

**Report of 2<sup>nd</sup> for MEDiterranean Acoustic Surveys  
(MEDIAS)**

in the framework of European Data Collection Regulation

Palma 1–3 June 2009

Steering Committee Report

The current meeting took place in Palma between 1 and 3 /6/2009. The aim of the meeting was a) to improve the common Protocol (as adapted in the first 2008 MEDIAS meeting that was held in Athens) for the Pan-Mediterranean Pelagic survey (MEDIAS) which is incorporated in the DCR framework, b) coordinate the first MEDIAS survey of 2009, and c) improve the harmonization of survey in the different regions through a workshop on the survey design.

Participants in the meeting were representatives from all European Union countries involved in acoustic surveys in the Mediterranean (i.e. Greece, Italy, Slovenia, Malta, France and Spain). In this 2<sup>nd</sup> MEDIAS meeting scientists from the new EU countries operating in the Black Sea, i.e. Bulgaria and Romania were invited to participate and Bulgaria participated with two representatives. In addition a scientist from Croatia that covers by acoustic survey the eastern part of the Adriatic Sea was participated as an observer (See list of participants ANNEX I).

During the first day the participants adopted the agenda of the 2<sup>nd</sup> MEDIAS Meeting (See ANNEX II). Dr. A. Machias informed the participants regarding the unavailability of Dr. Antonio Cervantes from the Directorate General for Fisheries and Maritime Affairs to participate the meeting and the reasons for this.

According to the agenda in the first day of the meeting the coordination of the first MEDIAS survey as well as the improvement on the MEDIAS protocol was discussed, while in the second and third day a workshop took place regarding the geostatistical analysis of past acoustic surveys as a first step to improve the harmonization of the acoustic survey design.

#### **A. Surveys held in 2008 and MEDIAS protocol**

In the first day of the meeting a presentation of the 2008 acoustic surveys in each area was shown in relation to the common protocol in order to define the progress done so far as well as to define the points needed further harmonization. Dr. M. Iglesias presented the Iberian coast acoustic survey, Dr. J.L. Bigot presented of the Gulf of Lions acoustic survey, Dr. A. De Felice presented the Adriatic acoustic survey in the Italian and Slovenian cost, while Dr. Ticina presented the Adriatic acoustic survey in the Croatian coast. Furthermore, Dr. A. Bonanno presented the Sicilian channel and Maltese waters acoustic survey, Dr. A. Machias presented the Aegean Sea survey as well as the planned future extension of the survey in the eastern Ionian Sea. Finally Dr. G. Petrov Gutoranov presented the status of the small pelagics fishery in the Bulgaria as well as the 2009 planned acoustic survey in the Black Sea coasts of Bulgaria and Romania. All the presentations are included in ANNEX IV. Table 1 summarizes the DCR surveys held in 2008 according to the common protocol as adopted in the 1<sup>st</sup> MEDIAS coordination meeting as well as the Croatian acoustic survey. Furthermore, an analytical description of the methodology followed in the Croatian survey similarly to the presentation of the past acoustic surveys from other regions that was done in the 1<sup>st</sup> MEDIAS coordination meeting, is presented in Annex III.

During this session, a first discussion on the harmonization of the different protocols was done.

**Table 1. Summary of the 2008 acoustic surveys.**

<b>Survey Identity</b>	<b>Greece Aegean Sea</b>	<b>Italy – Slovenia Adriatic Sea</b>	<b>Malta – Sicily channel</b>	<b>Italy – Sicily channel</b>	<b>France - Gulf of Lions</b>	<b>Spain - Iberian Coast</b>	<b>Croatia</b>
<b>Geographic area</b>	northern Aegean Sea	Western side (Italy) + Slovenia	Malta	Strait of Sicily	Gulf of Lions	Spanish Mediterranean Sea (continental shelf)	Adriatic Sea, Eastern part
<b>GSA area</b>		17 - 18	15	16 – South of Sicily		GSA01/GSA06	17 – Eastern part
<b>Size of Area to be covered (NM<sup>2</sup> / Km<sup>2</sup>)</b>	9 000 NM <sup>2</sup> / 31.000 Km <sup>2</sup>	About 15000 nm <sup>2</sup> = 51500 km <sup>2</sup>	1170 nm <sup>2</sup>	2680 nm <sup>2</sup>	3 300 NM <sup>2</sup>	23742 Km2/	Approx. 13,580 nm <sup>2</sup> / 46 580 km <sup>2</sup>
<b>Days at sea</b>	40	41	5	10	20	31	30
<b>Vessel</b>	RV “PHILIA”	RV “G Dallaporta”	RV “G Dallaporta”	R/V “G. Dallaporta”	RV «L’EUROPE »	RV “CORNIDE DE SAAVEDRA”	BIOS (2008) - BIOS DVA (2009)
<b>Vessel length</b>	26.1 m	35m	35.00m	35.00 m	30 m	67 m	27 m - 37 m
<b>Vessel HP</b>	2 x 340 HP	1000 HP	1000 HP	1000 HP	800 HP	2000 HP	300 HP - 1200 HP
<b>Period of survey</b>	10/6 -15/7	July - September	14 – 19 August	04 – 13 August	July	November-December	September
<b>Echo sounder parameters</b>							
<b>Echo sounder</b>	Biosonic DTX (Split beam)	Simrad EK60 (Split beam)	Simrad EK60 (Split beam)	Simrad EK60 (Split beam)	Simrad ER60 since 2006 (Split beam)	Simrad EK60 (Split beam)	Simrad EK60 (Split beam)
<b>Frequency for assessment (kHz)</b>	38	38	38	38	38	38 kHz	38kHz
<b>Complementary frequencies (kHz)</b>	120	120, 200	120, 200	120, 200	70, 120, 200	18, 70, 120 & 200 kHz	None
<b>Pulse duration (ms)</b>	1ms	1 ms	1 ms	1 ms	1.0	1 ms	1 024 ms
<b>Beam Angles (degrees)</b>	10.2	7	Athw. Beam Angle = 7.0 deg Alog. Beam Angle = 7.01deg	Athw. Beam Angle = 7.0 deg Alog. Beam Angle = 7.01deg	7.5	18: 11°x11°; 38: 7°x7°; 70: 7°; 120: 7°; 200: 7°	7°x7°
<b>Ping rate</b>	Maximum depending on depth	maximum	Maximum depending on depth	Maximum depending on depth	0.4/s to 1.0	Maximum	Maximum
<b>Calibration (No per survey)</b>	1	1	1	1	1	1	1 (before survey)
<b>Threshold for</b>	-80	-80	No limit with the	No limit with the	-80	No limit with raw	-70 dB

