REPORT OF THE 2019 MEDITS COORDINATION MEETING

(Sete, France, 16-17 April 2019)

1. Opening, adoption of agenda and meeting arrangements

The Meeting was held at Maison Regionale de la Mer in Sete, France from 16-17 April, 2019. Angelique Jadaud from the Institut Français de recherche pour l'exploitation de la Mer (FREMER) opened the meeting welcoming the participants ("the Group") and provided information on practicalities. George Tserpes on behalf of the Group, thanked IFREMER for hosting the meeting and highlighted the importance of the work to be developed by the Group during the meeting, aiming to facilitate collaboration among MEDITS scientists for the provision of updated information on the abundance trends of demersal stocks in the Mediterranean, as well as on the state of the marine ecosystem in terms of species composition and distribution patterns. Mr George Tserpes, meeting Chairperson, proceeded to review the Agenda, which was adopted (**Appendix 1**). The List of Participants is included in **Appendix 2**. The submitted Documents and Presentations are attached in **Appendixes 3** and **4** respectively.

2. Feedback from 2018 activities

2.1 Previous coordination meeting

The Group reviewed and adopted the report of the 2018 coordination meeting, which will become publicly available at the project web-site.

2.2 Relevant meetings and workshops

George Tserpes recalled the conclusions and recommendations of the MEDITS Coordination meeting held in Split (Croatia) in 2018 and informed the Group about the on going STECF survey evaluation. The Group discussed the potential added value from a second MEDITS survey in autumn-winter, particularly regarding the availability of additional data for improving knowledge on abundance fluctuations and identification of nursery grounds for spring spawning species. Practical problems related to the realization of a second survey were also discussed (e.g. budget issues, efficiency of institutional infrastructure).

Enric Massuti summarized the outcomes of the workshop on sampling processing and analysing stomach contents (WKSTCON) that was held in Palma (Balearic Islands, Spain) from 24-27 April 2018. The workshop aimed in reviewing and standardizing stomach content analysis in view of coordinating sampling that was planned to start in 2019. More information about the workshop is provided in Appendix 4. The Group stressed the importance of harmonized approaches for stomach content analysis and expressed its interest for participating in similar future activities.

Pierluigi Carbonara informed the Group that the "Rome" routine used for checking the MEDITS data was presented during a Red Shrimp meeting of the the GFCM and its potential use for the needs of red shrimp surveys was discussed.

Maria Cristina Follesa informed the Group of a workshop on Sexual Maturity Staging of Elasmobranchs (WKMSEL3) held in Cagliari, Italy, in February 2018 with the objective to update the common scales used inside the GFCM and ICES laboratories and also to define new objective criteria for classifying the maturity stages in those scales. Maria Cristina Follesa also summarised the outcomes of a Workshop for Advancing Sexual Maturity Staging in Fish that was held in May 2018 in Copenhagen, Denmark. The workshop was aiming to: (a) prepare a historical overview of (national) maturity scales used for uploading sexual maturity staging data into the ICES and GFCM databases; (b) create an overview, or prepare new, conversion tables from national maturity scales to the international agreed maturity scales; (c) establish an implementation plan for the international agreed maturity scales of WKMATCH and MEDITS, as the only scales for reporting to ICES and GFCM databases, respectively; (d) expand general histological criteria, for validation of macroscopic maturity staging, as established by WKMATHIS for the different reproductive strategies in teleosts. Further information is provided in Appendix 3.

2.3 Review of the 2018 MEDITS surveys

Participants presented briefly the activities accomplished during the 2018 MEDITS surveys in each country/GSA with special focus on problems encountered, extraordinary findings and future planning. In general, the survey was implemented without particular problems in all areas, following the agreed protocol. The main points by GSA are summarized below, while further details and presentations are included in Appendixes 3 and 4.

Enric Massuti presented information about the surveys realized in **GSAs 1, 2, 5 and 6** by Spanish scientists. During 2018, the Spanish MEDITS survey was carried out from April 26th to June 24th (60 days), on board the R/V Miguel Oliver. Four geographic sub-areas (GSAs) were covered: 1 (Northern Alboran), 2 (Alboran Island), 5 (Balearic Islands) and 6 (Northern Spain). A total of 219 hauls were performed and sampled by several teams of the Spanish Institute of Oceanography: 59, 7, 51 and 102 hauls in GSAs 1, 2, 5 and 6, respectively. Up to 689 species or taxa (221 fishes, 108 crustaceans, 134 molluscs and 226 other invertebrates and algae) were identified, counted and weighted. SCANMAR was used in all hauls. A CTD SBE 37 was used attached to the flotsam of the net in all these hauls. The total number of individuals captured was 1660080. Length measurements were taken from 153908 individuals. Biological information was collected from 28358 individuals, while hard tissues for age estimations were taken from 2713 samples of *Merluccius merluccius*, *Mullus barbatus*, *M. surmuletus*, *Lophius budegassa* and *L. piscatorius*. In 2018, the Spanish MEDITS survey was carried out applying the MEDITS protocol, without major problems to mention. In 2019, this survey is planned from April 23th to June 21th on board the R/V Miguel Oliver.

