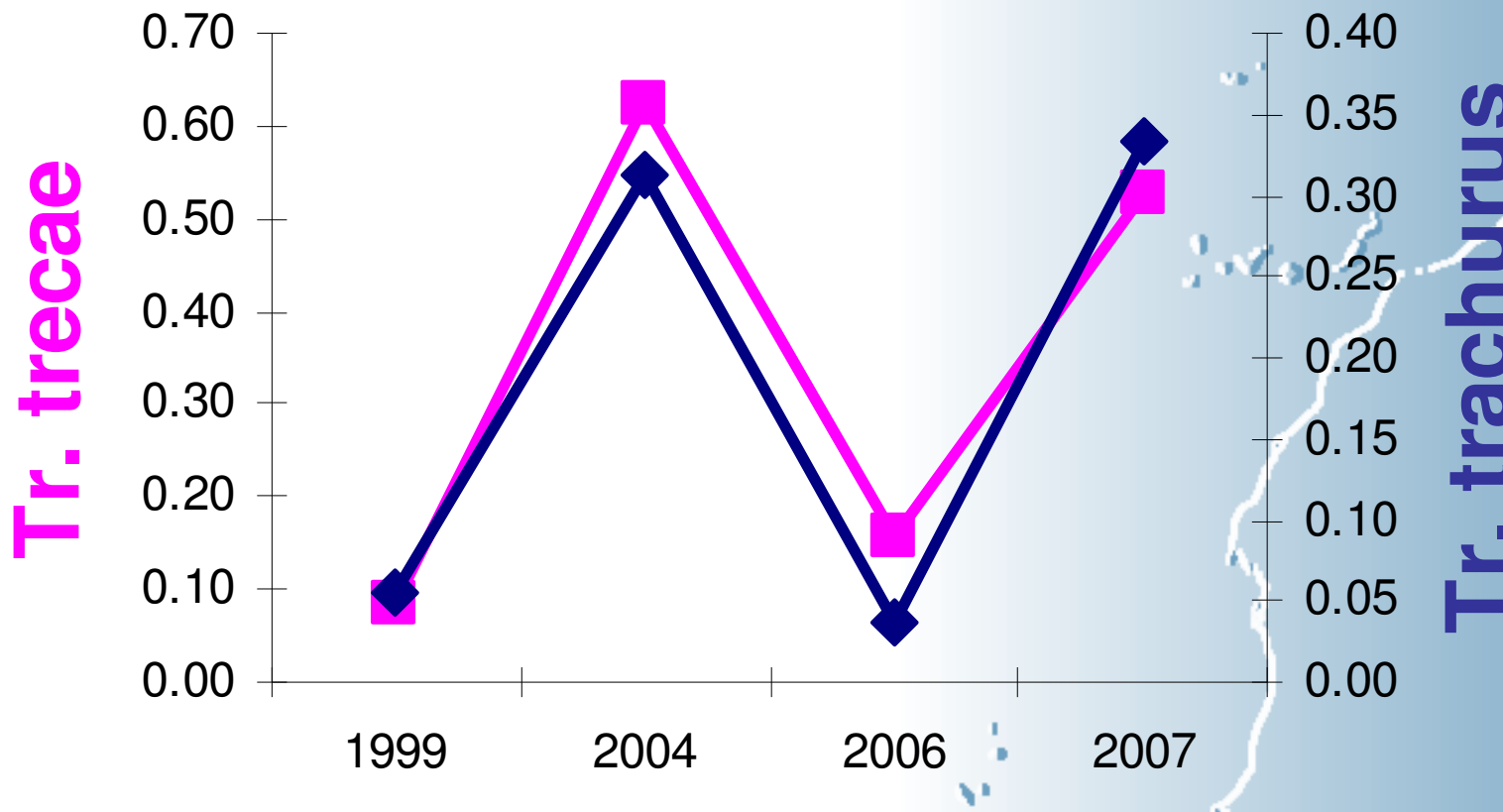
Biomass estimates of Sardinella (tx10^{-6}) by r/v DR.F.NANSEN (winter)



2007_Chap1Fig.xls

acoustic

Biomass estimates of Trachurus (tx10^{-6}) by r/v ATLANTIDA (summer)



fishily

acoustic

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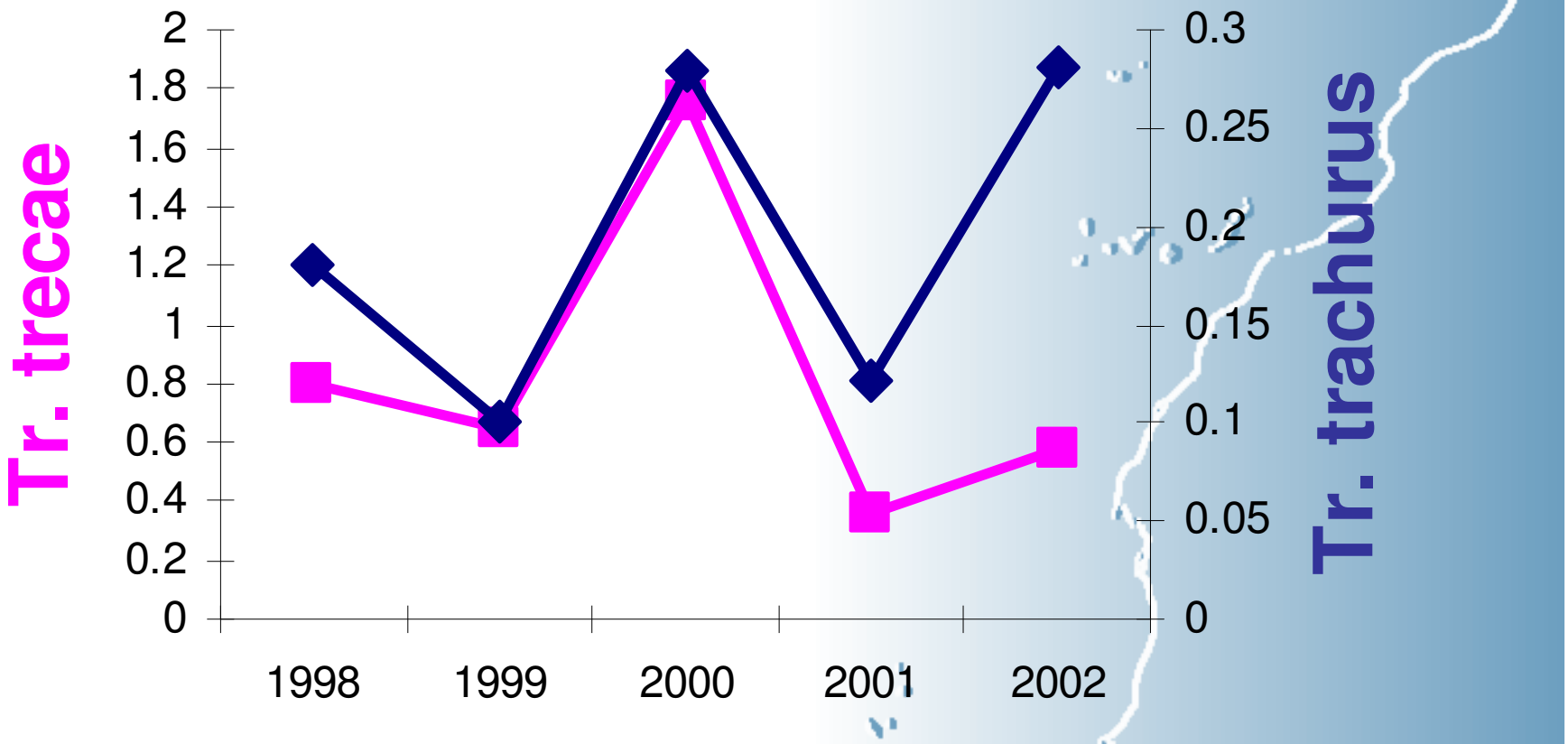
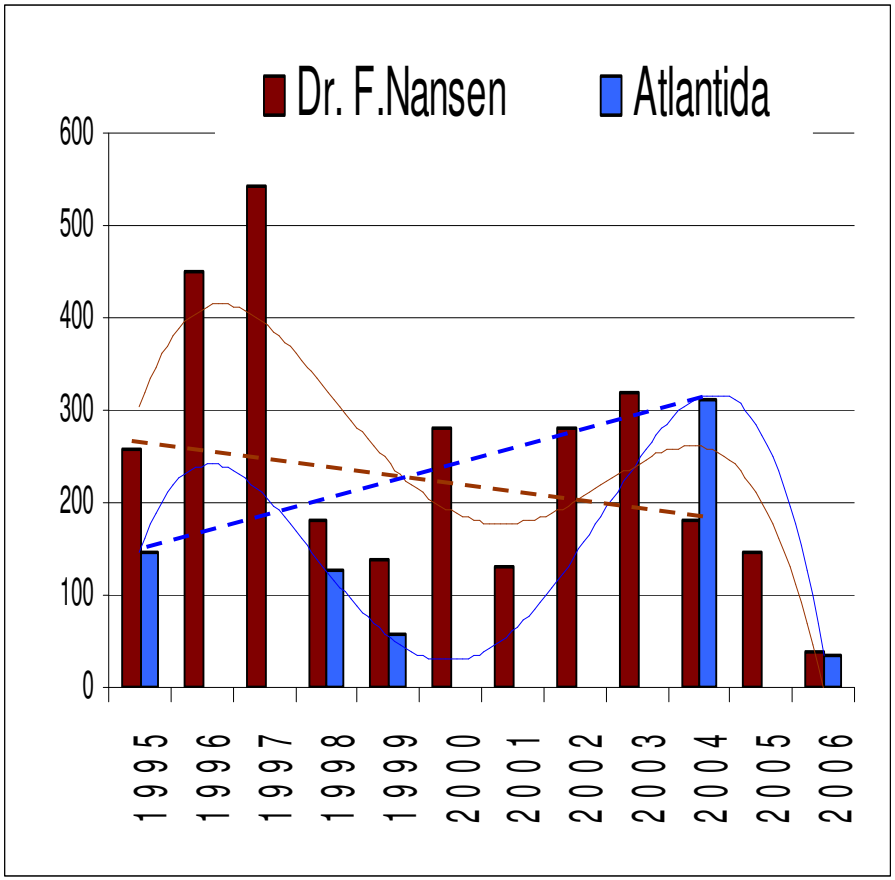
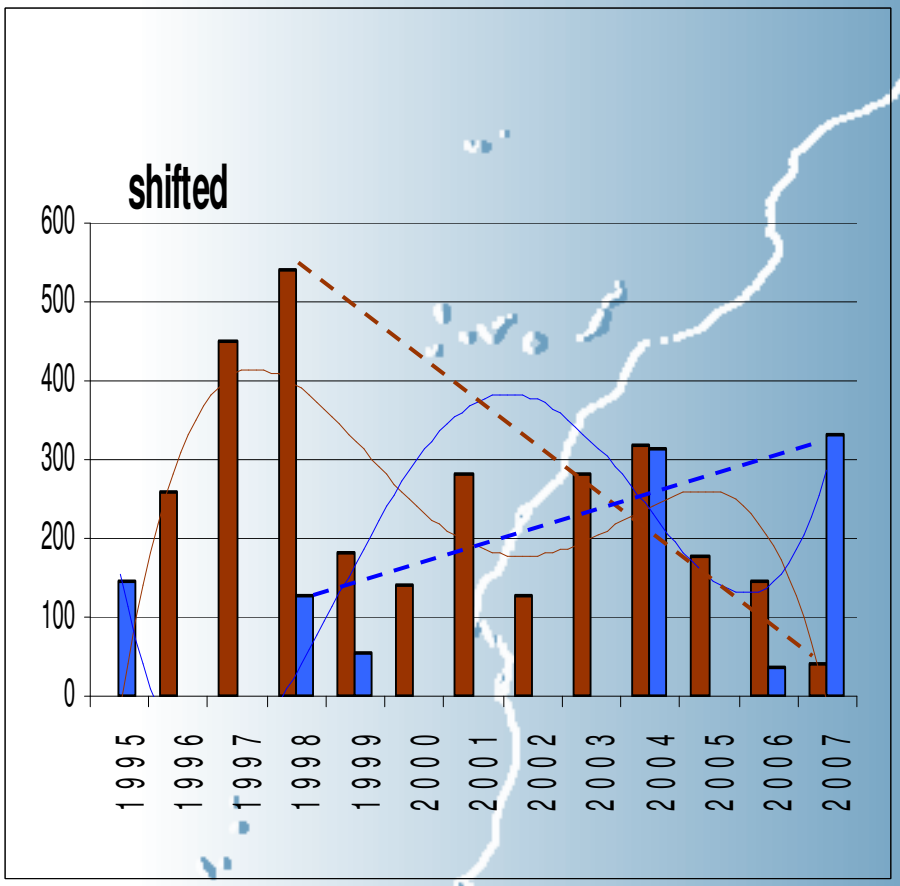


acostic

Biomass estimates of Tr. trachurus

(tx1000) by r/v DR.F.NANSEN (winter) and ATLANTIDA (summer)
Area Saint Louis - Cantin