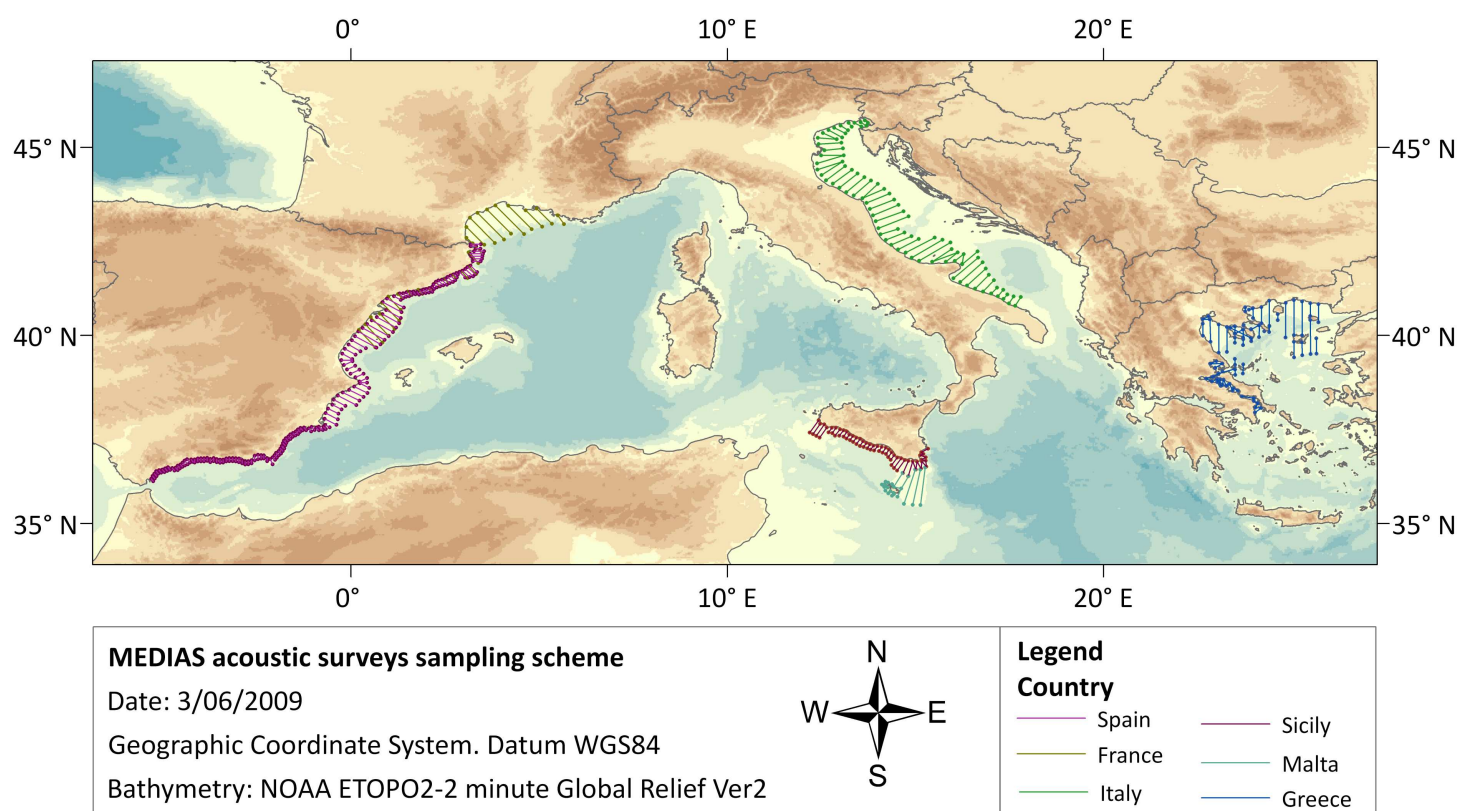
Survey Identity	Greece Aegean Sea	Italy – Slovenia Adriatic Sea	Malta – Sicily channel	Italy – Sicily channel	France - Gulf of Lions	Spain - Iberian Coast	Croatia
acquisition (dB)			raw data	raw data		data	
Threshold for assessment (dB)	-70	-70	-60	-60	-60	-60 dB	-60 to -70 dB
Survey design							
Transects design	Perpendicular to bathymetry, zig-zag inside the gulfs	Parallel grid, perpendicular to the coastline/bathymetry	Parallel transects and perpendicular to bathymetry	Parallel transects and perpendicular to bathymetry	Perpendicular to the coastline/bathymetry	Perpendicular to the coast	<ul style="list-style-type: none"> <li>Adapted to topography;</li> <li>Parallel, perpendicular to bathymetry</li> </ul>
Inter-transect distance (NM)	10 NM	10 NM and 8 NM in narrow shelf areas	4-8 NM	4-8 NM	12 NM	8 NM in wide continental shelf, 4 NM in narrow shelf	10 NM
Time of day for acoustic sampling	Day time	Day time & night time	Day time & night time	Day time & night time	Day time	Day time	Day time & night time
EDSU (NM)	1 NM	1 NM	1 NM	1 NM	1 NM	1 NM	1 NM
Distance from the coast according to the Bottom depth (min, m)	10 m	10 m	10 m	10 m	10 m	30 m	10 m
Echo sounding depth (min, m)	5	3.5	7	7	10	5	6-10 (usually 7 m)
Echo sounding depth (max, m) recording.	230	250	300	300	200	200-220	200 (260m – Pomo Pit)
Vessel speed	7 kn	9-10 kn	9-10 kn	9-10 kn	8 kn	10 kn	8-9 kn
Software for analysis	Echoview Myriax Ltd	Echoview Myriax Ltd,	Echoview Myriax Ltd	Echoview Myriax Ltd	Movies+	Echoview Myriax Ltd	BI60
File format	*.ev, *.hac	*.hac, *.raw, *.ev, *.ek5	*.raw, *.ev, *.hac	*.raw, *.ev, *.hac	hac	*ev; *.raw	*.raw
Inter - transect	Acoustic energy in the inter-transect track is not taken into account	Not considered for biomass estimation	Acoustic energy in the inter- transect track not taken into account	Acoustic energy in the inter-transect track not taken into account	not taken into account	Acoustic energy in the inter-transect track not taken into account	Used in assessment (2008); Not used in assessment (2009)
Applied TS (dB)	Sardine -72.6 Anchovy -71.2	Sardine: -72.5, Anchovy: -74.6, Sprat: -71.7	– 70.51 for Sardine – 75.3 for	– 70.51 for Sardine – 75.3 for Anchovy	Sardine -71.0 Anchovy -71.2	Sardine, anchovy and sardinella: - 72.6 dB	As used in ISMAR, Ancona