Angelique Jadaud presented information about the surveys realized in **GSAs 7** and **8.** The surveys were conducted in GSA 7 and 8, from the 23rd May until the 26th of June 2018. All hauls were successfully accomplished (23 in GSA 8–Eastern Corsica and 65 in GSA 7-Gulf of Lions). The opening of the net was measured using the MAREPORT system, on all hauls and the bottom temperature and salinity were measured using an Oddistar CTD sensor. The bottom temperature oscillated around 13 and 15 °C and salinity between 33 and 37. Macro litters were collected, weighted and counted by sub-category and mostly plastics were analyzed. In GSA 7 and 8 joined, 414 taxa were identified. Considering sex and maturity 25 taxa (GSA7) and 24 taxa (GSA 8) were sampled (G1 species). Regarding hard tissues for ageing, they were collected for five species *(Mullus barbatus*, *M. surmuletus*, *Lophius budegassa*, *L. piscatorius and M. Merluccius)*. Around 1500 otoliths were collected in GSA 7 (mainly *M. barbatus* with 615 otoliths) and 600 in GSA 8 ((mainly *M. barbatus* with 400 otoliths). Moreover, additional sampling was done considering specific needs of the Marine Strategy Framework Directive (MSFD): (a) characterization of abundance of zooplankton taxa by use of WP2 for 8 stations in the Eastern Corsica (1 station by depth strata; samples were stored in formalin). In the same stations CTDs were also performed. (b) determination of jelly fish. In 2019, the survey will be conducted from the 22nd late May till the 25th of June (first Eastern Corsica, then Gulf of Lions). Sampling will be also done for the needs of the MSFD (WP2, CTD).

Mario Sbrana presented information about the survey in **GSA 9** covering the Ligurian and North Central Tyrrhenian Sea. During 2018, the MEDITS survey was carried out in the Ligurian and North Central Tyrrhenian Sea from June 13th to July 5th on board of a new fishing vessel, named Pegaso SB. Unfortunately, the vessel S. Anna, used in the 2016-2017 MEDITS surveys, was demolished in accordance with the EU policy for the reduction of fishing effort in the Mediterranean and it was not possible to organize an inter-calibration survey with the new vessel. In order to minimize the factors related to the vessel change, a boat was chosen, Pegaso SB, which has structural characteristics very similar to those of S. Anna (similar length, tonnage and engine power). However, to evaluate the technological creep due to the use of different boats, it is planned to standardize the entire historical series of MEDITS. The modelling approaches will be provided by the project "Recovery of Fisheries Historical Time Series for Mediterranean and Black Sea Stock Assessment (RECFISH)", recently funded by the European Union within the EASME / EMFF / 2016/032 framework. Before the start of the survey, checking of gears was conduct according to the protocol. Sensors for the measurement of the vertical and horizontal net opening and CTD probe to detect the bottom temperature were used during the majority of the hauls and the results were presented. Existence of marine litter on the sea bottom was monitored and categorized according to the MEDITS Protocol. A total of 307 species (133 bony fishes, 18 elasmobranchs, 55 crustaceans, 29 cephalopods and 72 other invertebrates and algae) were identified, counted and weighted. Thirteen new species for GSA 9 were recorded: one bony fish *Facciolella oxyrhyncha* (Bellotti, 1883), two Crustaceans Decapoda *Munida rutllanti* B. Zariquiey Alvarez 1952 and *Necora puber* (Linnaeus, 1767), two cephalopods *Chiroteuthis* *veranii* (Férussac, 1835) and *Octopoteuthis sicula* Rüppell, 1844, one bivalve mollusc *Abra alba* (Wood, 1802), three opisthobranch molluscs *Peltodoris atromaculata* Bergh, 1880, *Pleurobranchus testudinarius* Cantraine, 1835 and *Umbraculum umbraculum* (Lightfoot, 1786), one echinoderm *Molpadia musculus* Risso, 1826 and three cnidarians *Actinauge richardi* (Marion, 1882), *Alcyonium acaule* Marion, 1878 and *Leptogorgia sarmentosa* (Esper, 1789). Tables summarising the total number of individuals of the target species caught, measured and sexed are reported. Historical density and biomass data series of the most important species were presented. No significant trends were observed for *Mullus surmuletus*, *Aristomorpha foliacea*, *Aristeus antennatus*, *Nephrops norvegicus*, *Illex coindetii* and *Loligo vulgaris*. Positive trends were noted for *Galeus melastomus*, *Scyliorhynus canicula*, *Mullus barbatus* and *Parapenaeus longirostris*. A significant negative trend was observed for *Merluccius merluccius* only. Concerning the mean size of the specimens, during the MEDITS time series, a significant negative trend was only detected in the case of *N. norvegicus*. The 2019 MEDITS survey will be carried out between the end of May and the end of July.