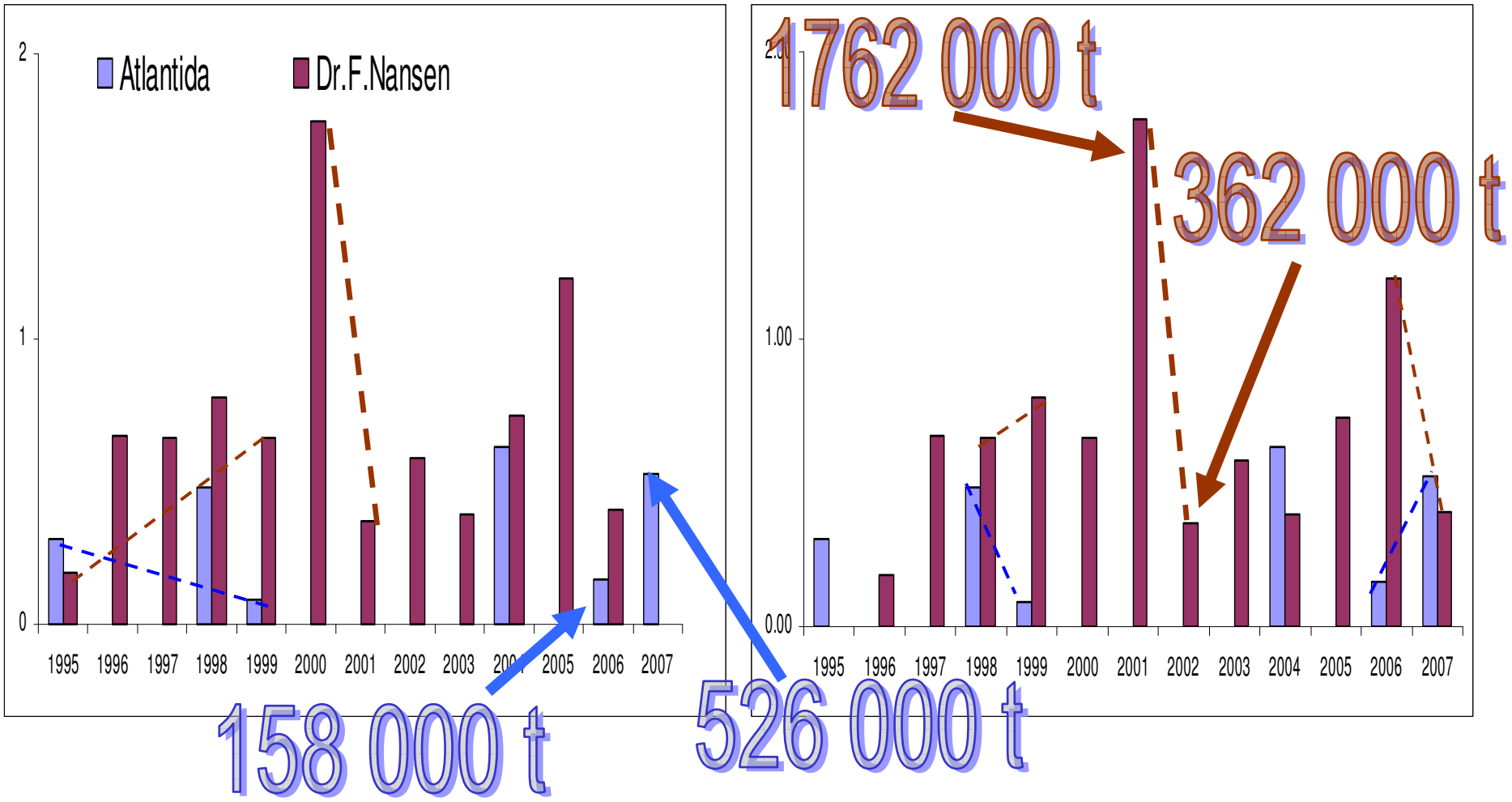




acoustic

Biomass estimates of Tt. trecae

(tx1000) by r/v DR.F.NANSEN (winter) and ATLANTIDA (summer)
Area Saint Louis - Cantin



acoustic

What must happen in the stock to reach biomass 526 th.t. after 158 th.t.

=R81*EXP(-0.6)

P	Q	R	S	T	U	V	W	X
			If no fishery in 2006					
age	weight_06	HS_2006	By same	By enlarged	HS_2007	weight_0		
		Numbers	number 0+	recruitmrnt	Numbers			
0	0.01	1092609	1092609	10926094	3565641	0.0		
1	0.04	1013112	599637	5996368	6053656	0.04		
2	0.12	209197	556007	1668022	2265523	0.0		
3	0.17	133394	114810	114810	338629	0.1		
4	0.24	78652	73208	73208	121328	0.1		
5	0.32	100074	43165	43165	48489	0.2		
6	0.35	18309	54922	54922	5595	0.2		
7	0.50	2355	10048	10048	1192	0.3		
8	0.61	1349	1292	1292	220	0.4		
9	0.67	698	741	741	26	0.42		
10	0.69	374	383	383		0.69		
11	0.84	2466	205	205		0.84		
Biomass		158547	128572	520948	525912			
	trecae			TB 2006	n 2006	N remind	N reminder	
	by VPA			arised to	arised to	after M	after M	
	n x 10	biomass	weight	HSsurv	HSsurv	without F	without F	
	2006			estimated			and R1* 10	
1	983043		0.051	41052	804951	804951	7783874	
2	551682		0.086	38849	451737	441766	441766	
3	296142		0.144	34919	242492	247919	247919	
4	152872		0.190	23784	125177	133082	133082	
5	68927		0.250	14110	56440	68699	68699	
6	18664		0.300	4585	15283	30975	30975	
7	3402		0.341	950	2786	8387	8387	
8	943		0.386	298	772	1529	1529	
	2076676							
	TB		158547	158547		169948	525873	

if number 0+ is tenfold more than in 2006

if number 1+ is tenfold more than in 2006

if number 2+ is three times more than in 2006

Inexplicable changes

acoustic

Hypothetical conditions of diminution of Tr. trecae biomass from 1762000 t till 362000

H141 =D141*(G148-0.6)*(1-EXP(-G148))/G148

A	B	C	D	E	F	G	H	I
	N from XSA	Weight	N 2001	N 2002		N 2002	Hypotetic catch 2001	
			adjusted	adjusted		adjusted,	to adjust	
Age	2001		to HS_01	to HS_02	B 1+	no recruitment	HS_02	
1	7889830	0.072	6235344	6235344	448945	0	0	
2	4156030	0.113	3284517	770		920704	1921406	
3	2133610	0.181	1686195	405		484988	986405	
4	1240450	0.237	980329.5	208		248982	573482	
5	721550	0.299	570242	121		144754	333585	
6	337750	0.412	266924.3	70		84201	156148	
7	242700	0.478	191806.2	33		39414	112204	
8	80380	0.507	63524	24		28322	37161	
	TB	2229529	1762000					
							768123	(in fact 210000)
		TB 2002 calculated		449247		362003		
				Z		Z		
				9		1.91		
				must 362000				

In no case

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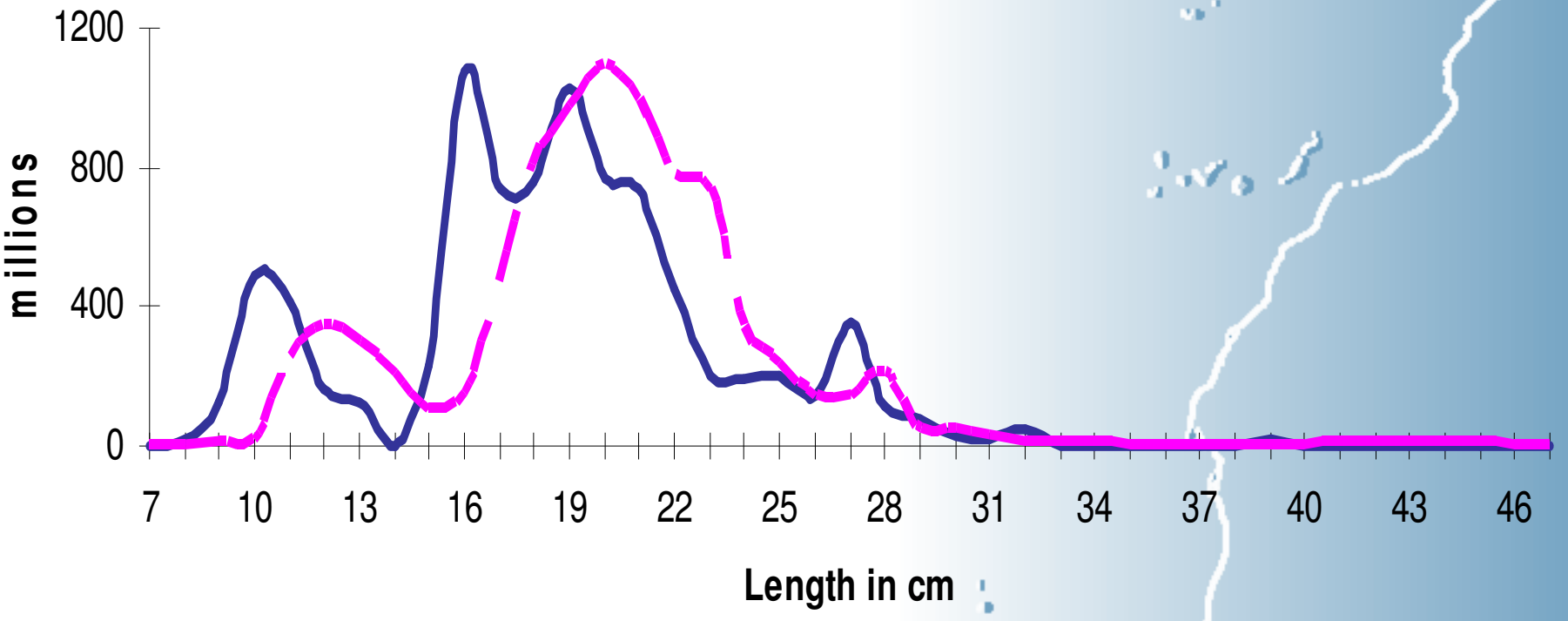
Tr. trecae number estimated by two surveys in 2004