Survey Identity	Greece Aegean Sea	Italy – Slovenia Adriatic Sea	Malta – Sicily channel	Italy – Sicily channel	France - Gulf of Lions	Spain - Iberian Coast	Croatia
			Anchovy			Trachurus spp. & Scomber colias : -68.7 dB Boops boops: -67 dB Scomber scombrus: -84.9 dB	Sardine: -72.5, Anchovy: -74.6, Sprat: -71.7
<b>Echo partitioning into species</b>	Echo trace classification based on echogram visual scrutinisation • Direct allocation and • allocation on account of representative fishing station	Frequencies comparison, catch of pelagic trawl, TS analysis when needed	Visual analysis of echogram and from results of control trawl	Visual analysis of echogram and from results of control trawl	Echo trace classification based on echogram visual scrutinisation and allocation on account of representative fishing station	Allocation on account of representative fishing station (sometimes direct allocation).	Echo trace classification based on echogram visual scrutinisation, TS analyses and/or catch information
<b>Abundance estimates</b>							
<b>Abundance indices estimated</b>	v Total fish NASC per EDSU v Anchovy, Sardine NASC per EDSU v Anchovy, Sardine Biomass per EDSU v Anchovy, Sardine Numbers per EDSU v Anchovy, Sardine Number/age and per length class v Anchovy, Sardine Biomass/age and per length class	Total pelagic biomass and biomass per species per area From 2009 indices agreed in MEDIAS protocol will be given	v Total fish NASC per EDSU v Anchovy, Sardine NASC per EDSU v Anchovy, Sardine Biomass per EDSU v Anchovy, Sardine Numbers per EDSU v Anchovy, Sardine Number/age and per length class v Anchovy, Sardine Biomass/age and per length class	v Total fish NASC per EDSU v Anchovy, Sardine NASC per EDSU v Anchovy, Sardine Biomass per EDSU v Anchovy, Sardine Numbers per EDSU v Anchovy, Sardine Number/age and per length class v Anchovy, Sardine Biomass/age and per length class	Total and by zone pelagic biomass and biomass per species, Total and by zone pelagic number and number per species, Pelagic biomass and biomass per species, Biomass per nautical mile, Numbers per species per nautical mile	v Total fish NASC per EDSU v Anchovy, Sardine NASC per EDSU v Anchovy, Sardine Biomass per EDSU v Anchovy, Sardine Numbers per EDSU v Anchovy, Sardine Number/age and per length class v Anchovy, Sardine Biomass/age and per length class	Biomass at time of survey / target species / sub-area; using CF from ISMAR, Ancona
<b>Maps and charts</b>	v Point maps of total fish NASC	NASC relative to pelagic fish and	v Point maps of total fish NASC	v Point maps of total fish NASC	Biomass / mile. Catch compositions	v Point maps of total fish NASC	S <sub>A</sub> maps (GIS based) per target species and

Survey Identity	Greece Aegean Sea	Italy – Slovenia Adriatic Sea	Malta – Sicily channel	Italy – Sicily channel	France - Gulf of Lions	Spain - Iberian Coast	Croatia
	v Point maps of target species in NASC/mile; biomass / mile. v Catch compositions of the hauls, pies charts indicating biomass per species	NASC per target species From 2009 indices agreed in MEDIAS protocol will be given	v Point maps of target species in NASC/mile; biomass / mile. v Catch compositions of the hauls, pies charts indicating biomass per species	v Point maps of target species in NASC/mile; biomass / mile. v Catch compositions of the hauls, pies charts indicating biomass per species	of the hauls	v Point maps of target species in NASC/mile; biomass / mile. v Catch compositions of the hauls, pies charts indicating biomass per species	OPS
<b>Fish sampling</b>							
<b>Target species</b>	Anchovy Sardine	Anchovy, sardine	Anchovy and Sardine	Anchovy and Sardine	Anchovy and Sardine	Sardine, anchovy	Anchovy, sardine, sprat
<b>Other species</b>	Horse mackerel Mackerel Gilt sardine	Sprat, atl. mackerel, horse mackerel, chub mackerel, bogue, gilt sardine, pickerel	Mackerel, Sardinella, Horse mackerel	Mackerel, Sardinella, Horse mackerel	All pelagics	Trachurus mediterraneus, bogue, sardinella, Scomber colias & Scomber scombrus.	OPS = Other Pelagic Species (All non-target pelagic organisms)
<b>Fishing gear, codend mesh size</b>	Pelagic trawl, 8mm	Mid-water pelagic trawl, 18 mm	9 mm of mesh side; 18mm of mesh size	9 mm of mesh side; 18mm of mesh size	Pelagic trawl, 12 mm	Pelagic trawl, 20 mm codend	Mid-water trawl; 16mm (2008) / 18mm with cod-end cover (2009)
<b>Vertical opening of the pelagic trawl</b>	6m	6-8 m	6-8 m	6-8 m	15 m	10 m, 16 m, 22 m.	4 m (2008) / 8 – 10 m (2009)
<b>Netsounder used</b>	Furuno	Simrad ITI Temp-Depth and Trawl Eye sensors	Simrad ITI with Trawl-Eye and Temp/Depth sensors	Simrad ITI with Trawl-Eye and Temp/Depth sensors		FS20/25 Simrad	Net-Mind (temperature, depth, vertical opening of the net)
<b>Duration of haul</b>	1h on average	30 min	30 min	30 min	30 mn to 1 h	Time necessary to identify the echotrace	30' – 45'
<b>Vessel speed during fishing</b>	3.5 – 4 knots	3.5-4.5 knots	3 – 4 knots	3 – 4 knots	3.5-4.5 knots	3,5-4,5 knots	3.5 – 4.0 knots
<b>Sampling intensity, no of hauls</b>	40	38	4	15	17-37	43	25
<b>Biological and</b>							

