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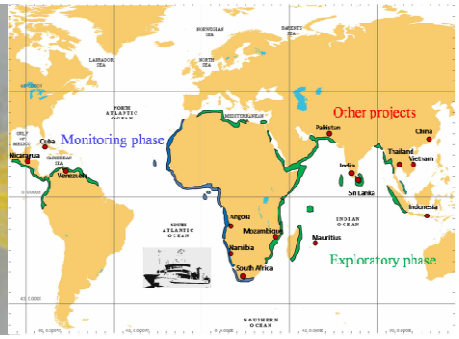
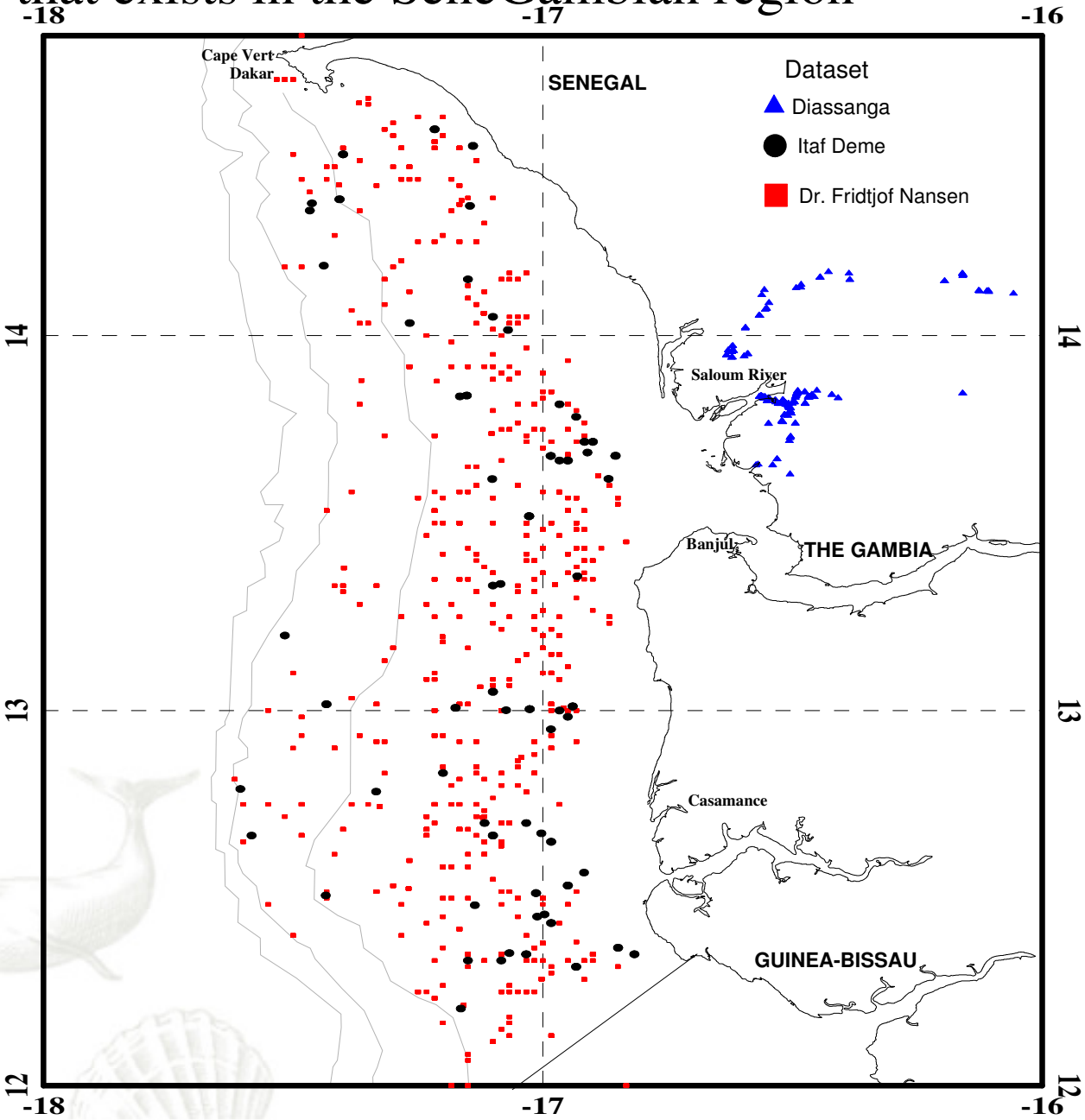