Atlantida in summer — Dr.F.Nansen 4 months later

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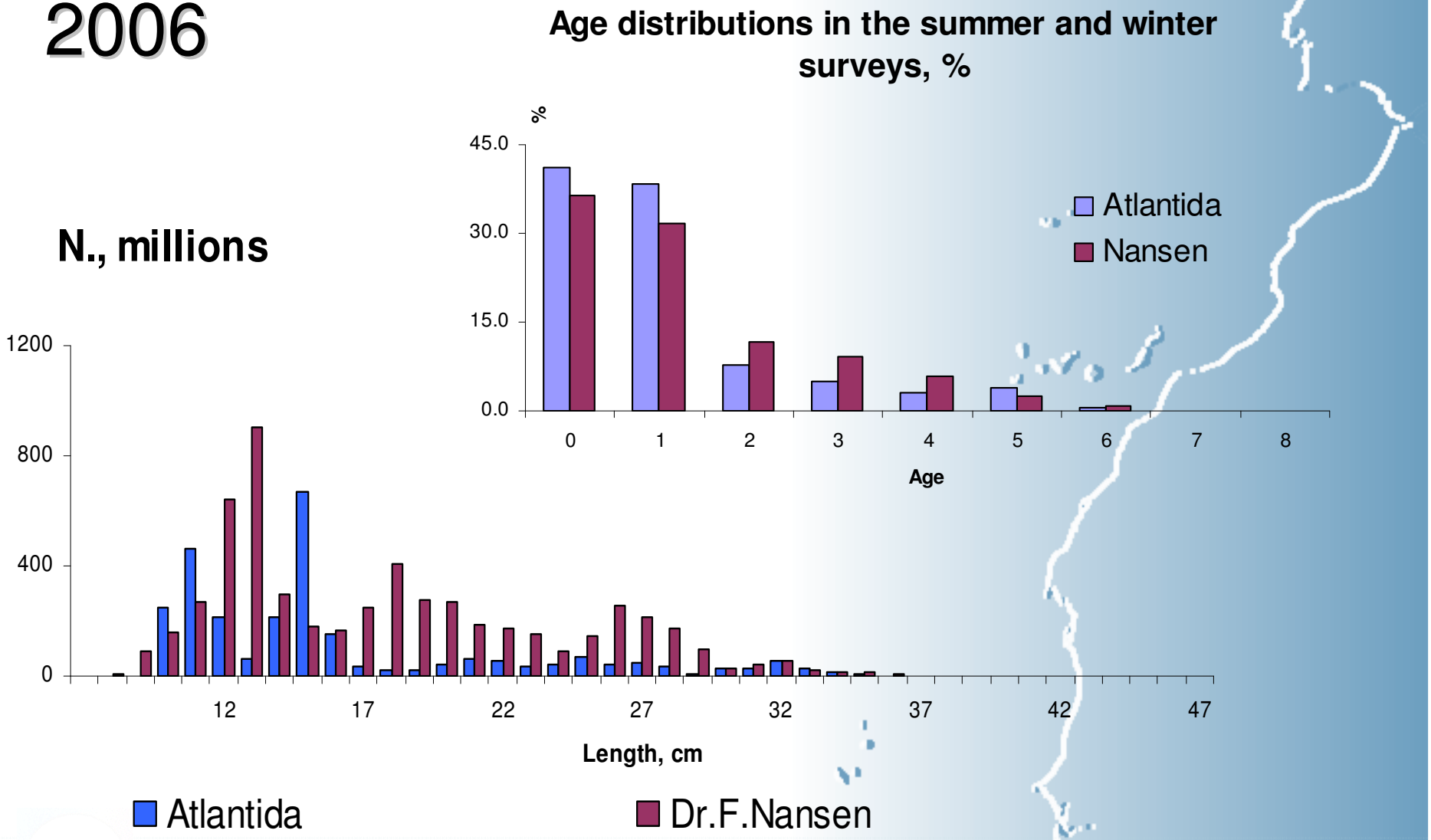
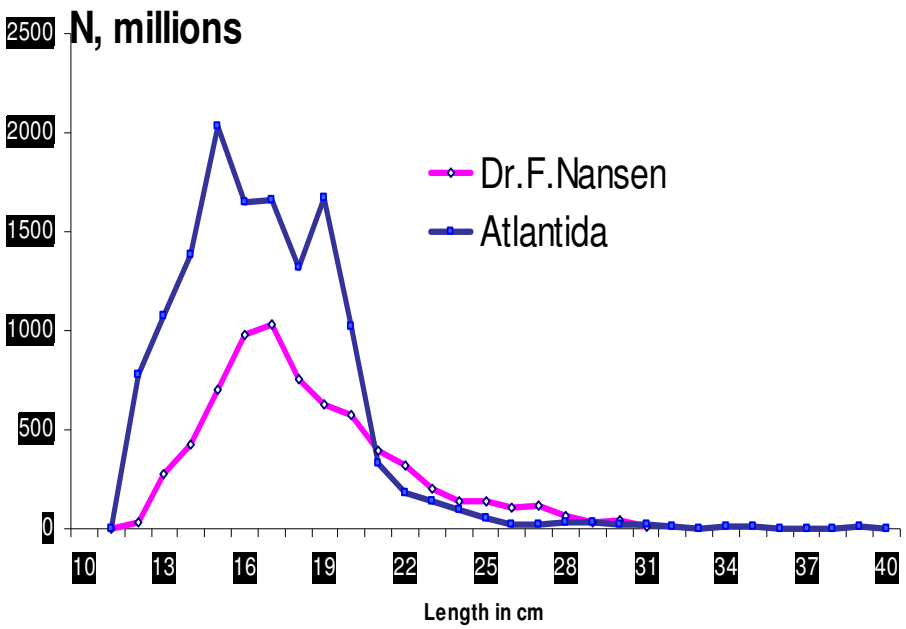
Tr. trecae estimated by two vessels in 2006

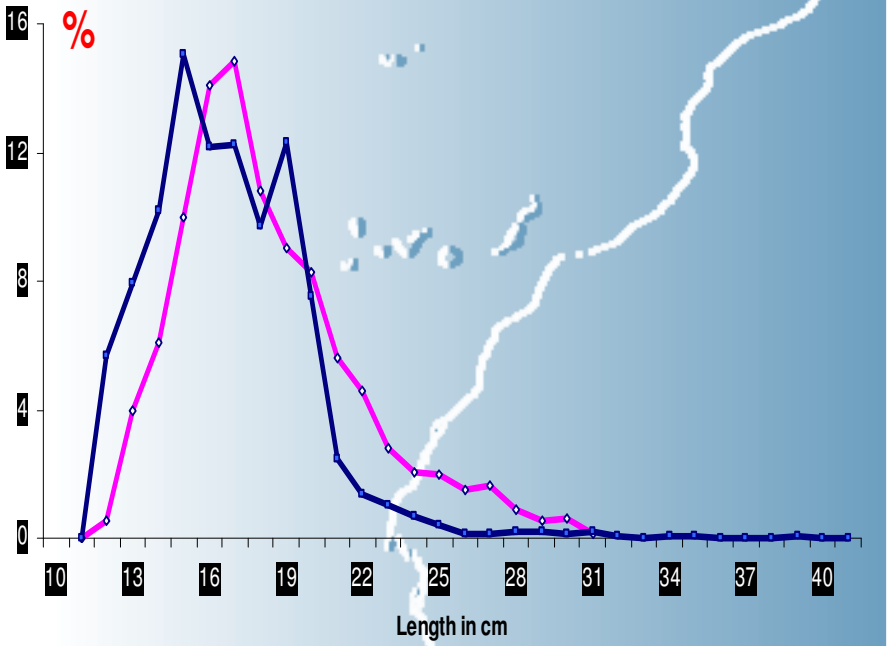


Lack of coincidence in numbers. Good convergence in %

acoustic

2006. Chub mackerel. Numbers by length class in the whole area investigated.





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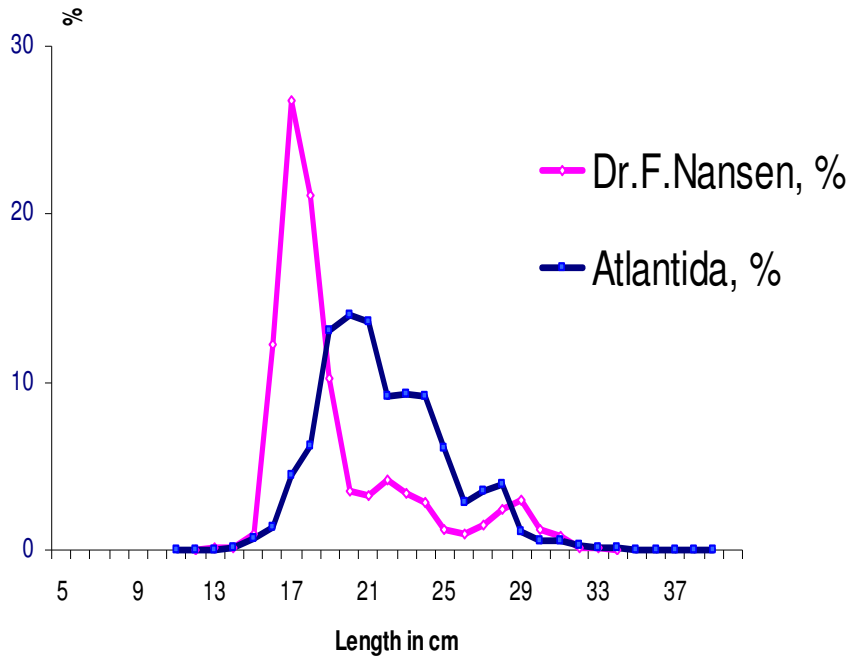
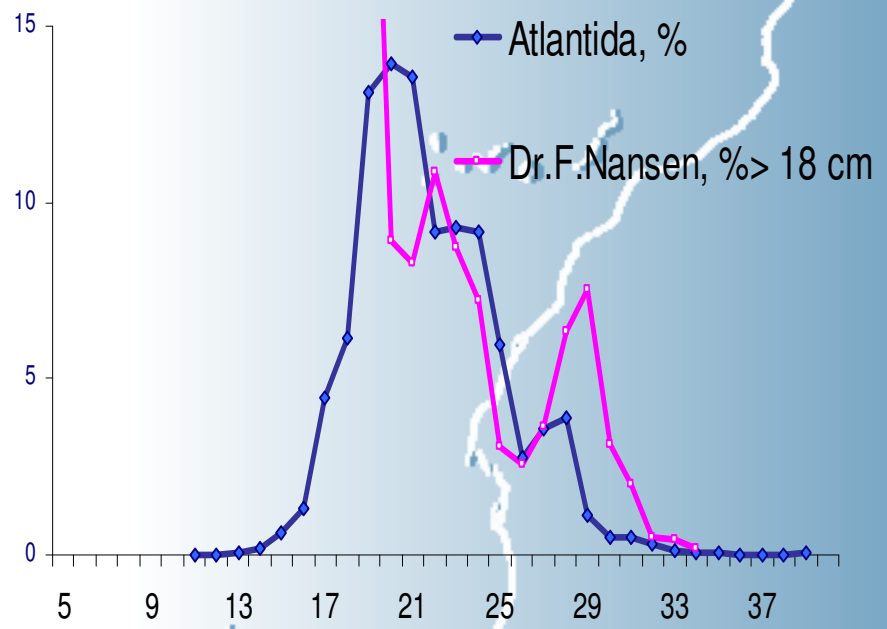




Lack of small fish in summer. Good convergence in the old ages

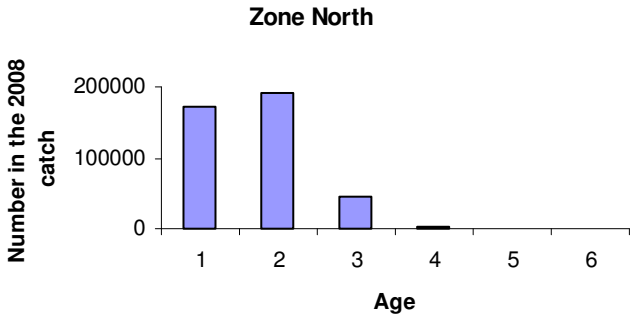
There are two sources to fit VPA

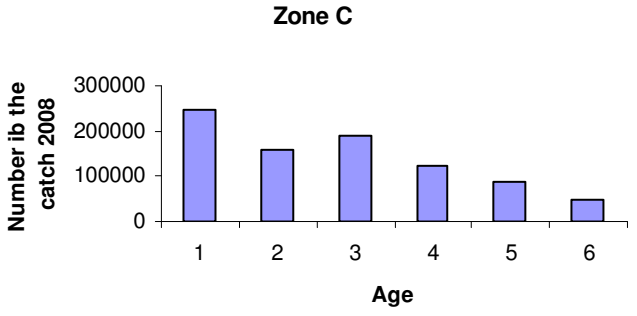
– above mentioned age indices as relative series, and recruitment series.