Paola Rinelli presented information about the survey in **GSA10.** During 2018 the MEDITS survey was carried out from 7th of July until 19th July 2018 using the vessel “Pegaso SB” from Mazara del Vallo Harbour. The boat was changed during 2018 because the vessel “S. Anna”, used during previous years, was demolished. The demolition did not allow the possibility to carry out an inter-calibration survey. The same trawler boat was also used, for the same problems, in the neighboring areas (GSA9 and GSA16). The survey was interrupted only for 1 day due to adverse sea conditions. The number of valid hauls performed was 70 as planned, in the same location of previous years. SIMRAD equipment, to control the trawl geometry (vertical and horizontal openings, contact with the bottom), was used only in few hauls for technical problems despite having been tested before departure. All data were collected in accordance with the common protocol, established in the framework of the MEDITS coordination (Instruction Manual V. 9, 2017), and according to the technical specifications in the approved project. The collected marine litters were classified according to the MEDITS Protocol. A total of 235 species belonging in 14 faunistic categories were identified: 16 species of Elasmobranchs, 84 species of Osteichthyes, 40 species of Crustaceans, 21 species of Cephalopods, 11 species of Mollusca Bivalvia, 15 species of Mollusca Gastropoda, 4 species of Tunicata, 1 species of Brachiopoda, 13 species of Cnidaria, 20 species of Echinoderms, 4 species of Opistobranchia, 2 species of Polychaeta, 1 species of Sipunculida, 3 species of Porifera. Length measurements were taken from 155443 individuals as well as for sex and maturity. The number of samples of hard tissues (otoliths) collected for ageing, by target species, was: *M. merluccius* 491, *M. barbatus* 600 and *M. surmuletus* 13. In 2019, the survey will be carried out during spring-summer using the same vessel as requested by the international protocol.

Maria Cristina Follesa presented information about the survey in **GSA 11**. The survey was carried out between 17th July and the 03th August 2018. The vessel used was the GISELLA (GIS), the same vessel used since 2004. As the previous year, a check of the net was done, before the survey, to verify if the measurements of all parts were coincident with those reported in the MEDITS manual. 99 hauls of the 100 planned were performed in the same location of previous years (one invalid haul was registered in zone 5 (Central western Sardinian) at depth between 10-50 mt in consequence of the present of nets at sea. Only vertical net opening was measured using the SIMRAD. It worked for 97% of the valid hauls (98 hauls out of 100). An estimation of the horizontal opening was made through a model using depth of the haul and warp length. Temperature was measured in 98 hauls. Out of the 100. Litter was found in 61 hauls out of 99 hauls performed (62%). Plastic (L1, N° 174, 13,2 kg) resulted the most common litter in Sardinian waters (found in 53% of valid hauls) followed by Cloth (textil)/Natural fibres (L5, N° 22, 10,9 kg, found in 18% of hauls) and Metal (L3, N° 16, 5,7 kg, found in 14% of hauls). As recorded in the previous surveys, the South-Western Sardinia (Zone 6) resulted, the area with highest quantity. The number of samples of hard tissues (otoliths) collected for ageing, by target species, were: *M. merluccius* 469, *M. barbatus 456* and *M. surmuletus* 94. Historical trends od biomass, density and mean size of the specimens caught were shown. Statistical increasing trends were registered for the density and biomass trends of *M. barbatus* and that of the mean size of *R. clavata*. Decreasing temporal trends were observed for the mean size of the two squaliforms *G. melastomus* and *S. canicula*, the biomass of *A.foliacea* and both density and biomass trends of *E.cirrhosa*.

Iman Busuttil presented information about the survey in **GSA 15**. This was conducted from the 14th October to 15th th November 2018. The fishing research vessel used was DEGRE holding registration number VLT MFA 0081. On the vessel there were present five (5) officials from the Department of Fisheries and Aquaculture and five (5) crew members from Grech Fisheries Limited owners of DEGRE. In total 45 hauls were successfully completed, the hauls consisted in using a MEDITS specific bottom trawling gear (net type GOC 73). In total through out the survey, a number of 114 marine species were sampled. As part of the obligations under the Data collection framework and following the MEDITS protocol, specimens were sorted into “target” and “non -target” species , for the target species biometric data consisting of Length, Weight, Gender and Reproductive Maturity stage were collected while for the non- target species the total number and weight by species was recorded . The data were uploaded to the EU commission through the Mediterranean and Black Sea Data Call.