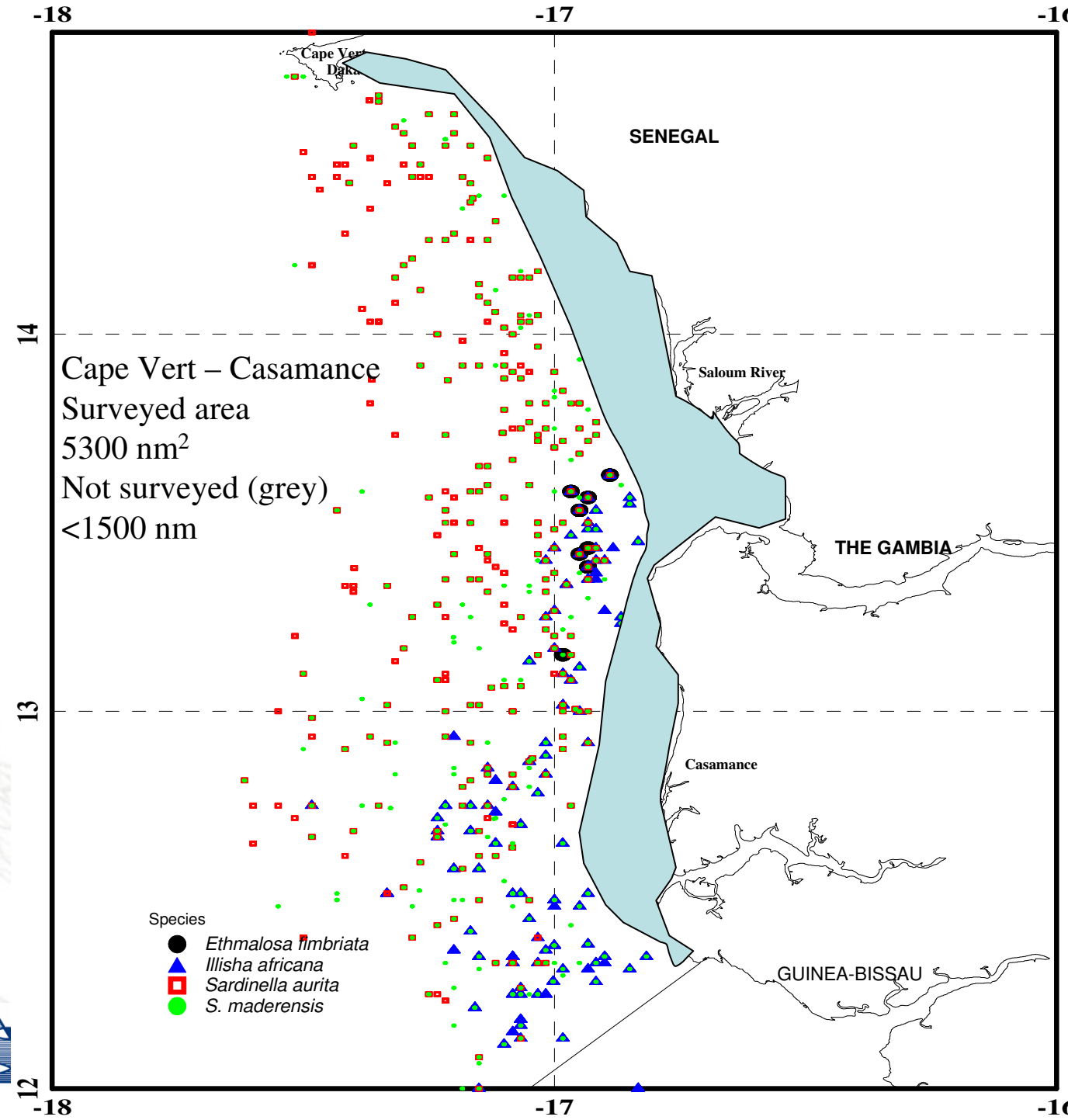
Distribution of Clupeid species on the shelf in the southern part of Senegal and The Gambia

A critical look at the surveys conducted by Dr. Fridtjof Nansen

J-O **Krakstad**, A **Sarre**, I **Sow** and E M **Mbye**

Three datasets illustrating typical survey data that exists in the SeneGambian region