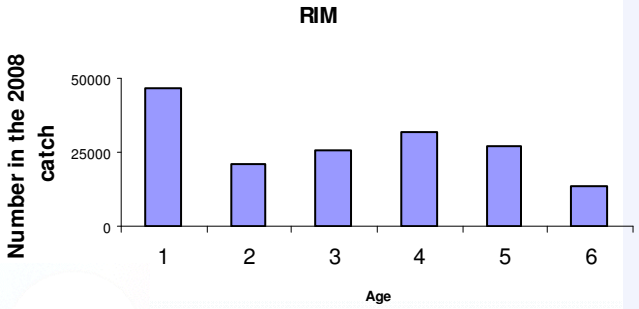
Then, to obtain good managed fishery, we need to apply age-structured projection and retrospective data from database

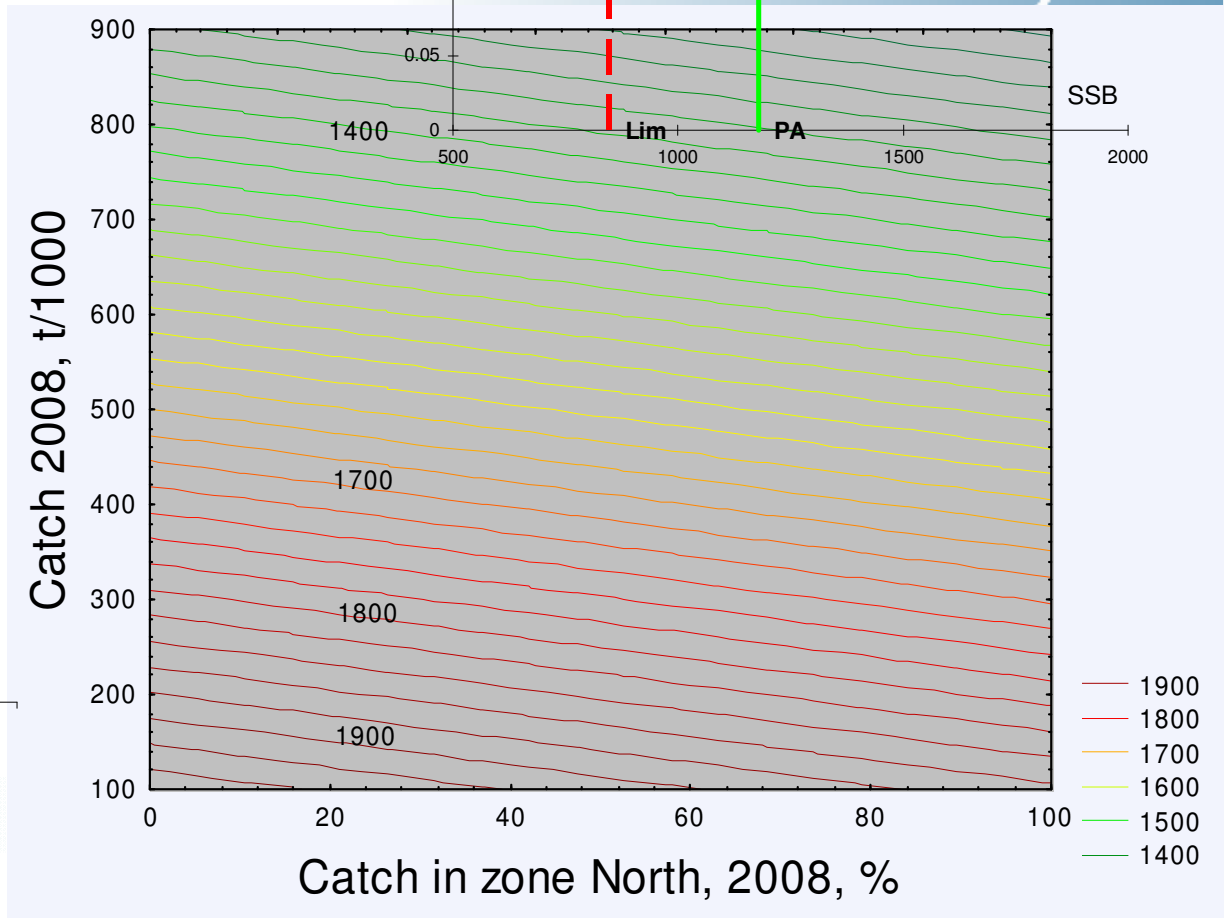
managing

Chub mackerel. SSB_{2009} as result of fishery in 2008. $R_{2009}=R_{2008}$.



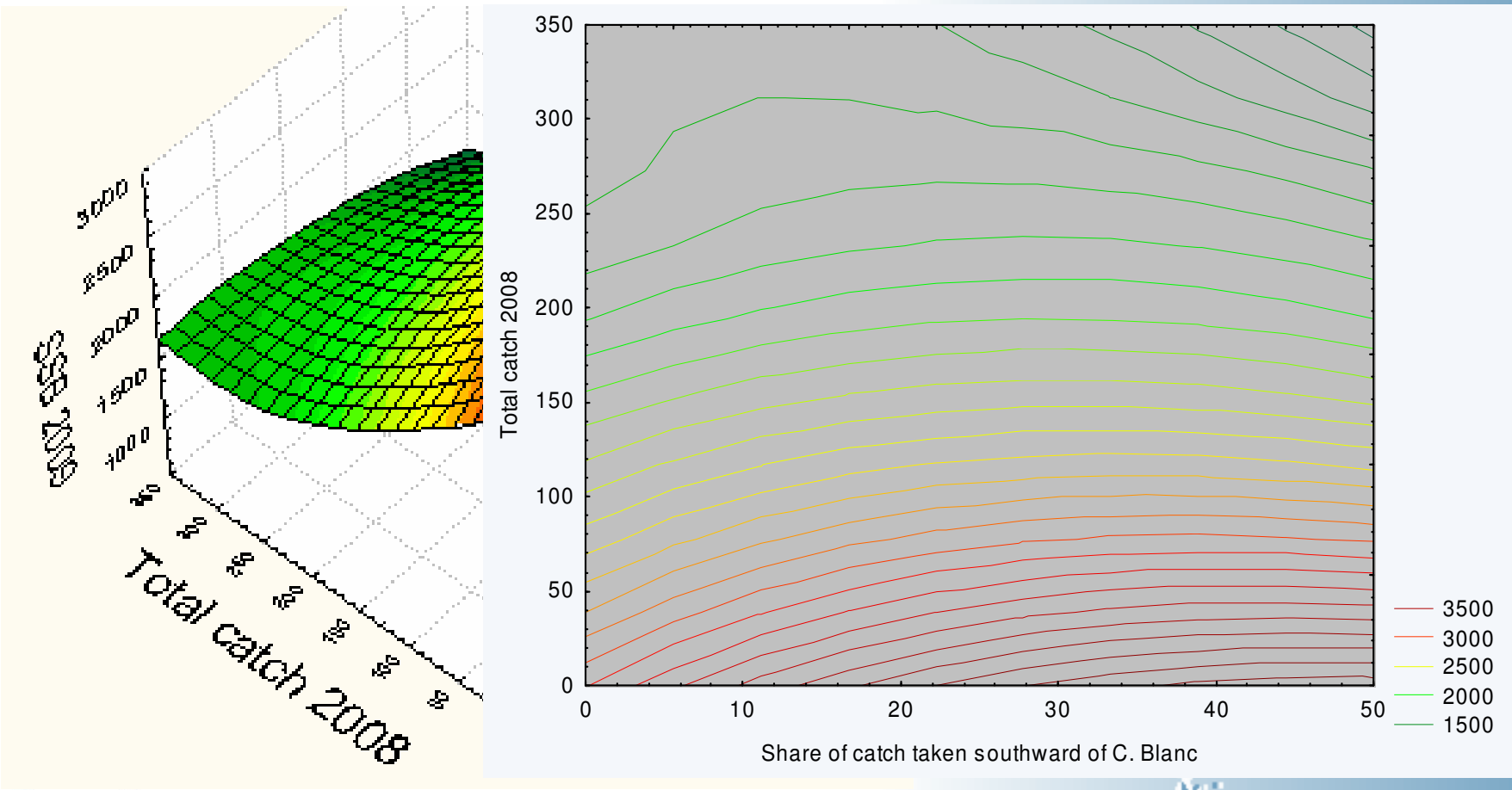






managing

Chub mackerel. SSB_{2009} as result of fishery in 2008. $R_{2009}=R_{2008}$. Catch in zone North as 20% of the catch northward of C.Blanc.



managing

To create short-term prediction on a quarterly basis, It is necessary to search 4 analogues:

-Year and quarter with similar dynamic of thermic front,

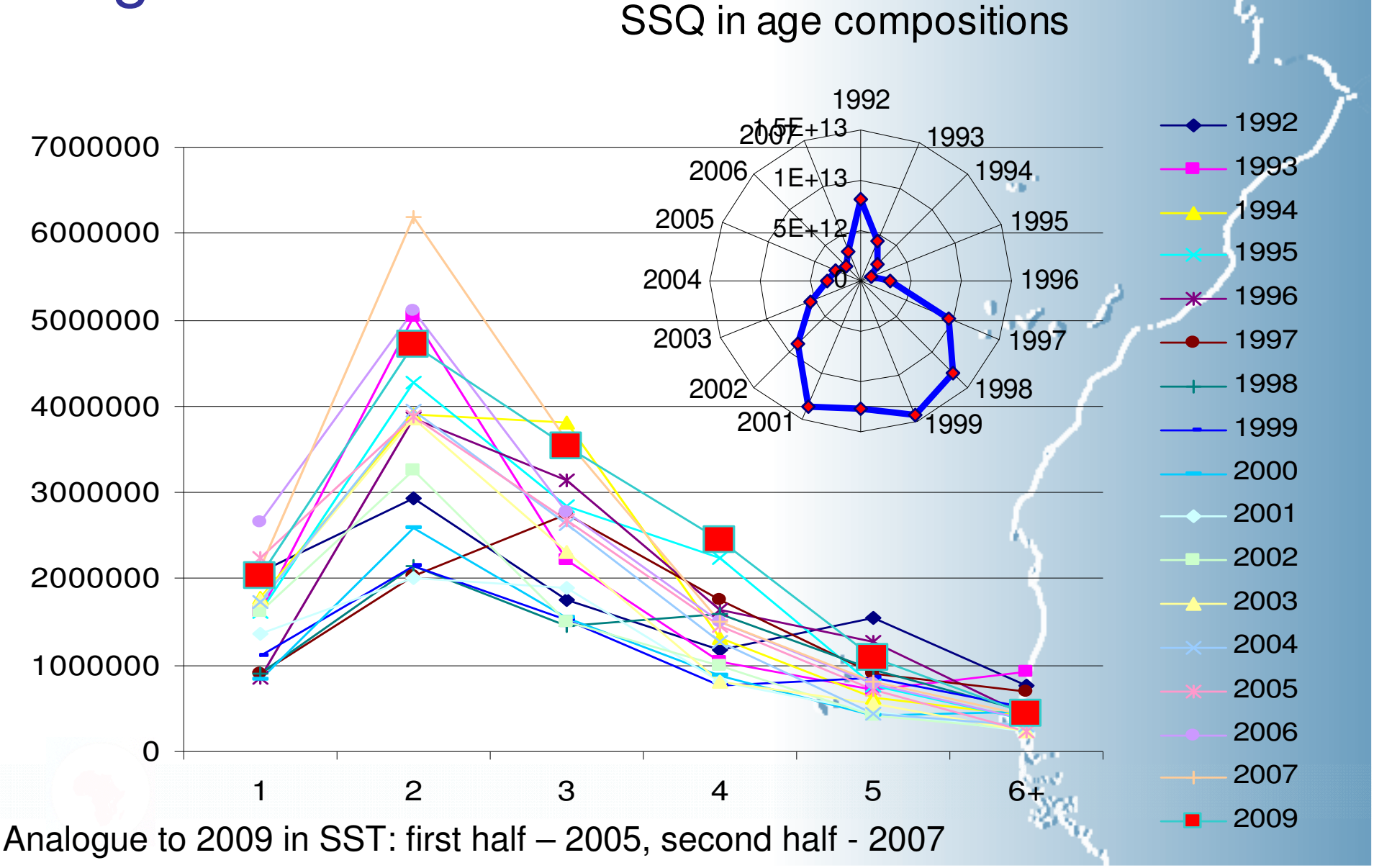
-Year and quarter with similar water temperature,