Germana Garofalo presented information about the survey conducted in **GSA 16** (south of Sicily) covering the northern part of the Strait of Sicily. The survey was carried out from 24th July to 21th August on board the commercial trawler Pegaso. The vessel was changed due to the demolition of the M/B S. Anna employed in the GSA 16 since 1994. A total of 120 valid hauls were performed as planned. Star Oddi CTD probes were used during the survey to record temperature/depth profiles during all the hauls. Due to malfunction of the SIMRAD equipment, measures of vertical and horizontal net opening were not recorded. Information on the amount and composition of marine litter was collected according to the MEDITS protocol. A total of 641 items were found in the 88% of the hauls. Plastic resulted the most abundant category (60%) followed by metal (13%). Sorting and identification of macro-benthos was carried out at the most detailed possible taxonomic level. Four new taxa of macro-benthos were recorded for the first time in the GSA16 and proposed for inclusion in the MEDITS reference list. Otoliths were taken from 478 specimens of *Merluccius merluccius*, 586 of *Mullus barbatus* and 162 of *Mullus surmuletus*. Input and first validation of data was performed using the SEATRIM software, specifically developed at CNR for the management of data from experimental surveys. The database FISHTRALW was used for the final validation (Rome routine) and data storage. A total of 324 taxa were identified during the survey, including 115 bony fishes, 26 elasmobranchs, 52 crustaceans, 26 cephalopods and 105 other invertebrates and algae. Historical trends of biomass indices were presented for the main faunistic categories and some target species. A preliminary comparison of the fishing performances of the new and old vessel was presented. Mostly, the average biomass index per stratum and faunistic category of 2018 fell within the 95% confidence intervals of the average biomass index of previous surveys conducted in the same months. Within the framework of the Italian National Plan for Data Collection 2017-2019, a pilot study focused on the diet of *Merluccius merluccius*. In particular 75 stomachs were sampled in GSA 16. The majority of preys were Fish (55%) followed by Crustaceans (32%). The analysis of the trophic spectrum confirmed different preferences according to the size. Within the framework of collateral activities, a total of 49 cartilaginous fish were tagged. Finally, preliminary results of an experiment called Zero Duration Haul (ZDH) were presented. The aim of the experiment was to test the hypothesis that the catch obtained during the setting time needed for stabilizing the trawl geometry is zero. In the 10 ZDHs conducted in the slope (201-800 m), a total of 1661 individuals weighing 21.07 kg were recorded, accounting for 108 different species. It is planned to perform the 2019 survey during the regular season late spring - early summer.

Igor Isailovic presented information about the survey performed in **GSA17**. The survey was jointly performed by the Laboratory of Marine Biology and Fishery of Fano (Italy), Institute of Oceanography and Fisheries of Split (IOF, Croatia) and the Fishery Research Institute of Slovenia. The survey in GSA 17 took place from 30th of June to the 31st of August 2019 on a board of two research vessels; M/V ANDREA operated in Italian territorial waters, Slovenian territorial waters and in the extra-territorial water from 8th of August to 31st August 2018, while M/V BIOS DVA performed the survey in Croatian territorial waters from the 30th of June to 22th of July 2018. In total 189 valid hauls were made in Italian, Croatian, Slovenian and extra-territorial waters. Bottom water temperature was measured using Star-Oddi temperature sensors in total of 150 hauls. Marine Litter was collected on a board of BIOS DVA and ANDREA. Biological sampling in GSA 17 was performed according to MEDITS 2017 protocol with minor difficulties in the application of the new protocol. The 2019 survey is planned for end of June – beginning of July in the Croatian side and will be performed with M/V BIOS DVA. in the Italian side it is planned for June - July 2019 and will be performed with the boat used in the previous years, i.e. the M/V Andrea.

Pierluigi Carbonara presented the results of the MEDITS survey in the **GSA18**. The survey was carried out from 14.07.2018 to 26.08.2018. A new vessel was used named Mizar (MIZ), as the vessel used (PEC) in the previous years was scrapped. It was therefore no possible to carry out an intercalibration exercise. Thus, exercises on data standardization were carried out, using the R routine BioStand, presented at the Subregional Committees for the Eastern (SRC-EM) and Central Mediterranean (SRC-CM) - Session on deep water red shrimp fisheries in the eastern-central Mediterranean Sea in Rome, March 20, 2019. The number of hauls performed was 89, out of the 90 initially planned. Simrad was used in 68 hauls and DST centi-TD in 89 hauls. Litters were monitored in all hauls following the common protocol. Species classified by taxa were 318 belonging in 16 faunistic categories. The total number of classified individuals of the MEDITS reference list was 23005. The total number of sampled individuals for length data was 81460. The total number of sampled individuals for sex and maturity was 22434 and 22356, respectively. The numbers of samples of hard tissues collected for ageing by target species were: *M. merluccius* 673 otoliths, *M. barbatus* 970 otoliths, *M. surmuletus* 55 otoliths. No difficulties were encountered in the application of the common protocol. Significant increasing trends of abundance and biomass have been estimated for several target species, excluding *N. norvegicus*, while decreasing trends were observed for the mean length of certain target species, such as *M. barbatus* and *P. longirostris*, as a consequence of recruitment peaks. The next surveys is planned in July 2019.