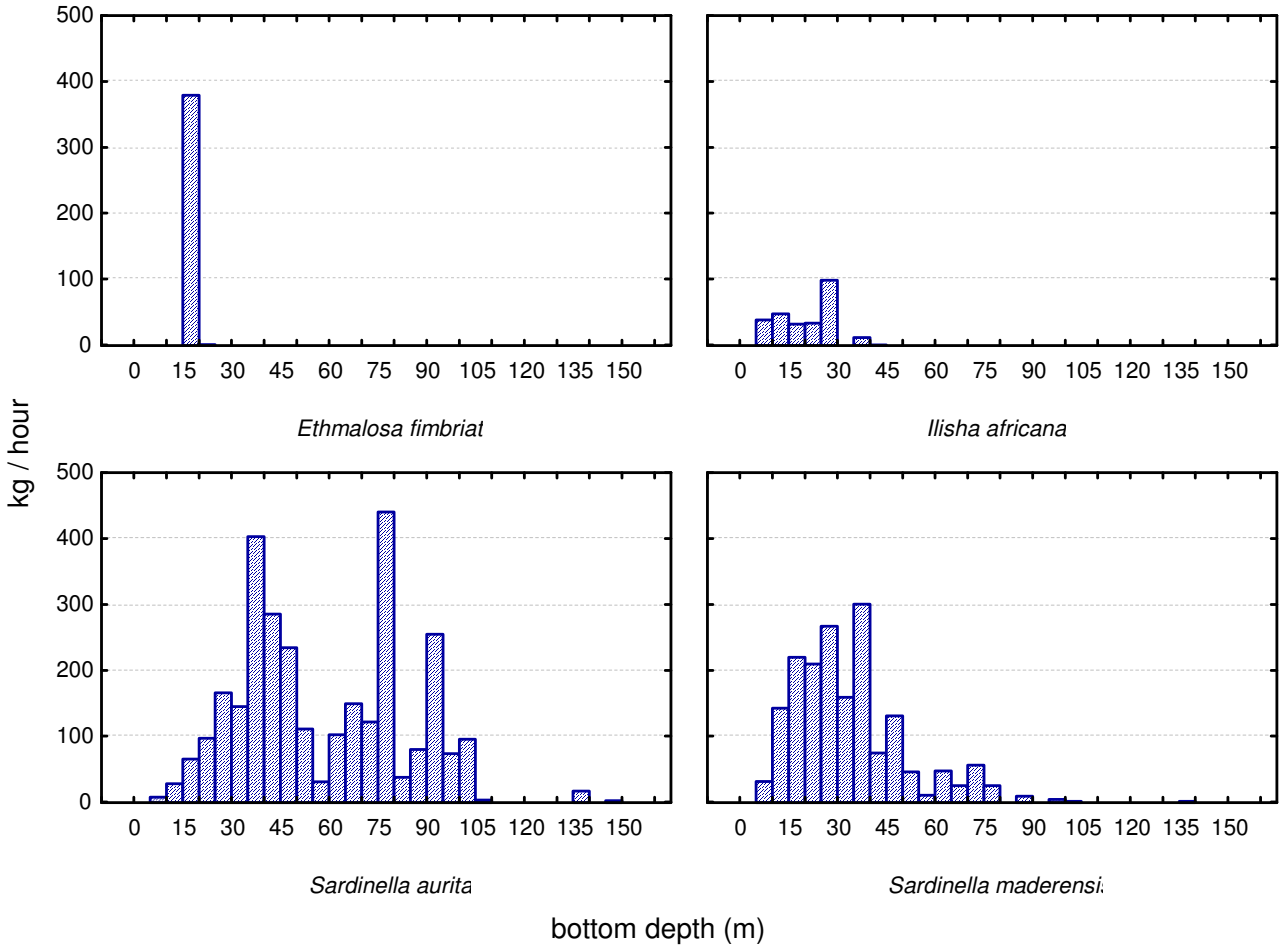




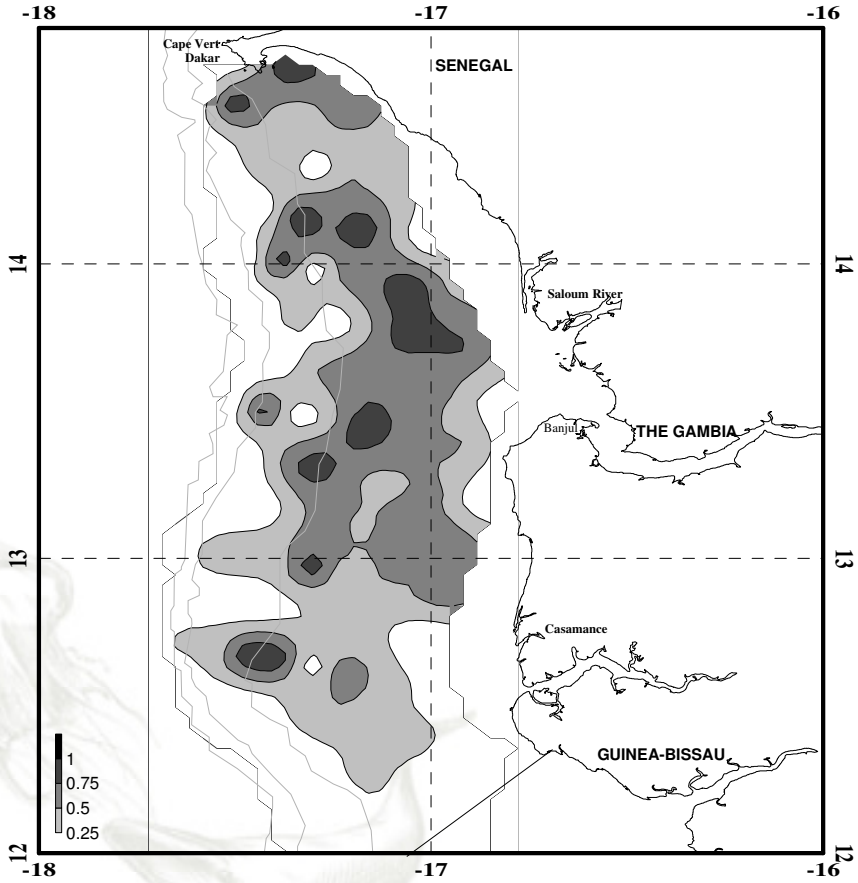
Species composition from trawls conducted with DFN 1981-2006