Survey Identity	Greece Aegean Sea	Italy – Slovenia Adriatic Sea	Malta – Sicily channel	Italy – Sicily channel	France - Gulf of Lions	Spain - Iberian Coast	Croatia
<b>oceanographic parameters</b>							
<b>Length</b>	Total Length frequency distribution available for v Anchovy v Sardine v Horse mackerel v Mackerel v Gilt sardine	v All fish species: Total length (TL), Length frequency distribution (0.5 cm)	Yes	Yes	All species: Total length (TL), Length frequency distribution (0.5 cm)	v	All species caught
<b>Age readings, ALK</b>	v Anchovy v Sardine v Mean TL at age available for both species	Sardine, Anchovy: Mean TL at age v Sample sizes according to the new DCR	Yes	Yes	Sardine, Anchovy: Mean TL at age Sample sizes according to the new DCR.	v	Not at the moment, but possibly in the future
<b>Length - Weight</b>	v Anchovy v Sardine v Horse mackerel v Mackerel v Gilt sardine	v Target species only. From 2009 measures will be extended to all pelagic fish species	Yes	Yes	All pelagic species	v	v anchovy v sardine v sprat
<b>Oceanographic. Parameter (CTD)</b>	138 CTD stations (every 10 NM)	Stations at pelagic trawl positions. From 2009 the CTD design will have an adequate density in order to describe the oceanography of the area. Main parameters: temperature, salinity, oxygen, fluorescence	20	51	1 CTD per haul T, S,	CTD, Temperature & salinity	CTD, dissolved O <sub>2</sub> , chlorophyll, phyto & zooplankton samples, sediment

The area covered by the MEDIAS survey is presented in the Figure 1.



Following the 2008 surveys presentations a discussion regarding the harmonization of the survey and the further improvement of the common protocol was done. The conclusions are summarized below:

1) The participants underlined two major improvements regarding the harmonization of the MEDIAS survey:

**a) In the Iberian coast** a new acoustic survey has been held in 2008 and is planned to take place in the framework of MEDIAS in May – June. This decision greatly harmonizes the time of the survey, as all the other survey took place between May and September;

**b) In the Adriatic survey** a first important step for the harmonization of the survey design was performed in 2008 and will be followed there after. The survey design changed from a zig-zag shape of transect to parallel perpendicular to coast transect according to the design in all the other areas.

2) Although the Croatian coast survey is not included into the MEDIAS survey, the participants underlined the need to further synchronization of the two Adriatic survey (The Italian-Slovenian and Croatian)

3) Angelo Bonanno singled out that in the period 17 august – 09 september an explorative echosurvey will be performed in the Tyrrhenian Sea along the western Italian coasts, from the northern Sicily to the Ligurian Sea. The echosurvey in such sea area is not scheduled in the MEDIAS. All the MEDIAS partners are interested in this echosurvey results and agreed on the opportunity to propose the Tyrrhenian Sea for the following DCR period, since a previous estimation of small pelagic biomass was carried out in 1991.

4) The participants agreed to include into the deliverables the following two tables (Table 3 and 4), regarding the number of fish per length class and the number of fish per age class.



**Table 3**

COUNTRY	AREA	YEAR	NAME_OF_SURVEY	SPECIES	SEX	LENGTH_CLASS (0.5 cm interval)	NUMBER	BIOMASS(Kg)

**Table 4.**

COUNTRY	AREA	YEAR	NAME_OF_SURVEY	SPECIES	SEX	AGE_CLASS	NUMBER	BIOMASS (Kg)

5) The participants reviewed and improved the existing common protocol. The reviewed common protocol is presented in the following Table 5 (reviewed fields are presented by red letters).

**Table 5. Summary of the common protocol for the Pan-Mediterranean Acoustic Survey (MEDIAS).**

Survey Identity	
Geographic area	Should be reported
GSA area	Should be reported
Size of Area to be covered (nm <sup>2</sup> / km <sup>2</sup> )	Should be reported
Days at sea	Should be reported
Vessel	Should be reported
Vessel length	Should be reported
Vessel HP	Should be reported
Period of survey	Should be reported
Echo sounder parameters	
Echo sounder	Split beam
Frequency for assessment (kHz)	38
Complementary frequencies (kHz)	120, 200 depending on availability.
Pulse duration (ms)	1 ms
Beam Angles (degrees) Athw. Beam Angle, Alog. Beam Angle	Should be reported
Ping rate	Maximum depending on depth
Calibration (No per survey)	A calibration report should be given (Annex III) One calibration per survey
Threshold for acquisition (dB)	-80
Threshold for assessment (dB)	-70 to -60 (reported)
Survey design	
Transects design	Perpendicular to the coastline/bathymetry, otherwise depending on topography The survey design should be reported.
Inter-transect distance (NM)	Max ≤12 NM.