Porzia Maiorano presented information about the survey in **GSA 19**. In 2018, the 25th MEDITS survey in the North-western Ionian Sea (GSA 19) has been slightly delayed in time in the full summer season for the research and selection of a new vessel. Indeed, considering the scrapping of the vessel PASQUALE e CRISTINA adopted during the previous surveys from 1998 to 2017, the new vessel MIZAR (ML/1097; 25.3 m of length; traction at ground run of 4.5 tons) has been selected for the 25th MEDITS survey. It took place from 1st to 12th August 2018 (12 days) in the study area between Cape Otranto (40° 06’ N – 18° 31’ E) and Cape Passero (36° 41’ N – 15° 10’ E). A total of 70 hauls has been performed by the team of the Department of Biology of University of Bari, following the MEDITS protocol. No particular problems occurred during the survey and the optimal weather condition allowed the sampling for all 12 days, without any stop or stand-by. Considering the new vessel with a new crew, more attention was needed in using the SIMRAD system, adopted in only 28 hauls (40%) for the trawl geometry and temperature monitoring. A total of 204 species of the main faunistic categories were identified, counted and weighed: 29 Cephalopods, 41 Crustaceans (Decapoda and Stomatopoda), 14 Elasmobranchs, and 120 Bony fish. The analysis of the other categories is still in progress. The total number of sampled individuals for length distributions and sex/maturity were 124710 and 35606 respectively. The samples of hard tissues collected (and read) for age estimations from the target species were as follows: 562 (349 read) for *M. merluccius*, 680 (545 read) for *M. barbatus* and 99 (97 read) for *M. surmuletus*. The samples were collected by sex and size according to the protocol. No particular difficulties were encountered in the application of the protocol. Moreover, some specimens have been also sampled for other activities, such as 135 individuals of M. merluccius for analysis of the stomach contents and 10 individuals of different Elasmobranchs for tagging. The focus on historical trends (1994-2018) enhanced a significant increase in the catch of the bony fish, particularly related to the small pelagic fish as well as an increase in the median length of the red shrimp and the Norway lobster. The marine litter has been recorded and weighed in each haul according to the MEDITS protocol. The presence of litter was detected in 69 stations (98.6%). A total of 29 different items were identified and occurrence, abundance in number (N/km2) and weight (kg/km2) of each category have been also computed. The 26th MEDITS survey in the North-western Ionian Sea is planned in June 2019.

Evgenia Lefkaditou presented information about the 2018 survey in **GSA 20**. The fishing vessel TAKIS-MIMIS was used, as in the surveys carried out since 2014. The survey in the eastern Ionian Sea (GSA 20), was carried out from 1 to 24 of August. A total of 51 valid hauls were performed, including the 43 hauls made at the same locations as in 2016 and 8 additional hauls at the southern part of the GSA. In most hauls, CTD and Minilog were used for depth, temperature and salinity recording, whereas through a SCANMAR system the trawl net openings were measured. A total of 271 taxa (15 chondrichthyes, 120 osteichthyes, 20 crustaceans, 24 cephalopods, 6 bivalves, 9 gastropods, 23 echinoderms, 10 ascidians , 10 cnidarians, 20 porifera and 14 other invertebrates) were identified, counted and weighted. Considering sex and maturity 40 taxa were sampled, including 24 MEDITS G1 species, 14 MEDITS G2 species that are considered under the DCF sampling plan for biological data from commercial fisheries and *Todaropsis eblanae*, for which a further investigation on its size at maturity has been planned, as a decrease in ML50 has been observed from 2008 to 2014). Otoliths from 1223 fish specimens (374 *Merluccius merluccius*, 842 *Mullus barbatus*, 7 *Mullus surmuletus*) were collected. Tissue samples and calibrated pictures of *Centrophorus granulosus* specimens were collected for a study of GenoDREAM (Laboratory of Genetics & Genomics of Marine Resources and Environment, Interdepartmental Research Centre for Environmental Sciences, University of Bologna) aiming to clarify *Centrophorus specimens* taxonomic confusion between the two species *C. granulosus* and *C. uyato* occuring in the Mediterranean Sea. Litter items were collected, weighted and counted by sub-category.