Typical surveys covers depth regions between 15 – 500 m

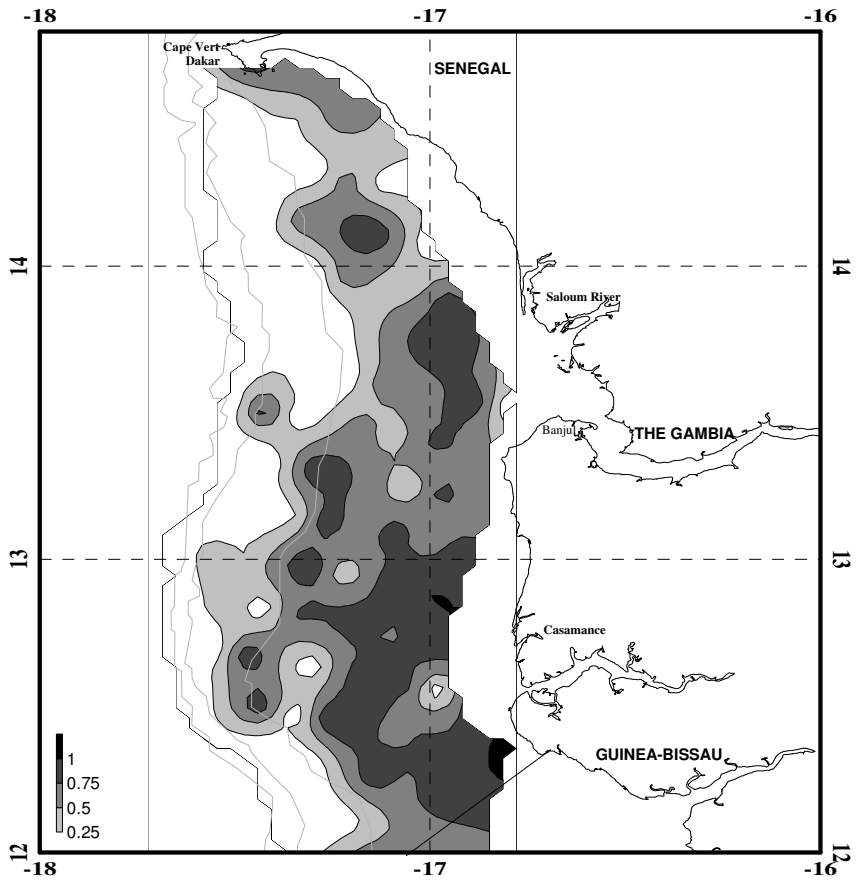
Depth distribution of the four clupeoids, *Ethmalosa fimbriata*, *Iisha africana*, *Sardinella aurita* and *S. maderensis* described as average (relative) Catch/h



Distribution of the two sardinella species *S. aurita* and *S. maderensis* extrapolated from trawl catches within the region between 1981 – 2006