Time of day for acoustic sampling	Day time. Otherwise, in cases of time limitation and if echo allocation into species does not depend on school shape identification (in this case justification of the accuracy of results will be presented)
EDSU (nm)	1 NM
Distance from the coast according to the Bottom depth (min, m)	At least 20 m bottom depth, minimum 10 m of echo-sampling.
Echo sounding depth (min, m)	Depending on the draught of RV. Should be reported
Echo sounding depth (max, m) recording.	200 m
Vessel speed	8-10 knots
Software for analysis	Movies and/or Echoview
File format	*.hac
Inter - transect	Acoustic energy in the inter-transect track will not be taken into account
Applied TS (dB)	Keep historical TS equations.
Echo partitioning into species	Echo trace classification based on echogram visual scrutinisation <ul style="list-style-type: none"> <li>• Direct allocation and</li> <li>• allocation on account of representative fishing station</li> </ul>
<b>Abundance estimates</b>	
Abundance indices estimated	<ul style="list-style-type: none"> <li>v Total fish NASC per EDSU</li> <li>v Anchovy, Sardine NASC per EDSU</li> <li>v Anchovy, Sardine Biomass per EDSU</li> <li>v Anchovy, Sardine Numbers per EDSU</li> <li>v Anchovy, Sardine Number/age and per length class</li> <li>v Anchovy, Sardine Biomass/age and per length class</li> </ul>
Maps and charts	<ul style="list-style-type: none"> <li>v Point maps of total fish NASC</li> <li>v Point maps of target species in NASC/mile; biomass / mile.</li> <li>v Catch compositions of the hauls, pies charts indicating biomass per species</li> </ul>
<b>Fish sampling</b>	
Target species	Anchovy, Sardine
Other species	Biological data for all species in the pelagic community: Length-Weight relationships; Length distribution.
Fishing gear, codend mesh size	Pelagic trawl, Codend and trawl characteristics should be reported. Max Codend mesh size = 24 mm (side of mesh = 12 mm).
Vertical opening of the pelagic trawl	Should be reported
Netsounder used	Should be reported
Duration of haul	Minimum 30 min for unknown echoes
Vessel speed during fishing	3.5 – 4.5 knots
Sampling intensity, no of hauls	The total number of hauls has to be adequate to <ul style="list-style-type: none"> <li>• ensure identification of echo traces</li> <li>• obtain length structure of the population</li> <li>• obtain species composition</li> <li>• get biological samples</li> </ul>
<b>Biological and oceanographic parameters</b>	
Length	All species: Total length (TL), Length frequency distribution (0.5 cm)
Age readings, ALK	Sardine, Anchovy: Mean TL at age Sample sizes according to the new DCR.
Length - Weight	All pelagic species
Oceanographic. Parameter (CTD)	Minimum 3 CTD per transect or grid of stations with density adequate to describe the oceanography of the area. Minimum variables: T, S

6) The meeting reviewed and improved the existing common calibration protocol. The reviewed common calibration protocol is presented in the following Table 6.

**Table 6. Calibration report**

<b>Calibration report</b>	
Frequency (kHz)	*
Echosounder type	*
Transducer serial no.	*
Vessel	C
Date	*
Place	C
Latitude	C
Longitude	C
Bottom depth (m)	C
Temperature (°C) at sphere depth	C
Salinity (psu) at sphere depth	C
Speed of sound (ms <sup>-1</sup> )	*
TS of sphere (dB)	*
Pulse duration (s)	*
Equivalent 2-way beam angle (dB)	*
Default Sv transducer gain	*
Iteration no.	C
Time	*
Range to sphere (m)	*
Ping rate	C
Calibrated Sv transducer gain	*
Time (GMT)	*

\*.- Data you can find in the EK60 report sheet.

C.- Data you can introduce in the “Comments line” and will appear in the EK60 report sheet.

During the meeting Roberto Gramolini showed a brief presentation illustrating the AdriaMed Trawl Surveys Information Systems (ATrIS).

ATrIS is an application developed under the framework of the FAO AdriaMed Project to store, organize and provide basic statistic and GIS analysis tools to manage trawl surveys data collected during the AdriaMed trawl surveys but used from a lot of MEDITS partners to manage their own trawl survey data. The main features illustrated during the presentation are listed below:

- data input and retrieval;
- data analysis
- data input and export
- GIS maps

ATrIS application was illustrated as an example of common database associated with common data quality controls and data exploration procedures specifically developed for MEDITS.

Furthermore it was emphasized the continuous process of development of ATrIS that is not considered as a final application but as a very flexible project that can be improved in the future.

## **B. Work shop on geostatistics, survey design**

The workshop targets to a) summarize the work done so far in the different areas regarding the geostatistical analysis and the estimation of certain parameters in the different areas; b) harmonize the work between the scientist involved in the analyses c) conclude to the future work.

As a first step the initial geostatistical analyses that have been applied so far in most areas were presented. Specifically

Iberian coast by Pilar Tugores Ferra

Gulf of Lions by Jean Luis Bigot

Adriatic Sea by Roberto Gramolini

Aegean Sea by Marianna Giannoulaki

The presentations are included in the Annex IV. As a next step it was agreed by all the participants to proceed with an analysis of a common data set, the one of the Sicilian channel. The results of the common analysis were presented during the third day by Dr. Roberto Gramolini.

## Preliminary Geostatistical analysis on Sicily channel NASC Small Pelagic Fish

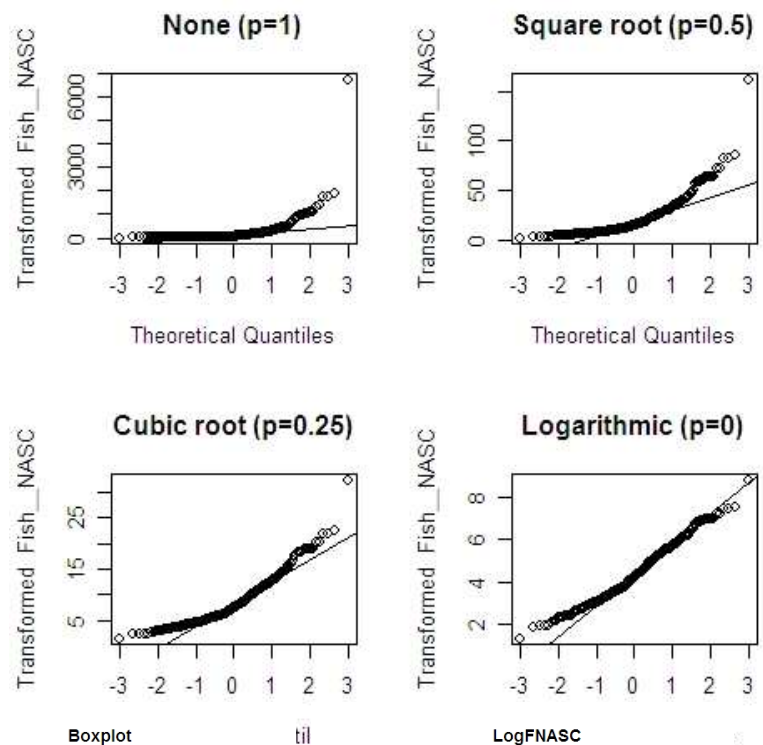
A preliminary geostatistical analysis of Acoustic-survey data collected in the Sicily channel in 2004 was performed using GStat Software 2.4.1 (E. J. Pedesma) and it included the following steps:

- Data exploration in order to:
  - identify outliers;
  - check for normality;
- Data transformation and removal of the outliers;
- Appropriate transformations of the geographical coordinates;
- Mapping of the data to visually inspect any spatial correlations;
- Compute the experimental omnidirectional variogram and fitting of a suitable model:
  - Geostatistical parameters i.e range, nugget and sill determination
- Examination of the spatial correlation between points that are in the same transect and between points in different transects in order to check for anisotropy

### Data exploration (1)

A Q-Q plots of the data was obtained in order to identify which transformation could grant the normal distribution of data:

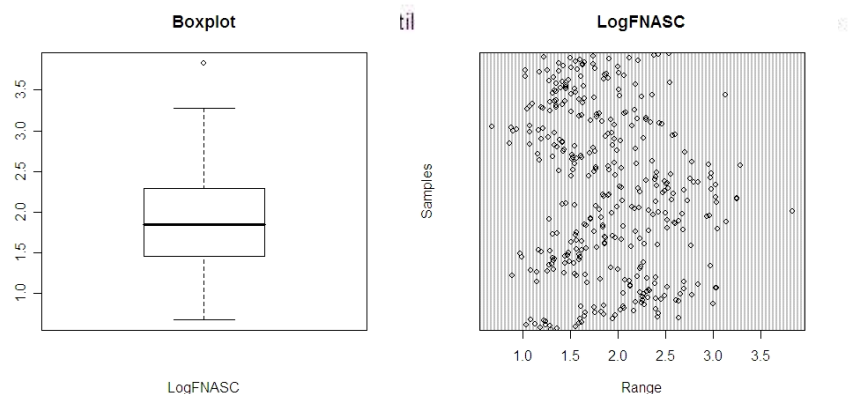
The logarithmic transformation performed best and it was the one used for the exercise  $NASC^* = \text{Log}_{10}(NASC + 1)$ .



### Data exploration (2)

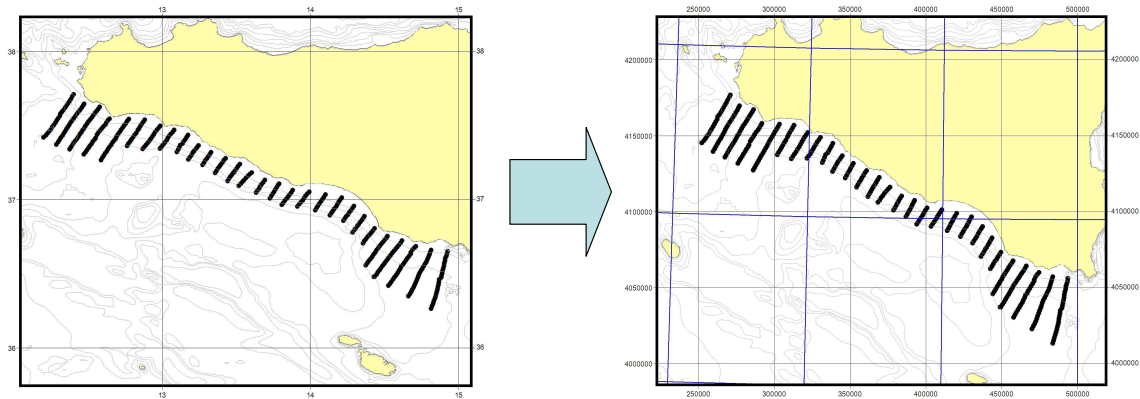
A Box-plot and a Dotplot of transformed data was produced to identify possible the existence of possible outliers:

The box plot identified the presence of an outlier and also showed an isolated point in the right side of the graph that it was considered as an outlier and subsequently removed.



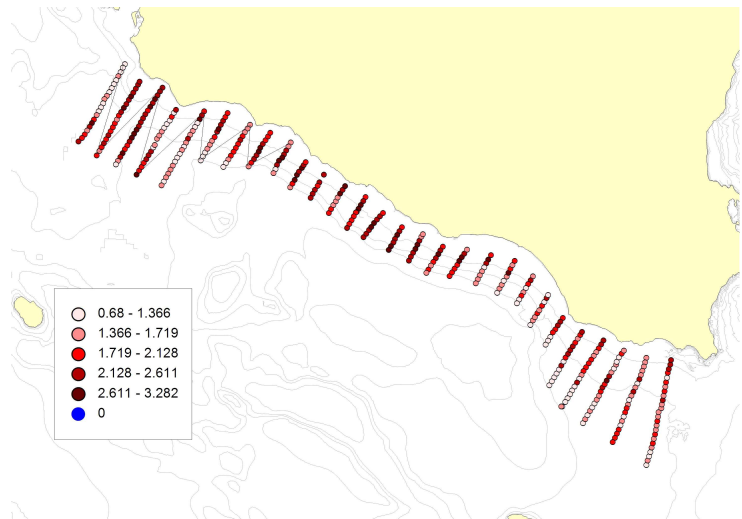
## Coordinate transformation

Distances were calculated by GStat as Euclidean distance and coordinates of survey routes from the original Geographical Latitude and Longitude were expressed in decimal degrees to Projected UTM33 Northing and Easting metrical coordinates.



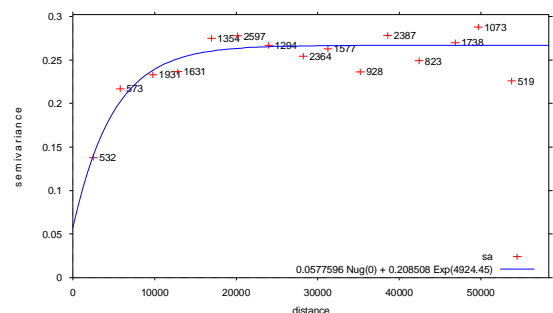
## Map of transformed data

A thematic map of transformed data was produced to visually check if there was any spatial correlation between data. A Natural breaks algorithm was used to subdivide data in 5 class. It seems that points of the same class are contiguous and only sporadic points were surrounded by others of different class.