Panagiota Peristeraki presented information for **GSAs 22** and **23.** Three scientific teams were involved in the surveys, two from HCMR and one from FRI. FRI team was responsible for the survey in the N. Aegean Sea (part of GSA 22). The survey was realized from 18/6/2018 to 16/7/2018, with the hired commercial vessel “MEGALOHARI N.Θ. 1031». Sixty five stations were sampled during this survey. HCMR (Crete) team was responsible for the survey in the S. Aegean Sea (part of GSA 22) and Cretan Sea (GSA 23), that was realized from 22/6/2018 to 25/7/2018, with the hired commercial vessel “NAUTILOS N.X. 154. In these areas the survey covered sixty one stations. HCMR (Athens) team was responsible for the survey in the Argosaronikos region (part of GSA 22). In this case the survey was realized from 25/8/2018 to 5/9/2018, with the hired commercial vessel “TAKIS-MIMIS N.X. 411» and twenty eight (28) stations were sampled. All surveys were accomplished without any particular problems and data were collected in accordance with the foreseen design and procedures (Medits_Handbook_2017).

Ioannis Thasitis, from DFRM presented the MEDITS results for **GSA 25**. The 13th MEDITS survey was carried out from 30 of July to 10 of August 2018 and in total 25 of the 26 stations were effectively sampled using the Greek commercial vessel MEGALOCHARI. Prior to the survey the gear was measured and corrected according to the MEDITS protocol. Trawl sensors (SIMRAD ITI) and MiniCTD probes were used. On station No 3 the net was severely damaged from rock formations and it was not possible to resample it. An unintentional dropping of rocks from damping platforms while moving to their registered damping site had the result of canceling that station. A displacement was proposed during the presentation and approved by the group. Otoliths and Marine litter were effectively sampled. In total 213 species caught, recording 12 alien species and a first-time occurrence of 11 species. Analytical macrobenthos sampling was performed on all hauls and as a result 25 new species were proposed for the TM list. In addition, bongo net (vertical) and multi-net (horizontal) were used for sampling icthyoplankton. The 14th MEDITS survey already planned for June 2019.

3. Other relevant activities and on going projects

George Tiganov presented information about the demersal surveys accomplished along the Romanian Black Sea Coast in spring and autumn of 2018. The swept area method was used for the assessment of the turbot, whiting and dogfish biomass, based on the statistical analysis of survey and commercial data. Estimates by species ranged between: turbot (300 tons and 2,356 tons); whiting (5,650 t and 21,000 t) dogfish (1,450 t and 13,051 t), rapa wells (13,000 – 17,500 t) and gobies (300-500 t). The detailed report is included in Appendix 3.

Pierluigi Carbonara outlined the objectives of the EU financed “MED_UNITS” project noting the contribution of MEDITS data in achieving the project’s objectives. The project aims to clarify the stock structure of commercially important species in the Mediterranean.

Claudia Musumeci presented results of the EU funded project “Strengthening regional cooperation in the area of fisheries data collection” (STREAM), noting the contribution of MEDITS data. The main objective of the project was to support the realization of Regional Sampling Plans (RSP) for the Mediterranean fisheries. Claudia Musumeci presented findings related to the development of standardized approaches for the monitoring of fish communities and for abundance trends analysis. Further information is provided in Appendix 4.

George Tserpes presented an approach for the standardization of MEDITS survey indices that was developed in the frame of the EU funded “RECFISH” project. Further information is provided in Appendix 4.

Valentina Lauria made a presentation about the spatial distribution of Vulnerable Marine Ecosystems (VMEs) and their contribution to fisheries management in the Mediterranean. Further information is provided in Appendixes 3 and 4. The Group discussed about the indicator species presented and a proposal for an update of the MEDITS manual (target list) with some endangered species (e.g *Isidella*, *Leptomera*, various Coralligenous species) was made. The updated list could include a small number of easily identified on-board endangered species. Relevant scientists will prepare and present a concise proposal to the Group. Several group members, however, pointed out that the MEDITS data on these species may not be sufficient to allow detection of temporal trends.

Paolo Carpentieri presented information regarding the GFCM survey protocol and informed the Group that GFCM will support the realization of MEDITS compatible surveys in 2019 by Morocco and Tunisia. In this way the survey will expand in GSAs 12 and 14.

Pierluigi Carbonara presented a study that is under publication regarding the spatial distribution of *Isidella elongata* in Italian GSAs.