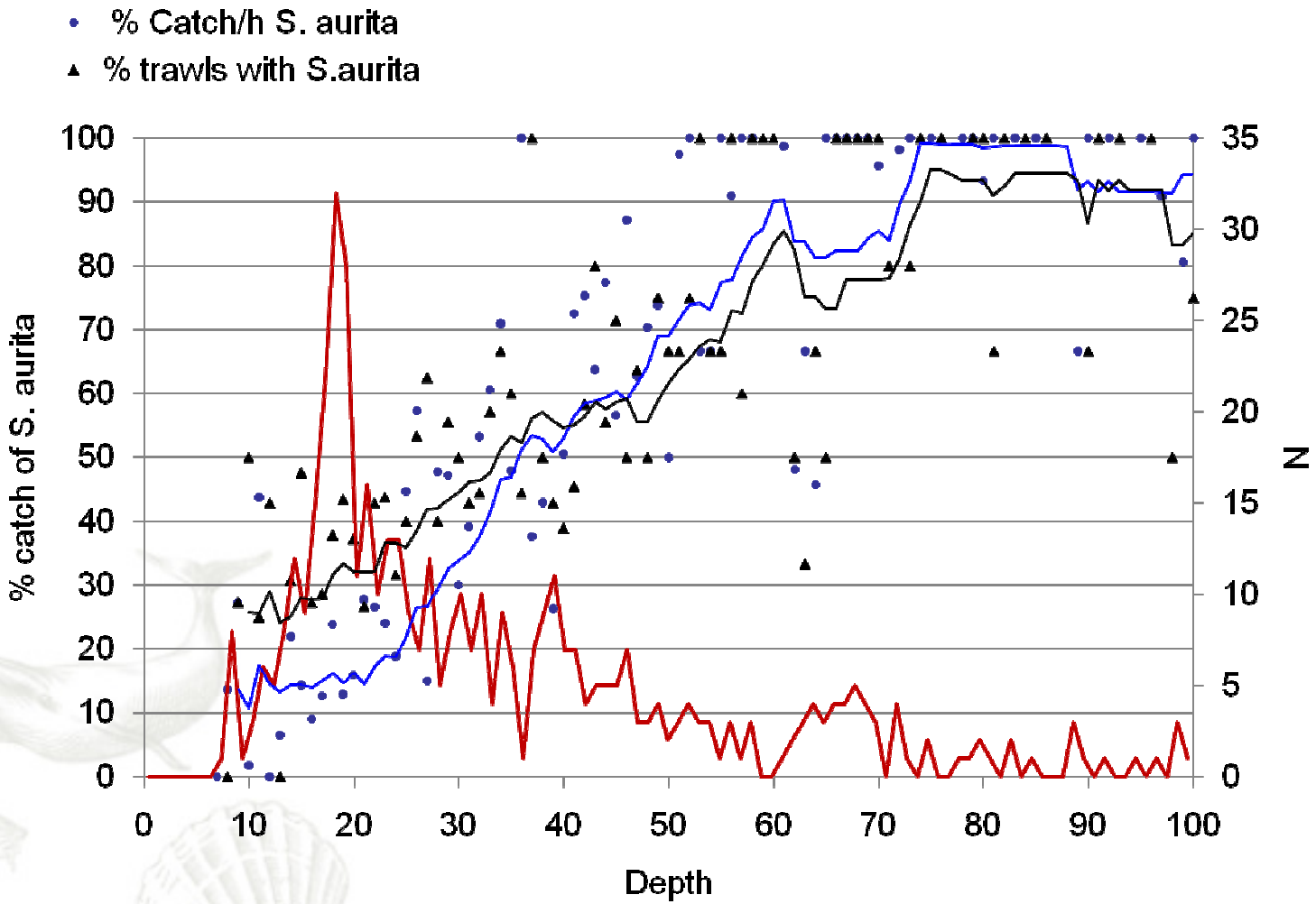


S.aurita

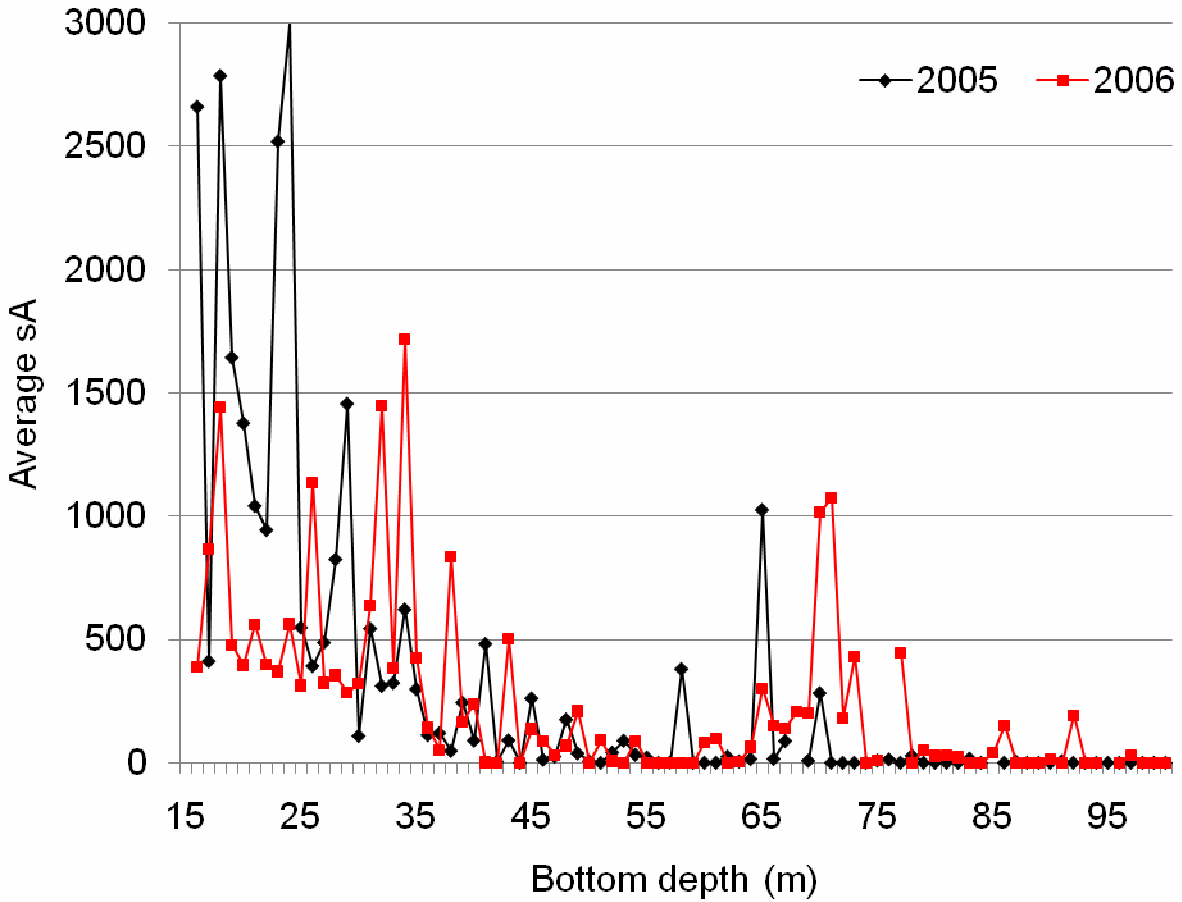


S.maderensis

Relative proportion of the *S. aurita* in comparison with *S. maderensis* in catches from different depth regions, and the number of trawls containing sardinella within each region