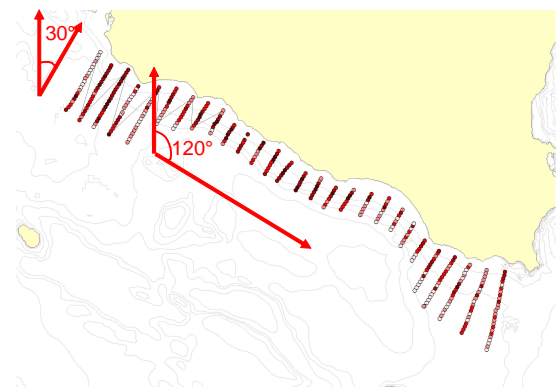
## Experimental omnidirectional variogram

The experimental variogram was obtained using a lag of 3704 m (2 nautical miles). An exponential model was fitted and its characteristic parameters were:  
 Range = 14773.35 m (8 nautical miles)  
 Nugget = 0.058  
 Nugget/Sill ratio = 21.7%



## Anisotropy

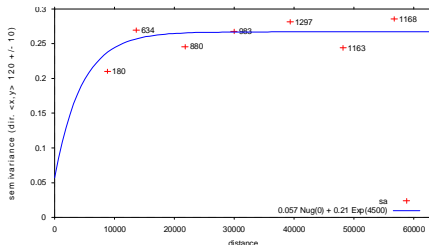
To investigate the spatial correlation between points in the same transect and between points located in contiguous ones, the orientation of the transects was determined. Two experimental variograms were calculated for a direction parallel to the transects (30°) and for the perpendicular one (120°).



The two models were forced to have the same nugget of the omnidirectional one, that should be the spatially independent variance component. In case that spatial independent assumption is valid it should not vary with direction.

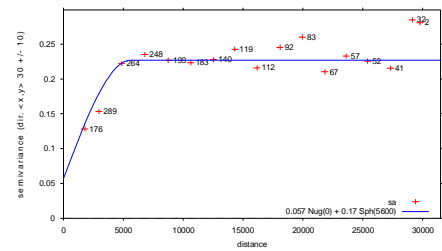
Direction:  $30^\circ \pm 10^\circ$

Lag: 1852 m (1 nm) i.e. the distance between points in a transect



Direction:  $120^\circ \pm 10^\circ$

Lag: 9260 m (5 nm) i.e. the distance between transects



## Preliminary results

- Range value for the data analyzed is 14773.35m (8 nautical miles)
- Nugget effect is 21% of sill;
- Anisotropy analysis showed a different spatial relation between points in the same transect than between points in two contiguous ones (5 nm) but it seems that the distance between transects can describe quite well this different relation.

## Further investigations

The participants agreed that:

- The analysis should be extended to the fish NASC assigned to different pelagic species (i.e. Anchovy and Sardine);
- The examination of whether or not zero values should be included or not in the variogram computations?
- Use of “Indicator Kriging” technique could be explored in order to produce a map of presence/absence.

After the presentation each participant worked with its own data set based on the experience gained through the analysis of the common data set.

Final the participants agreed on the following issues regarding the future work:

- 1) In each area the following parameter should be calculated in order to obtain a common basis so as to define the appropriateness of the inter-transect distance: range, sill, nugget and anisotropy (omnidirectional variograms) for the last 5 years period in each area. For the calculations of these parameters NASC values per mile should be used or alternatively biomass per mile. Specifically, the following table (Table 7) should be filled for each area:

**Table 7. Geostatistical and density parameters calculated per species and area**

Sub Area (GSA: XXX)	Year	Omnidirectional Variogram			Density (NASC/NM <sup>2</sup> )	Anisotropy			
		Range	Sill	Nugget		0°	45°	90°	135°
<b>Pelagics</b>	2004								
	2005								
	2006								
	2007								
	2008								
<b>Anchovy</b>	2004								
	2005								
	2006								
	2007								
	2008								
<b>Sardine</b>	2004								
	2005								
	2006								
	2007								
	2008								

- 2) It was decided that based on the aforementioned results another workshop will take place within the framework of the next MEDIAS meeting, with the participation of an external expert on survey design who should be invited to help the completion of the work.
- 3) The next MEDIAS meeting it was agreed to be held in Mazara del Vallo in Sicily, as kindly invited and hosted by the CNR Institute during March 2010.



## ANNEX I

### List of participants

Name	e-mail	Country	
Athanassios Machias	<a href="mailto:amachias@ath.hcmr.gr">amachias@ath.hcmr.gr</a>	Greece	HCMR
Marianna Giannoulaki	<a href="mailto:marianna@her.hcmr.gr">marianna@her.hcmr.gr</a>	Greece	HCMR
Magdalena Iglesias	<a href="mailto:Magdalena.inglesias@be.ieo.es">Magdalena.inglesias@be.ieo.es</a>	Spain	IEO
Joan Miquel		Spain	IEO
Pilar Tugores Ferra	<a href="mailto:Pilar.Tugores@ba.ieo.es">Pilar.Tugores@ba.ieo.es</a>	Spain	IEO
Jean-Louis Bigot	<a href="mailto:Jean.Louis.Bigot@ifremer.fr">Jean.Louis.Bigot@ifremer.fr</a>	France	IFREMER
Tomaz Modic	<a href="mailto:tomaz.modic@zzrs.si">tomaz.modic@zzrs.si</a>	Slovenia	FRIS
Andrea DeFelice	<a href="mailto:a.defelice@ismar.cnr.it">a.defelice@ismar.cnr.it</a>	Italy	CNR-ISMAR
Roberto Gramolini	<a href="mailto:mail@kosmosambiente.it">mail@kosmosambiente.it</a>	Italy	CNR-ISMAR
Angelo Bonanno	<a href="mailto:angelo.bonanno@iamc.cnr.it">angelo.bonanno@iamc.cnr.it</a>	Italy	CNR- IAMC
Roberta Pace	<a href="mailto:roberta.a.pace@gov.mt">roberta.a.pace@gov.mt</a>	Malta	
Georgi Petrov Gutoranov	<a href="mailto:gutoranow@nafa-bg.org">gutoranow@nafa-bg.org</a>	Bulgaria	National Agency of Fisheries and Aquaculture
Asya Ljubomirova Bondokova	<a href="mailto:a.bondokova@nafa-bg.org">a.bondokova@nafa-bg.org</a>	Bulgaria	National Agency of Fisheries and Aquaculture
Vjekoslav Tičina	<a href="mailto:ticina@izor.hr">ticina@izor.hr</a>	Croatia	Institute of Oceanography and Fisheries