Sotiris Kiparissis referred to incidences of *Isidella elongata* presence in a couple of MEDITS stations in the northern Aegean Sea. The Group suggested that sampling on VMEs should be avoided and this point should be stressed in an updated version of the MEDITS manual. Such an update should also include a short list of easily identified on board endangered species (e.g. isidella, coralligenous, leptometra). Relevant benthos scientist would were asked to prepare a concise proposal to the Group.

Emanuela Fanelli presented a proposal aiming to the implementation of protection measures for *isidella elongata* through habitat mapping based on MEDITS and fisheries related data. The Group agreed to contribute to such an effort.

An inventory template was prepared and circulated among participants in order to identify to what extend other benthic species than those included in the MEDITS target lists (i.e. G1, G2, G3 list of species) are recorded in the different surveys and GSAs. The template is included in Appendix 3

Daniela Massi, made a presentation summarizing experiences gathered, since 2008, in sampling and processing procedures developed at CNR of Mazara del Vallo Laboratory for benthos studies in the Strait of Sicily including those based on the MEDITS survey. Further information is provided in Appendixes 3 and 4. Some critical issues faced during on-board sampling and laboratory processing were further discussed. As the MEDITS survey is primarily designed for sampling fish, cephalopod and crustacean megafauna, it was agreed to establish a working group (WG) to elaborate a standardized sampling protocol for other benthic species. The WG will provide a proposal for minimum sampling requirements considering the characteristics of the MEDITS surveys.

Maria Cristina Follesa informed the Group about the publication by FAO-GFCM of two manuals relative to age and maturity of halieutic species. Both are published as *Studies and reviews series* of the GFCM for the Mediterranean and are edited by Maria Cristina Follesa and Pierluigi Carbonara. Further information is provided in Appendix 3. The first manual entitled *ATLAS of the Maturity stages of the Mediterranean resources* contains the macro and micro photos of the MEDITS maturity scales for about 40 species, subdivided in Telosteans, Elasmobranchs, Crustaceans and Cephalopods. The structure of the Atlas chapters was demonstarted in detail for certain species. The second manual, entitled *Handbook on the fish age determination: a Mediterranean experience* contains information about the sampling methods, technics of extraction and storage of calcified structures, as well as chapters dealing with the interpretation of the ring structure (presence of false rings and growth annuli). The information included in the manual refers to 12 demersal, six large and small pelagic, five cartilaginous and one diadromous species. The structure of the Handbook chapters was shown in detail for certain species.

Several requests were communicated to the Group regarding the use of MEDITS data for the accomplishment of various projects and studies:

– Igor Agostini (University of Salento, Italy) requested historical MEDITS data on groupers for the accoplishment of a relevant study. The Group noted that groupers are not among the target species of the survey and are rarely captured due to their habitat preferences. It was, however, agreed to provide any relevant data that may exist.
– A request for historical data on diadromus species was also communicated by Noémie Deleys (Agrocampus-Quest, France). Similarly to the previous request the Group noted the rarity of such data and agreed to provide any relevant information may exist.

– A request for a series of yearly biomass indexes by species (primary list) and GSA for the needs of the Horizon 2020 project "ODYSSEA" was made by the project coordinator (Georgios Sylaios). The Group agreed to provide the relevant information.
– Valentina Lauria, on behalf of Francesco Colloca (CNR, Italy), presented a proposal for collaborative work with MEDITS scientists on issues related to the exploration of compensatory dynamics in Mediterranean exploited fish communities (further information is provided in Appendix 4). It was agreed that regional responsible scientists willing to collaborate in the above study will contact Dr. Colloca.
– Giovanna Lasinio ("Sapienza", University of Rome, Italy) requested the detailed time series of MEDITS data from all areas in order to support two Ph.D theses aiming to: (a) the comparison and development of Statistical methods to model large multispecies multiscale databases, and, (b) examine spatio-temporal patterns in biodiversity of Mediterranean demersal elasmobranchs in relation to fishing pressure and environmental variability. The Group noted that MEDITS scientists are currently involved in several studies on the above aspects and it was stressed that the analysis of MEDITS data independently of scientists involved in the survey can lead to misinterpretation problems. It was finally agreed that regional responsible scientists willing to contribute to the aforementioned theses could contact Dr. Lasinio to discuss about potential collaboration.

4. MEDITS monograph

Enric Massuti made a detailed presentation informing about the progress achieved so far regarding the publication of the Special MEDITS Monograph Volume in "Scientia Marina". The Group was informed about the remaining issues and it was estimated that the Volume will be released by the end of the current year. Furher information is provided in Appendix 4.

5. Other matters

The group agreed to proceed with an upgrade of the MEDITS manual, taking into account relevant questions mentioned under section 3 of the current report, as well as details on terminology. Concise text clarifying issues regarding the use of the MEDITS data, particularly from external users, will be included in the update.