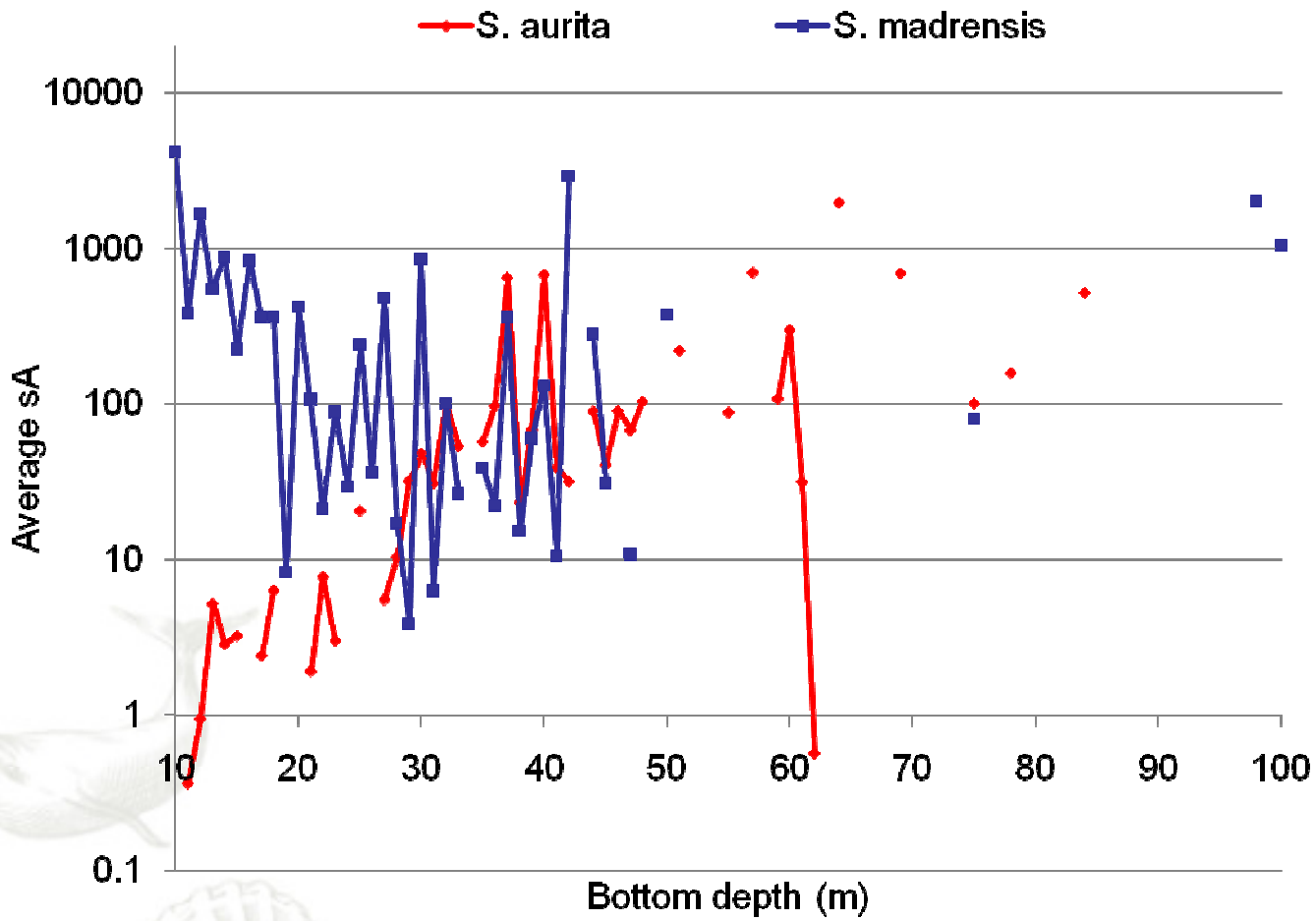


Average s_A recorded with the DFN between Cape vert - Casamance and allocated to the sardinella species per 1 m depth regions, 15-100 m depth from two surveys in October 2005 and October 2006.