## ANNEX II

### **Agenda of the 2<sup>nd</sup> MEDIAS meeting** in the framework of European Data Collection Regulation **Palma 1–3 June 2009**

#### **Monday 1/6/09**

9:00 – 9:30: Opening of the meeting –welcome of the participants  
9:30-9:45: Presentation of the Iberian survey  
9:45 – 10:00: Presentation of the Gulf of Lions survey  
10:00-10:15: Presentation of the Adriatic survey  
10:15-10:30: Presentation of Croatian survey  
10:30 -10:45: Presentation of the Sicilian channel survey  
10:45-11:00: Presentation of the Aegean Sea survey  
*11:00-11:30: Coffee break*  
11:30 – 11:45: Presentation of the Bulgarian survey.  
11:45 – 14:00: Discussion on the new survey  
*14:00 – 15:00 Lunch*  
15:00 – 17:30: Improvement and changes on the MEDIAS protocol  
17:30 - 18:00: Discussion – adoption of the report

#### **Tuesday 2/6/09**

##### **Working group on Survey design**

9:00 – 9:10: Description of the work  
9:10-9:30: Presentation of the Geostatistical analysis applied in the Aegean Sea survey  
9:30-9:50: Presentation of the Geostatistical analysis applied in the Adriatic sea survey  
9:50 – 10:10: Presentation of the Geostatistical analysis applied in the Gulf of Lions survey  
10:10-10:30: Presentation of the Geostatistical analysis applied in the Iberian survey.  
10:30 – 11:00: Discussion on the work to be applied  
*11:00-11:30: Coffee break*  
11:30 – 14:00. Working on a common data set  
*14:00 – 15:00 Lunch*  
14:00 – 18:00: Working on a common data set

#### **Wednesday 3/6/09**

9:00 – 10:00: Presentation of the previous day work  
10:00 - 11:00 Working on the data set of each area  
*11:00-11:30: Coffee break*  
11:30 – 14:00. Working on the data set of each area  
*14:00 – 15:00 Lunch*  
15:00 – 17:00: Working on a common set of data  
17:00 - 17:30: Adoption of the report  
17:30 – 18:00: Plan of the future work  
18:00: Closing of the meeting.

## ANNEX III

### Acoustic parameters used by acoustic survey at the Croatian coast of the Adriatic Sea (Institute of Oceanography and Fisheries - IOF).

Parameter	Adriatic Sea (IOF)
<b>Survey Identity</b>	
Country	Croatia
Geographic area	GSA 17 (eastern part)
Area covered	13 580 NM <sup>2</sup> / 46 580 km <sup>2</sup>
Days at sea	Variable, depends on weather conditions
Indicative - available time series of acoustic surveys	Since 2003
Vessel	RV BIOS
<b>Survey design</b>	
Month/Period of the year that the survey take place	September
Transects design	Paralell- perpendicular to the coast; Random- between the islands
Inter-transect distance (NM)	10
Time of day in which acoustic data are collected	Daytime & nighttime
EDSU (nm)	1
Bottom depth (min, m)	10
Echo sounding depth (min, m)	6-10 (mostly 7)
Echo sounding depth (max, m)	200 (260 in the Pomo Pit only)
Fishing gear	Pelagic trawl
Target species	Anchovy, sardine and sprat
Other species	Horse mackerels, chub mackerel, gilt sardine, <i>Aphia minuta</i> , pickarels, bogues, etc.
<b>Echo sounder parameters</b>	
Echo sounder	Simrad EK-60
Frequency for assessment (kHz)	38
Complementary frequencies (kHz)	-
Pulse duration (ms)	1
Threshold for acquisition (db)	No limit with the raw data
Threshold for assessment (db)	-60 to -70
Calibration (No per survey)	1 per survey
<b>Applied TS (db) [20Log L(cm)]</b>	
Sardine	-72.5
Anchovy 20Log L(cm)	-74.6
Horse mackerel	
Mackerel	
Sprat	-71.7
Spanish Mackerel	
Blue whiting	
Mackerel ( <i>S. japonicus</i> )	
Bogue	
Sardinella	
<b>Abundance estimates</b>	

Parameter	Adriatic Sea (IOF)
Software for analysis	BI60
File format	*.raw
Inter - transect	Acoustic energy in the inter-transect track taken into account
Echo partitioning into species	Echo trace classification based on echogram visual scrutiny, TS analyses and/or allocation on account of representative fishing station
Abundance indices estimated	S <sub>A</sub> (NASC) per EDSU per target species; Biomass at time of survey / target species / sub-area; using CF from ISMAR, Ancona
<b>Fish sampling</b>	
Codend	8 mm of mesh side; 16 mm of mesh size
Vessel speed during fishing	3.5-4 kt
Time of day	Daytime & night time
No of hauls (min-max)	15-25
Sampling intensity	Depending on bottom type and time of day, Aimed to: <ul style="list-style-type: none"> <li>• ensure identification of echo traces</li> <li>• obtain length structure of the population</li> <li>• obtain species composition</li> </ul> check length-weight equation
<b>Biological and environmental parameters</b>	
Fish measurements	Total length or Fork length for Scomber spp Total number and weight by length classes (0.5 cm) Stomack content analyses (target species only)
Oceanographic Parameters taken in stations: CTDs	T, S, dissolved O <sub>2</sub> , chlorophil, fito&zoo plankton assemblages analyses, sediment
Oceanographic. Parameters taken continuously	