-Year with similar value and ratio of biomasses in different species,

-Year with similar structure of the stock

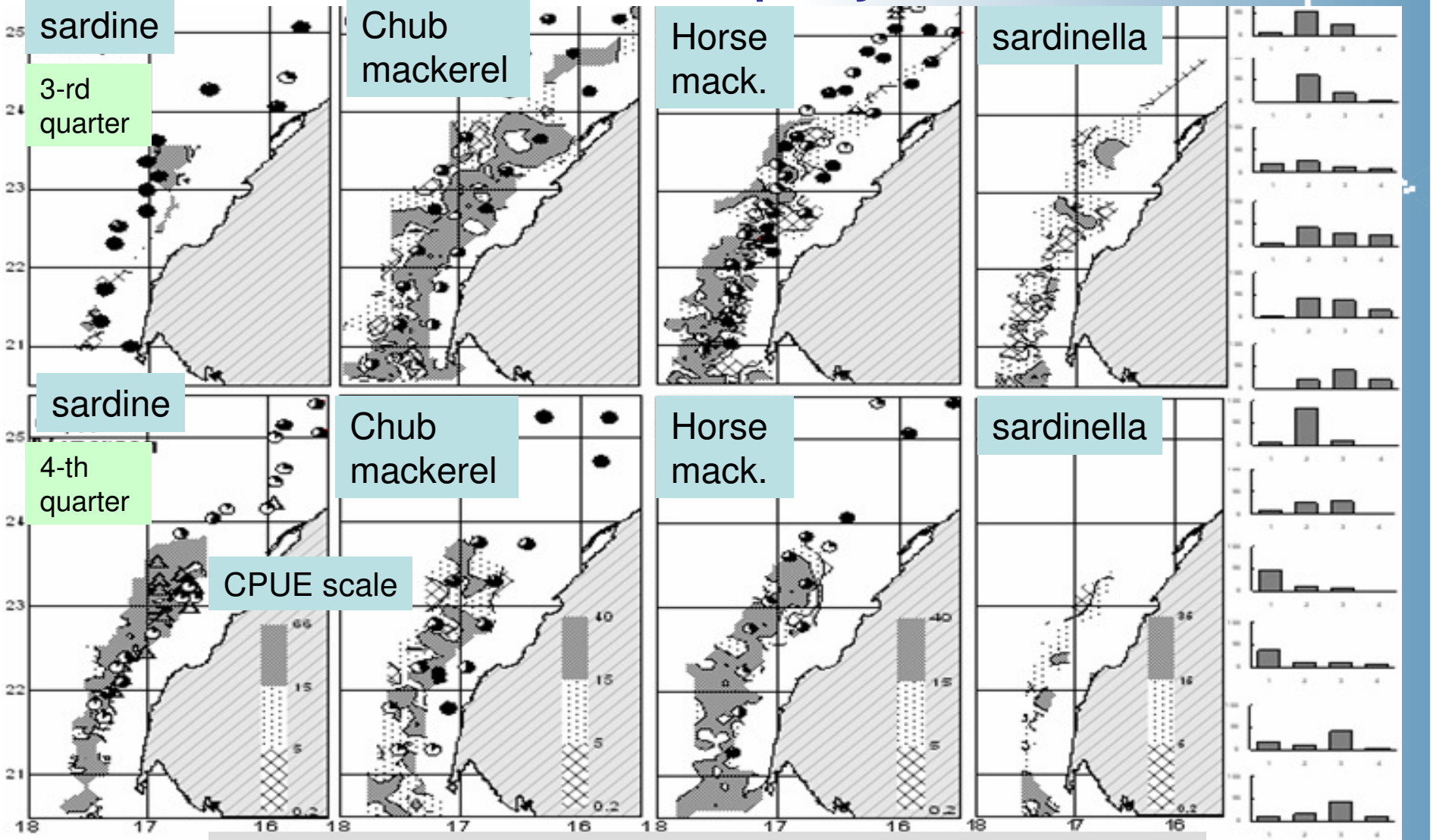
managing

Selection of year similar to 2009 by age-structure of chub mackerel stock

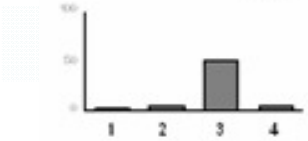


Analogue to 2009 in SST: first half – 2005, second half - 2007

Fisheries conditions project to 2005



- Small fish portion in the expected catches in weight.

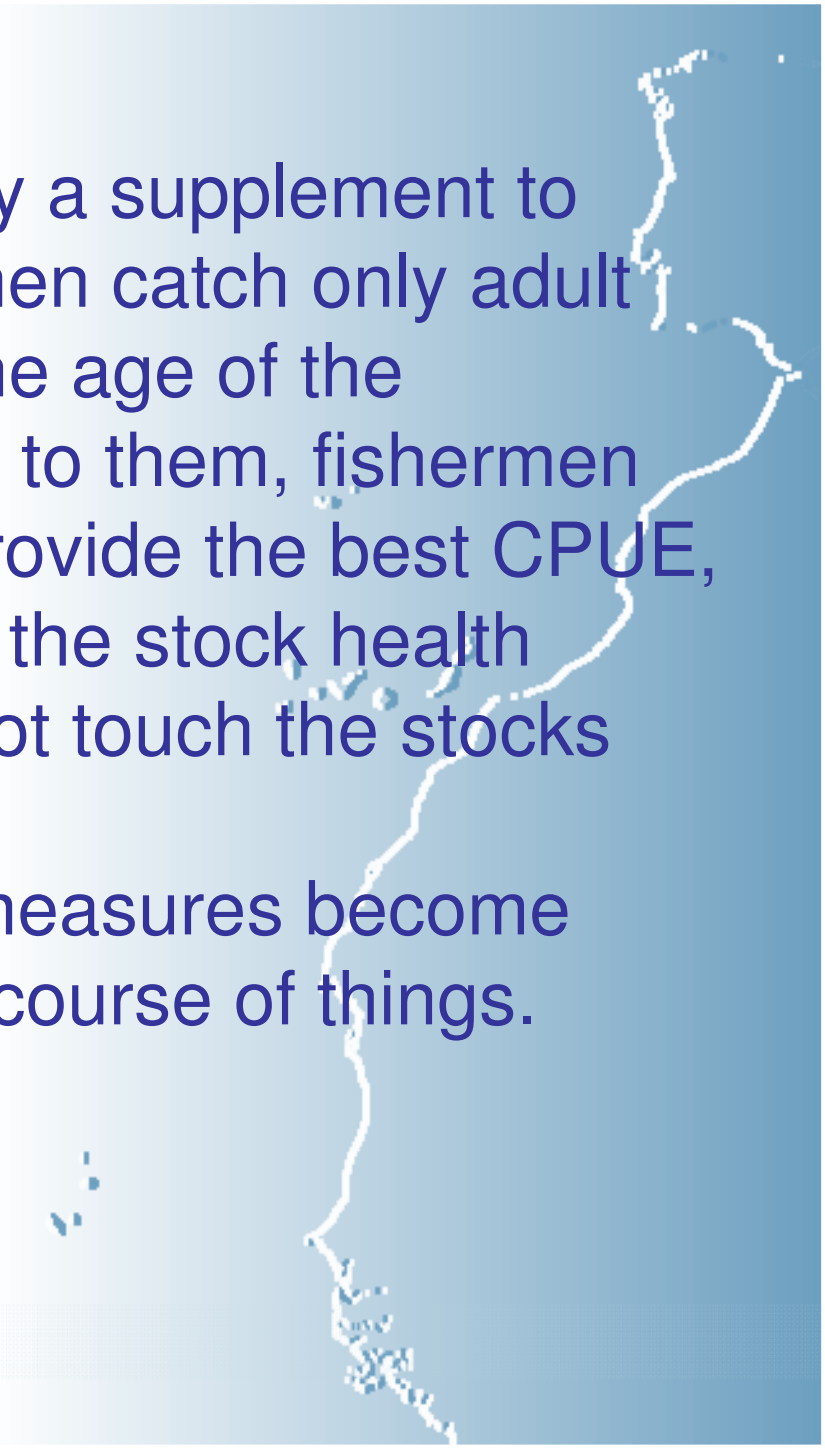


- % in the expected catches by latitudinal zones. 1-sardine, 2-chub mackerel, 3-horse mackerel, 4-sardinella

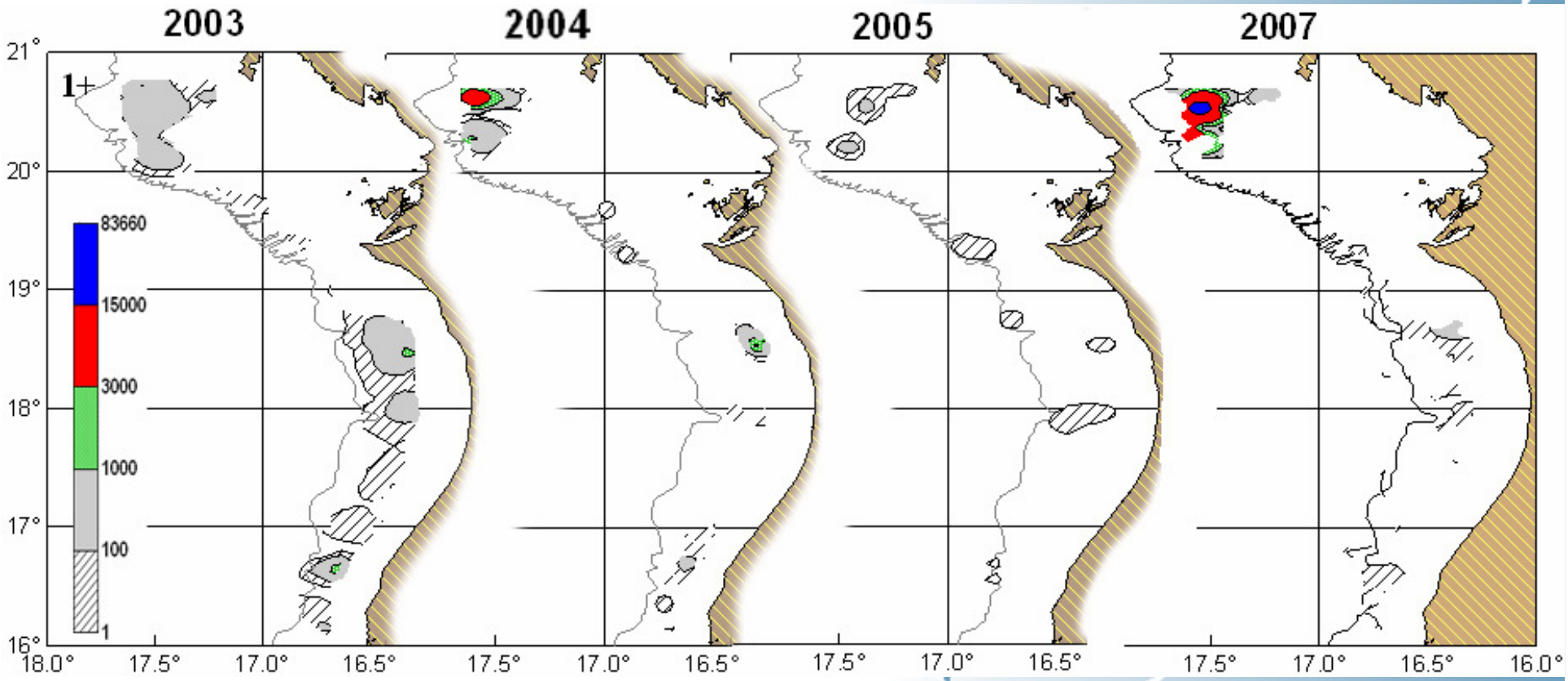
managing

Detailed projection is not only a supplement to TAC. Owing to them, fishermen catch only adult fish whose age is closer to the age of the culmination of weight. Owing to them, fishermen catch those species which provide the best CPUE, but productivity is high when the stock health Is good. Therefore they do not touch the stocks In poor condition.
And then our management measures become just an addition to a natural course of things.