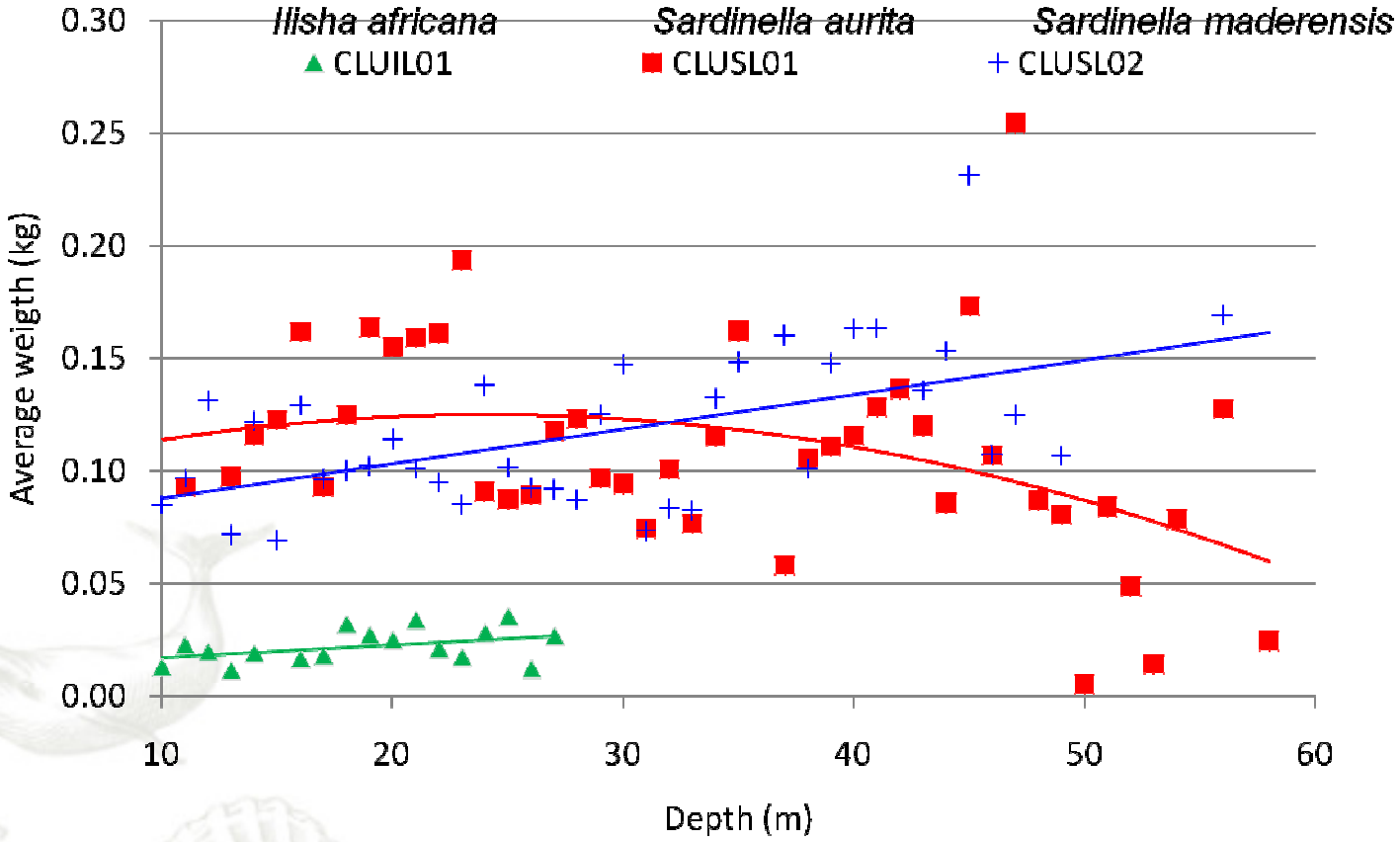


Average s_A recorded by the ID in 2007 between Cape Vert - Casamance per 1 m depth regions 10 – 100 m depth. Recorded s_A values are split directly between the two sardinella species.

Note: logarithmic y scale, 0-values excluded



Average weight of fish in individual trawls by the Dr. Fridtjof Nansen in the period 1981- 2006 between Cape Vert - Casamance per 2 m depth regions 10 – 70 m depth.



Summary of observations

•As expected the distribution area of *Illisha africana* and *Ethmalosa fimbriata* are not covered during the Dr. Fridtjof Nansen (DFN) surveys and consequently these surveys can not be used for abundance estimates of these two species

•The *Ethmalosa fimbriata* is distributed in the shallow costal waters < 15 m bottom depth and are not picked up to any extent by the DFN surveys. Inshore distribution are far into the inverse estuary of the Saloum river (60 nm inland from the coast) and The Gambia river

•The *Ilisha africana* is distributed offshore to around 40 m bottom depth and inshore into the river mouth

•None of the two species are picked up in the DFN surveys between Saloum River and Cape Vert

•The distribution area of *Sardinella maderensis* and *S. aurita* are mainly covered during the DFN surveys. However *S. maderensis* have a distribution inshore and south of the survey area and are consequently underestimated ….But to what extent?

•The abundance of *S. maderensis* is increasing towards the inner limit of the survey area observed from increasing s_A towards the coast and decreasing proportion of *S. aurita* in the catches. The largest catches of *S. maderensis* was made between 20 – 40 m depth decreasing inshore.

•The *S. aurita* is distributed deeper and further north than *S. maderensis* with a modal peak in catch size around 35 m depth, and another increases deeper than 65 m towards the shelf break. In this depth region only occasional mixing with *S. maderensis* occur

•Average fish size decrease with decreasing depth for *S. maderensis*, the picture is more complex for *S. aurita* with decreasing average fish size deeper than 50 m

Biomass estimates for the two sardinella species per region for surveys conducted between St. Louis and Casamance in October each year between 2000 -2006.

	S. aurita					*S.maderensis*					
Year	St. Louis-C. Vert	C. Vert-Gambia	The Gambia	Casa-mance	Total Senegal -The Gambia	St. Louis-C. Vert	C. Vert-Gambia	The Gambia	Casa-mance	Total Senegal -The Gambia	Reference
2006	24	113	19	53	209	13	230	100	160	504	Krakstad et al, 2006
2005	0	191	73	19	282	8	148	188	201	545	Krakstad et al, 2005
2004	25	108	21	117	270	39	154	107	249	548	Krakstad et al, 2004
2003	1	16	36	68	122	6	126	203	140	475	Krakstad et al, 2003
2002	0	48	112	62	222	0	172	92	428	692	Toresen et al ,2002
2001	0	132	33	4	169	2	159	21	83	264	Toresen et al ,2001
2000	0	19	23	12	54	0	95	58	94	248	Toresen et al, 2000

How do we survey shallow water areas

The North West African region has several shallow areas of high biological importance not surveyed on a regular basis. Banc D'Argain in Mauritania and the inner shelf between Cape Vert and Casamance are among the most important and deserves higher attention. These are to shallow for large research vessels