MERCI DE VOTRE ATTENTION

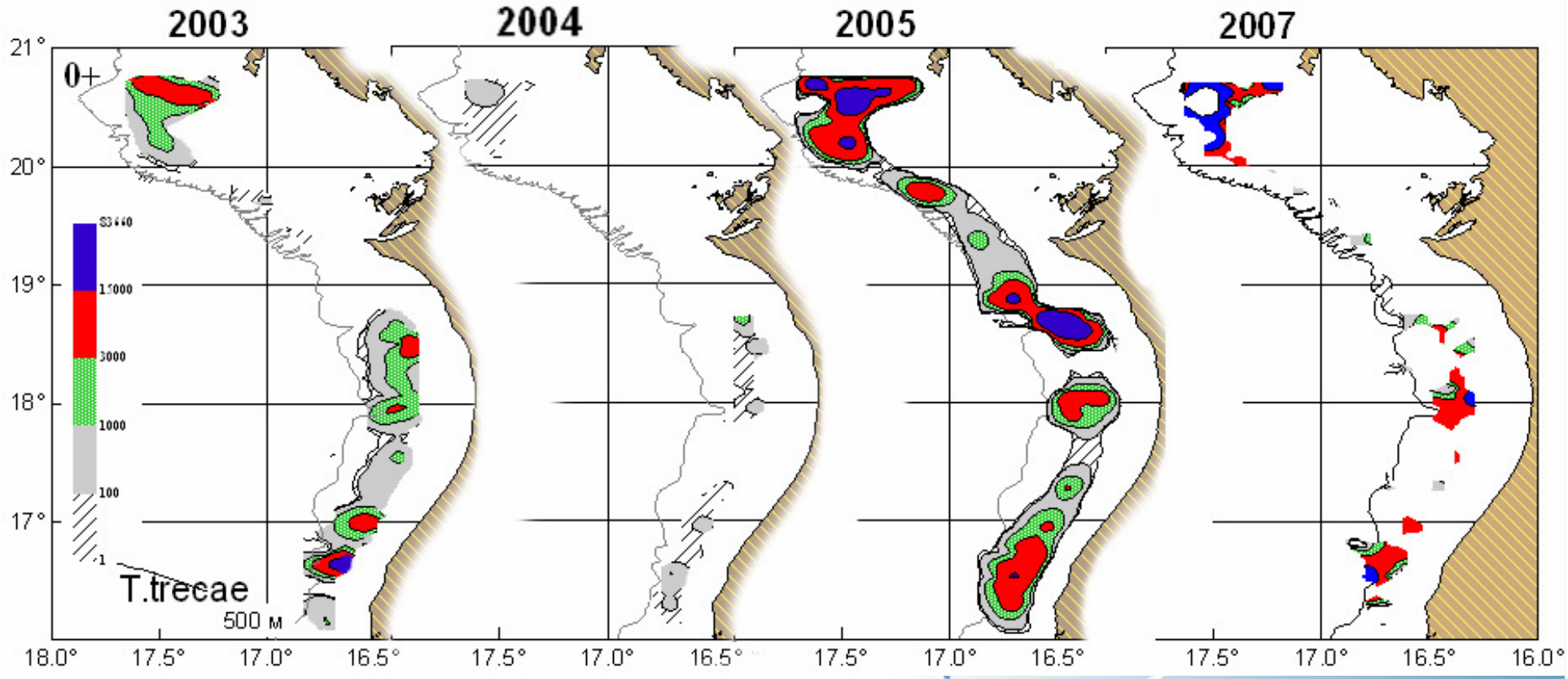


Young fish surveys



Tr. trecae. Age 1+

Young fish surveys



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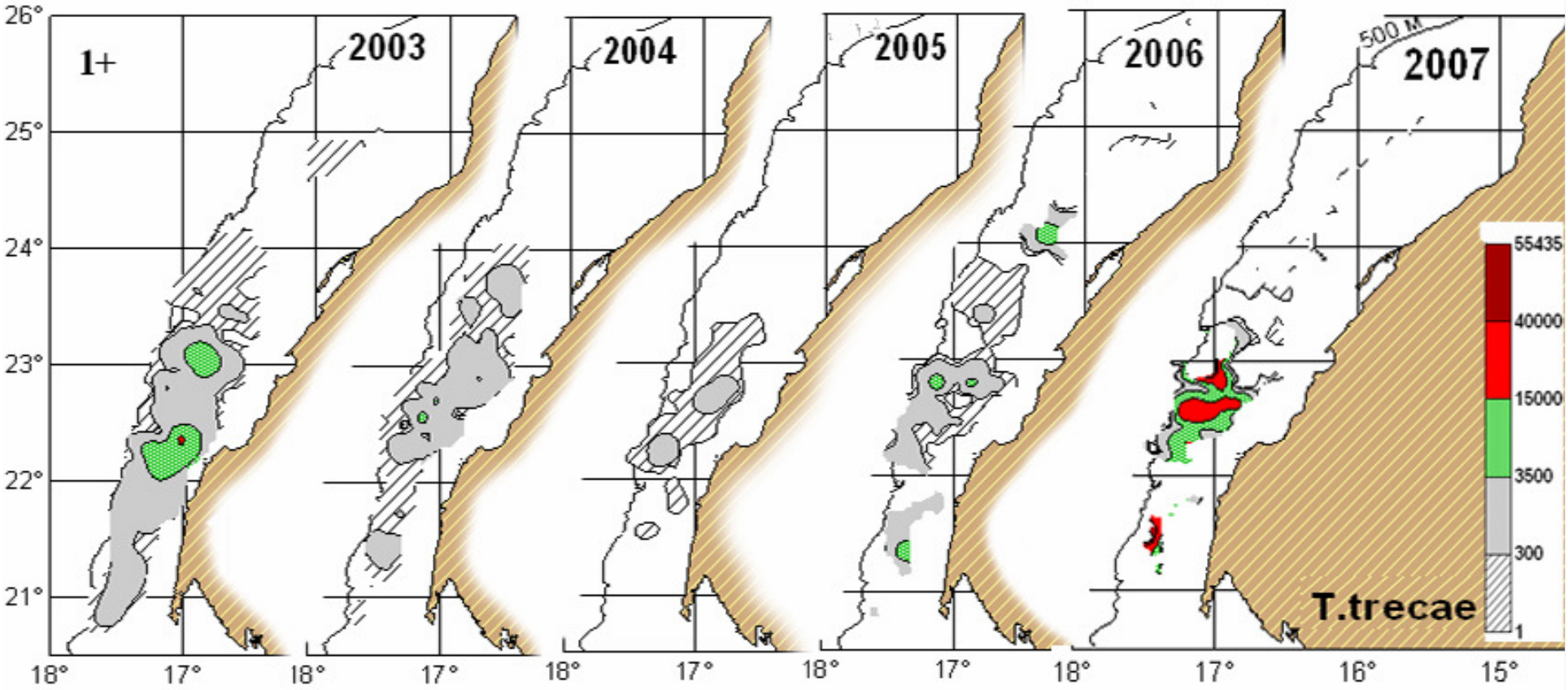

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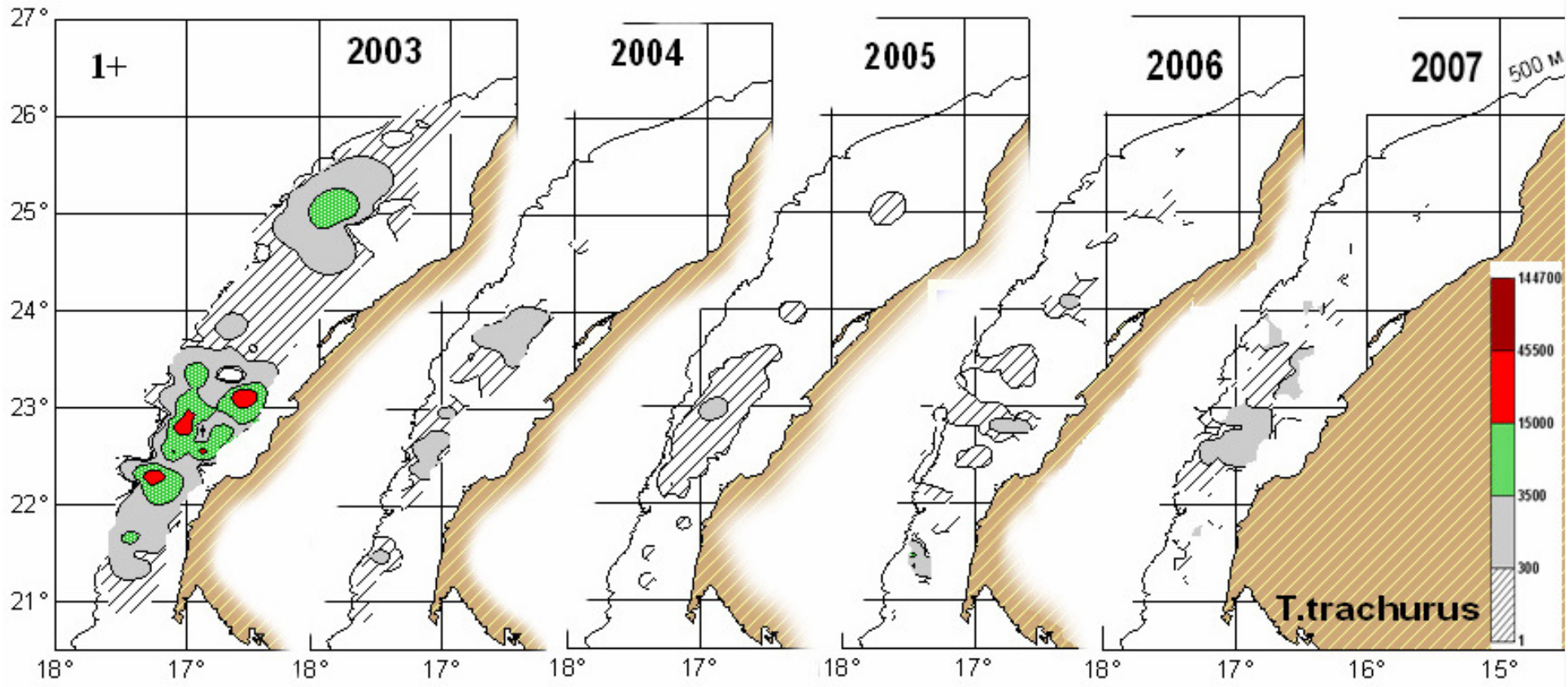
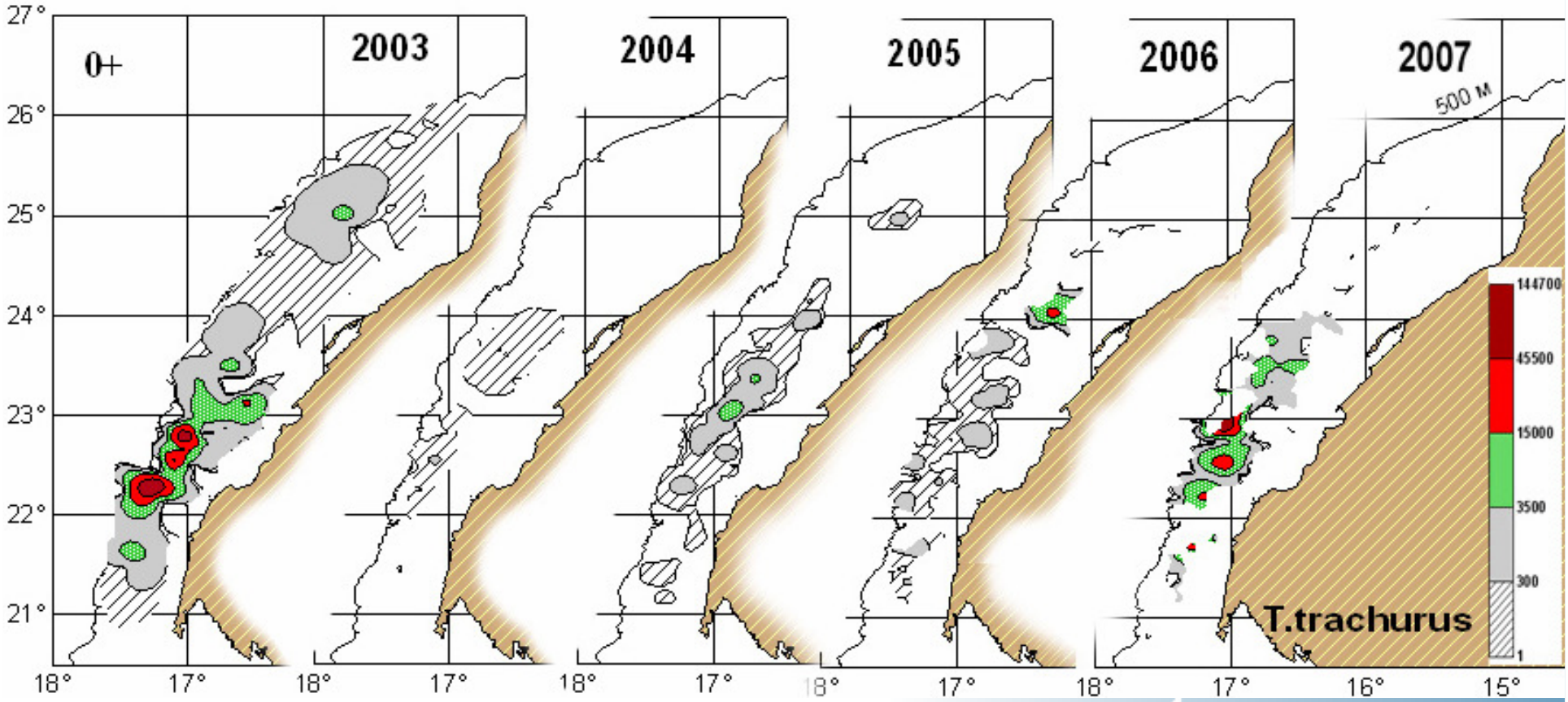
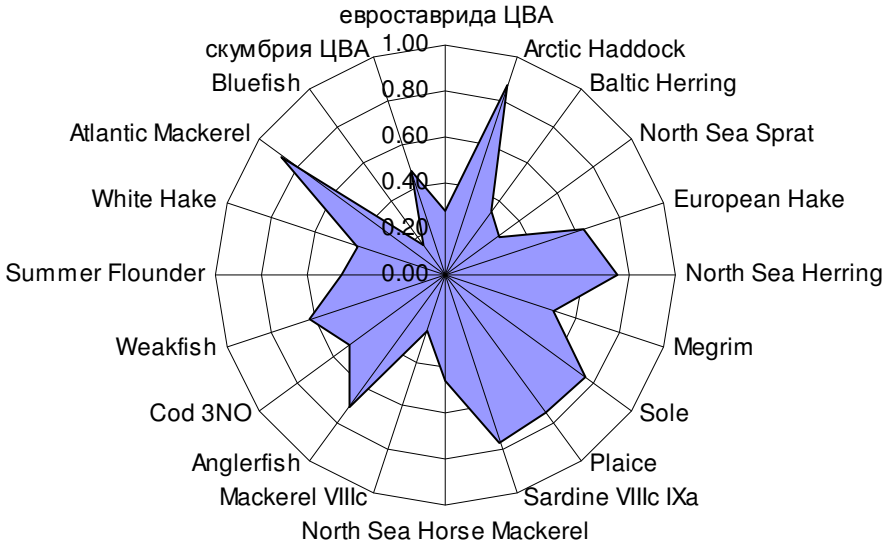
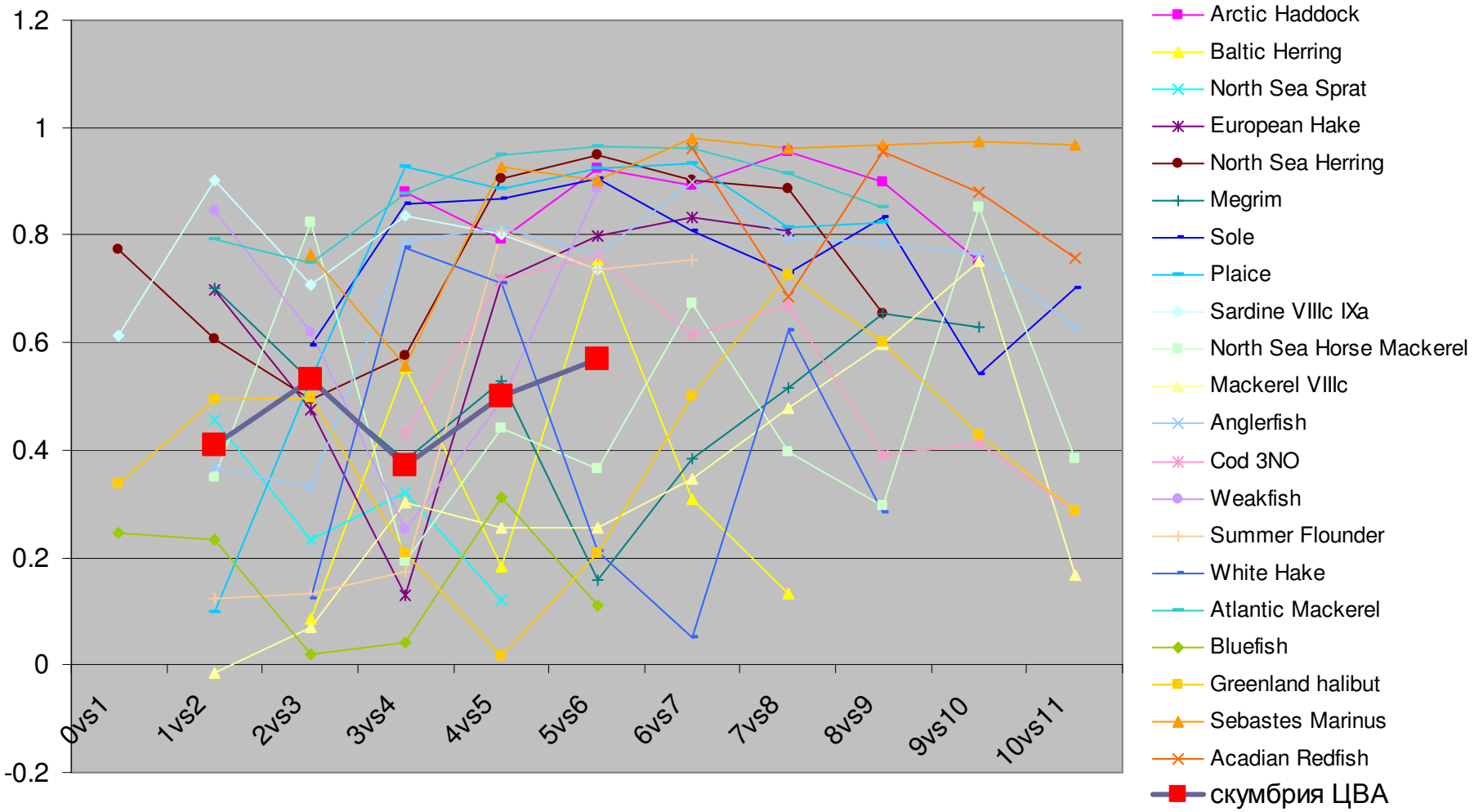


Young fish surveys




евроставрида ЦВА
Arctic Haddock
Baltic Herring
North Sea Sprat
European Hake
North Sea Herring
Megrim
Sole
Plaice
Sardine VIIIc IXa
North Sea Horse Mackerel
Mackerel VIIIc
Anglerfish
Cod 3NO
Weakfish
Summer Flounder
White Hake
Atlantic Mackerel
Bluefish
скумбрия ЦВА
1.00
0.80
0.60
0.40
0.20
0.00

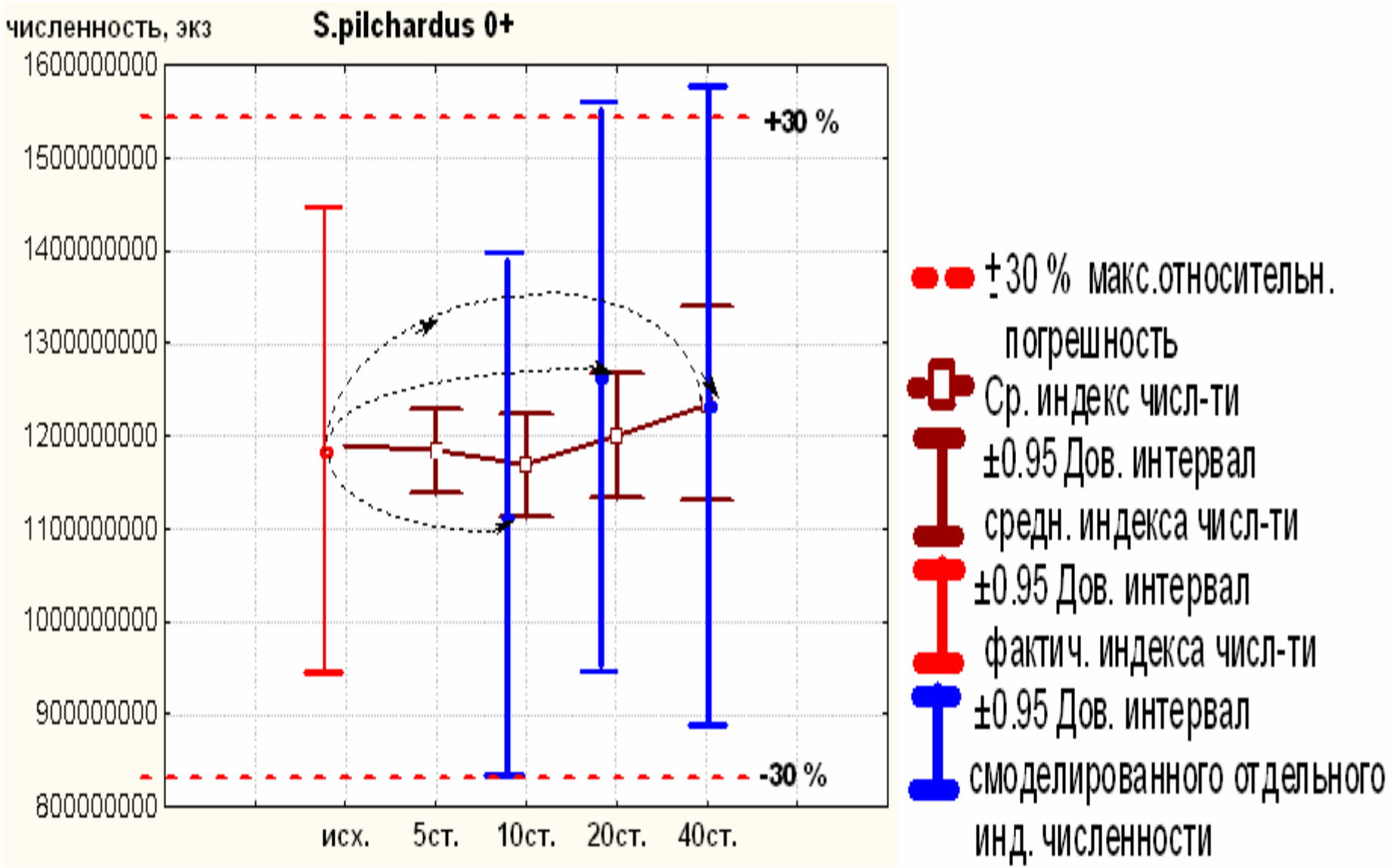
Valeurs du coefficient de corrélation linéaire entre les captures estimées d'âges consécutifs des mêmes cohortes