SOLUTIONS

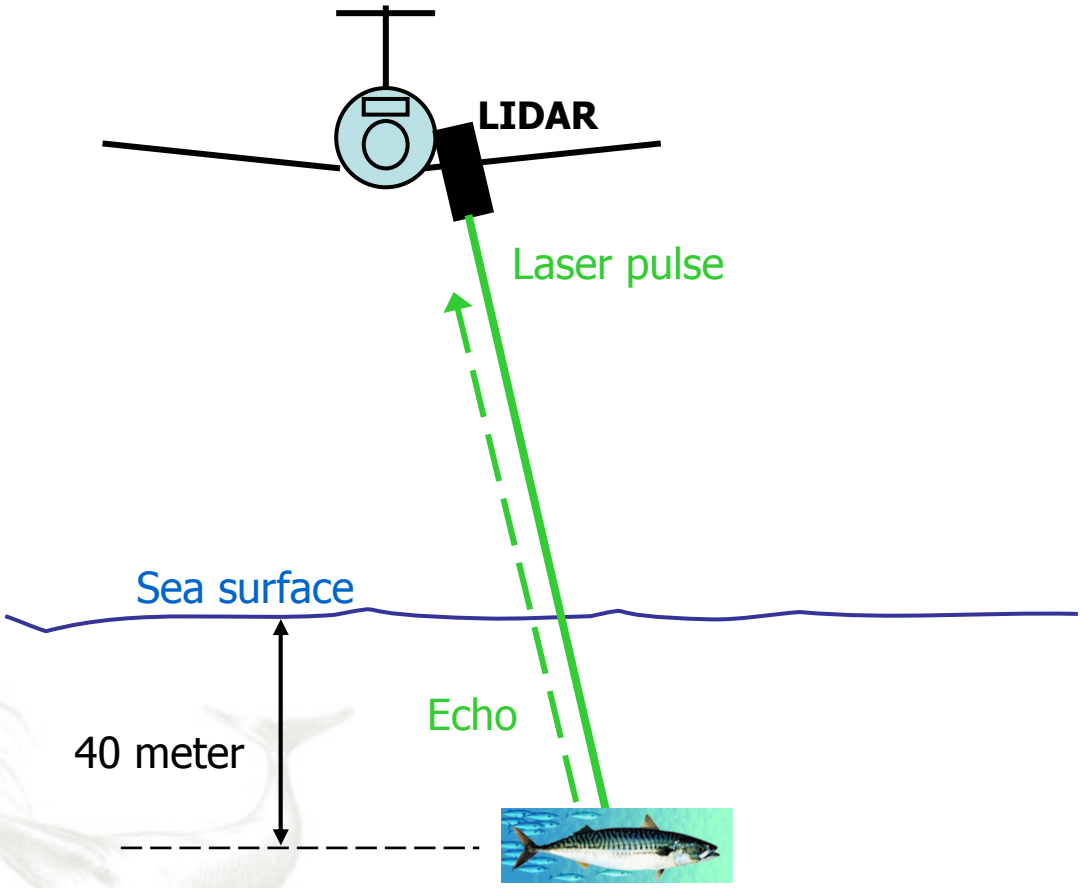
Either

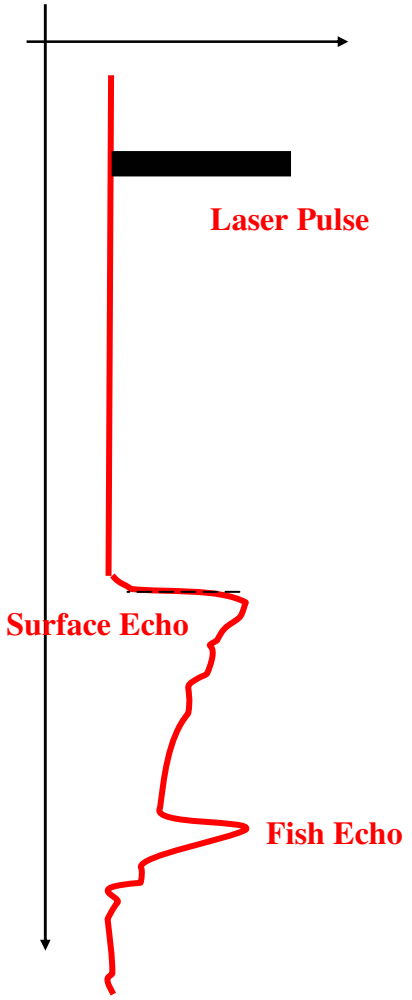
•Arial surveys with LIDAR, a technique using laser from airplanes in much the same way as an echo sounder, combined with sampling from small boats

Or

Traditional acoustic sampling with small boat inside of the area covered by the larger research vessel and use of underwater camera equipment / local fishing vessels for identification of targets.

Lidar


LIDAR
Laser pulse
Sea surface
40 meter
Echo


Laser Pulse
Surface Echo
Fish Echo

LIDAR is an economical alternative that has the advantage of surveying large areas fast and with little crew.

•It may cover the shallow water coastal zone to a maximum depth of around 40 m but have no minimum depth limitation

•Data on bottom depth and roughness may be collected simultaneously

•Additional data on number and type of fishing vessels may be additional information

•It may be an economical alternative to surveys with vessels

•In the same way as acoustic data, recordings needs to be verified, for eksample with catches from local canoes

Thank you