Консистен-ть данных при ВПА

					ICES	NAFO									
	0vs1	1vs2	2vs3	3vs4	4vs5	5vs6	6vs7	7vs8	8vs9	9vs10	10vs11	11vs12	12vs13	13vs14	MODEL
евроставрида ЦВА		0.194	0.352	0.195	0.349	0.169	0.395								
Arctic Haddock				0.880	0.792	0.925	0.893	0.955	0.897	0.751					XSA
Baltic Herring			**0.087**	0.554	**0.182**	0.755	**0.308**	**0.133**							ICA
North Sea Sprat		0.456	**0.234**	**0.322**	**0.119**										CSA
European Hake		0.699	**0.475**	**0.129**	0.717	0.799	0.834	0.806							XSA
North Sea Herring	0.773	0.607	0.494	0.575	0.905	0.948	0.901	0.887	0.655						ICA
Megrim		0.700	0.528	**0.382**	0.527	**0.157**	**0.385**	0.515	0.652	0.628					XSA
Sole			0.595	0.858	0.866	0.905	0.807	0.729	0.834	0.541	0.701				XSA
Plaice		**0.098**	0.530	0.928	0.886	0.923	0.932	0.813	0.823						XSA
Sardine VIIIc IXa	0.613	0.902	0.707	0.834	0.803	0.735									AMCI
North Sea Horse Mackerel		**0.351**	0.822	**0.194**	**0.439**	**0.364**	0.672	**0.396**	**0.295**	0.851	**0.385**	0.662	0.798	**-0.266**	N/A
Mackerel VIIIc		**-0.013**	**0.071**	**0.304**	**0.256**	**0.255**	**0.348**	0.478	0.598	0.751	**0.166**	**-0.134**	**0.217**	**-0.003**	ICA
Anglerfish		**0.369**	**0.330**	0.789	0.815	0.762	0.899	0.794	0.785	0.765	0.629	0.853			XSA
Cod 3NO				**0.430**	0.717	0.760	0.613	0.668	**0.389**	**0.412**	**0.285**	**0.498**	**0.353**		ADAPT
Weakfish		0.845	0.620	**0.252**	**0.490**	0.887									ADAPT
Summer Flounder		**0.124**	**0.133**	**0.173**	0.806	0.736	0.754								ADAPT
White Hake			**0.123**	0.775	0.710	**0.212**	**0.050**	0.624	**0.285**						ASPIC
Atlantic Mackerel		0.791	0.747	0.876	0.950	0.966	0.961	0.914	0.852						ADAPT/ASA
Bluefish	**0.246**	**0.235**	**0.020**	**0.040**	**0.372**	**0.110**									ADAPT/ASA
скумбрия ЦВА		**0.410**	**0.530**	**0.370**	**0.500**	**0.570**									
	5vs6	6vs7	7vs8	8vs9	9vs10	10vs11	11vs12	12vs13	13vs14	14vs15	15vs16	16vs17	18vs19	19vs20	MODEL
Greenland halibut	**0.337**	**0.493**	**0.498**	**0.207**	**0.078**	**0.208**	**0.499**	0.725	0.600	**0.429**	**0.286**	**0.160**			GLM
Sebastes Marinus			0.764	0.555	0.928	0.902	0.981	0.963	0.966	0.974	0.969	0.973	0.952	0.949	Bormicor
Acadian Redfish							0.960	0.684	0.954	0.880	0.756	0.808	0.587	0.908	ASPIC

Возможное измен-е точности оценки чис-ти при сокращении съемки.



Годы с услов, аналогичными ожидаемым в 9

По ТПО:

в Саха 1 кв– 2001, 2005, 2007 ; 2 кв – 1999, 2001, 2002; 3 кв. – 2000, 2001, 2003, 2005; 4 кв – 1999, 2000, 2002, 2007

в Мавр: 1 кв – 1994, 1999, 2003; 2 кв – 1992, 2000, 2002; 3 кв – 1994, 2002, 2007; 4 кв – 1988, 1993, 2003

По СМФ:

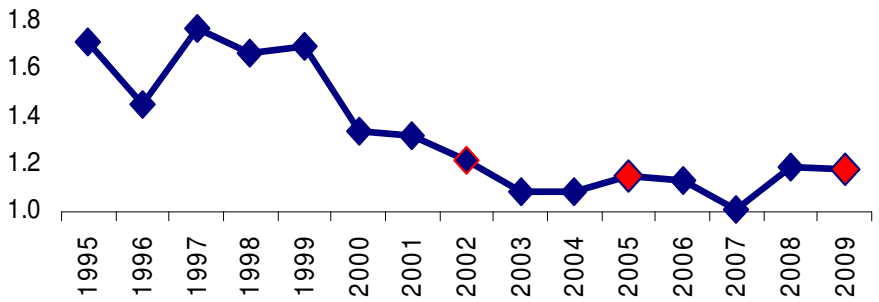
Положение зимой 10°-12°с.ш.
Летом 18°-20°с.ш.
Т.е. аналогично 2005

Анало по соотн биомас – **2005, 2000**

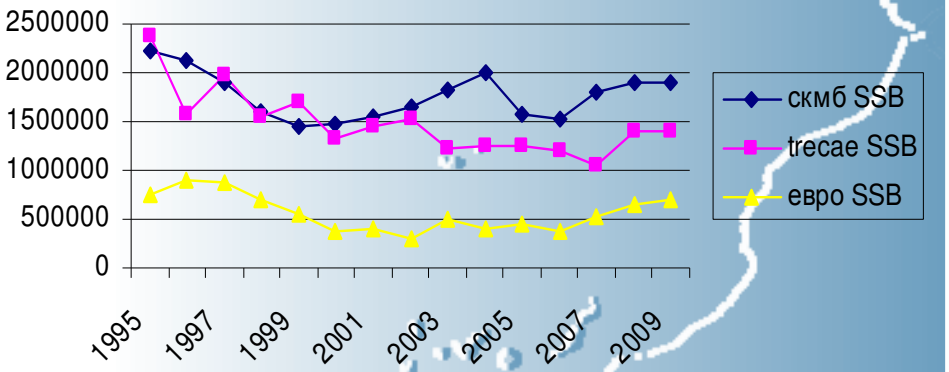
Анал по структ запасов: скумб, ставриды – **2005**

Поиск года-аналога по соотношению биомасс

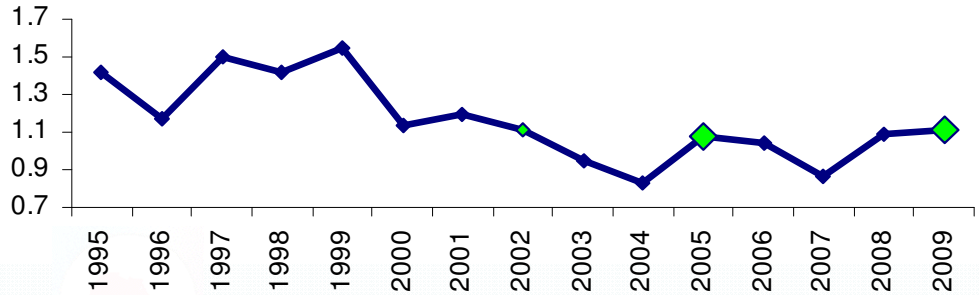
Отношение биомассы ставрид к биомассе скумбрии



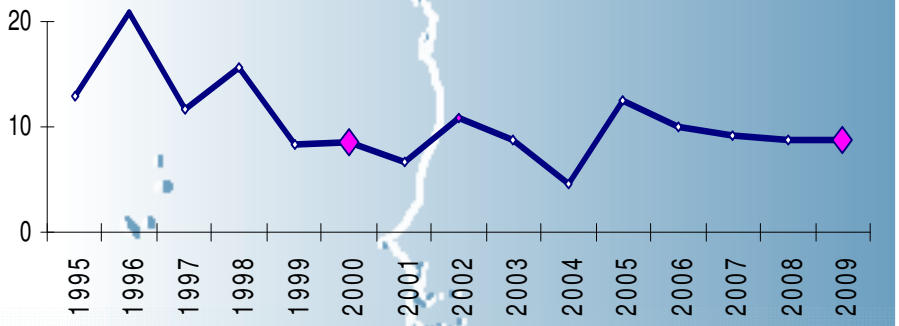
Нерестовая биомасса



Отношение суммы нерестовых биомасс ставрид к нерестовой биомассе скумбрии

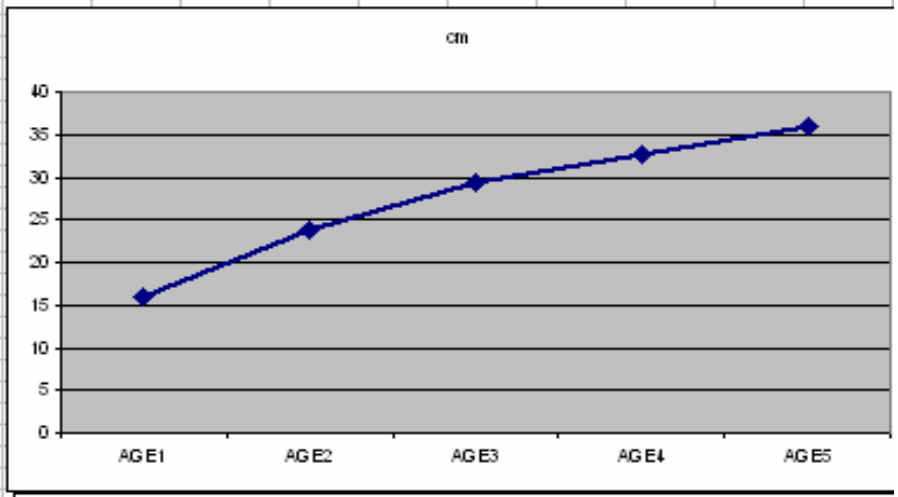


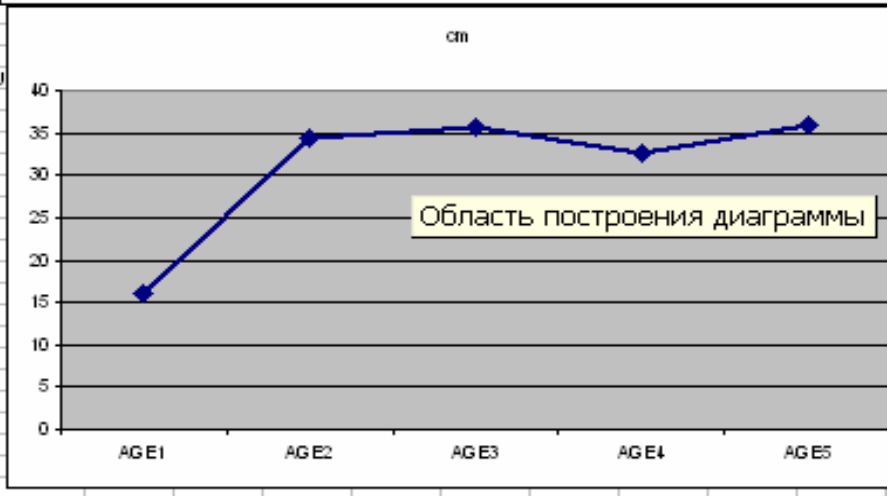
производительность лова сардинелл



S. aurita. Age-length key 3qu2005

34	Species: Sardinella aurita						
35	LNGTH						
36		AGE1	AGE2	AGE3	AGE4	AGE5	TOTAL NUM
37	13.5	5					5
38	14.5	4					4
39	15.5	5					5
40	16.5	5					5
41	17.5	5					5
42	18.5	4					4
43	19.5						
44	20.5		1				1
45	21.5		8				8
46	22.5		10				10
47	23.5		5				5
48	24.5		11				11
49	25.5		9	1			10
50	26.5		6	6			12
51	27.5			12			12
52	28.5			14			14
53	29.5			22			22
54	30.5			13	6		19
55	31.5			12	11		23
56	32.5			2	22		24
57	33.5				13		13
58	34.5				8	1	9
59	35.5					4	4
60	36.5					4	4
61	Total num	28	50	82	60	9	229
62	cm	15.96429	23.86	29.29268	32.6	35.83333	
63							
64	LNGTH						
65		AGE1	AGE2	AGE3	AGE4	AGE5	TOTAL NU
66	13.5	5					5
67	14.5	4					4
68	15.5	5					5
69	16.5	5					5
70	17.5	5					5
71	18.5	4					4
72	19.5						
73	20.5		1				1
74	21.5		8				8
75	22.5		10				10
76	23.5		5				5
77	24.5		11				11
78	25.5		9	1			10
79	26.5		26	26			12
80	27.5			12			12
81	28.5			14			14
82	29.5			22			22
83	30.5			13	6		19
84	31.5			12	11		23
85	32.5			2	22		24
86	33.5				13		13
87	34.5				8	1	9
88	35.5					4	4
89	36.5					4	4
90	Total num	28	50	82	60	9	229
91	cm	15.96429	34.42	35.7561	32.6	35.83333	





Sampl_05 | %Mauritania | %Morocco | Sa05m3n | Sa05m3p | Sa05s3n | Sa05s3p | Sa05s4