Through correspondence from Prof. Giulio Relini, who chairs the TM list group, the Group was informed about updates in the TM list of species. The updated list is available on the web-site of MEDITS hosted by the Italian Society for Marine Biology (www.sibm.it).

Given that ICES has accepted to hold the MEDITS sharepoint, the group will discuss in a future meeting how this tool will be used in order to facilitate the work of the Steering Committee.

It was proposed and agreed that George Tserpes will continue the chairmanship of the MEDITS Steering Committee for the next two years.

It is most likely that the next MEDITS coordination meeting will be held in Slovenia in the spring of 2020 and will be hosted by the Fisheries Research Institute of Slovenia. Final arrangements about the venue will be made at a later stage.

6. Meeting closure

The Chairman thanked the hosts for their hospitality and the participants for their work during the meeting. The meeting was then adjourned.

APPENDIX 1

Meeting Agenda

2019 MEDITS Coordination Meeting Agenda

The meeting will start at 09.30 of April 16, 2018 and will end on April 17 (~17.00)
Meeting place: Sete, FRANCE, Maison Regionale de la Mer

Tuesday 16th April 2019 (09.30-13.00)

09.30-10.00

- Welcome of the participants
- Approval of the agenda

10.00-11.00

1. Conclusions of the previous Coordination meeting
2. Feedback from other relevant meetings and workgroups
   a. RCG Med & BS
   b. STECF survey evaluation
   c. Workshop on sampling, processing and analysing stomach contents (WKSTCON)
   d. GFCM
   e. ICES
3. Concise presentations (max 15 min) of the activities in the 2018 MEDITS surveys, by country/GSA, with special focus on problems, future planning, and extraordinary findings.

11.00-11.20 Coffee break
11.20-13.00
Continue on point 3.

13.00-14.30 Lunch break
14.30-16.00
Continue on point 3.
Discussion

16.00-16.20 Coffee break

16.20-17.30

4. Other relevant activities and on going projects
   a. Demersal Surveys at the Romanian Black Sea littoral. *George Tiganov*
   b. MEDITS contribution in EU funded project MED_UNITS. *Maria Teresa Spedicato*
   c. MEDITS contribution in EU funded project STREAM. *Claudia Musumeci*
   d. Standardization of MEDITS abundance indices in the frame of the EU funded RECFISH project. *Isabella Bitetto & George Tserpes*.
   e. Spatial distribution of VME to support fishery management in the Mediterranean sea. *Valentina Lauria*
   f. Exploring deep-sea Vulnerable Marine Ecosystems: *Isidella elongata* (Esper, 1788) assemblages in the Western-Central Mediterranean. *Pierluigi Carbonara*
   g. Standardization of macrobenthos processing during the MEDITS surveys

Social Dinner

Wednesday 17th April 2019 (09.00-17.00)

09.00-11.00

Continue on point 4

h. Request of MEDITS data for studying the distribution of groupers. *Igor Agostini*
i. Request of MEDITS data on anadromus species
j. Request of MEDITS biomass estimates from the Horizon 2020 ODYSSEA project
k. Request of MEDITS data for the comparison and development of Statistical methods to model large multispecies multiscale databases. *Giovanna Lasinio*
l. Request of MEDITS data to examine spatio-temporal patterns in biodiversity of Mediterranean demersal elasmobranchs in relation to fishing pressure and environmental variability. *Giovanna Lasinio*
e. Request of MEDITS data for the identification of *Isidella* habitats. *Emanuela Fanelli*
f. The GFCM survey protocol and outputs of the GFCM VME WG. *Paolo Carpentieri*

11.00-11.20 Coffee break

11.20-13.00

Continue on point 4

g. Guidelines regarding the use of MEDITS data
h. MEDITS share-point
i. TM list update
j. Terminology note

13.00-14.30 Lunch break

14.30-17.00

5. MEDITS Monograph: state of play. Final list of publications, progress made, time-frame for finalization. Maria Teresa Spedicato/Enric Massuti
6. Planning of activities for the next twelve months, including dates and venue of the next meeting
7. Any Other Business
8. Meeting closure

APPENDIX 2

List of Participants

N.	Surname	Name	Affiliation	e-mail
1	MASSI	Daniela	CNR-IRBIM, Italy	daniela.massi@cnr.it
2	BUSUTILL	Iman	DFA-MESDC, Malta	iman.busuttil@gov.mt
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9	ISAJLOVIC	Igor	IZOR, Split, Croatia	igor@izor.hr
10	JADAUD	Angelique	Ifremer, Sete, France	ajadaud@ifremer.fr
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13	THASITIS	Ioannis	DFMR, Cyprus	ithasitis@dfmr.moa.gov.cy
14	MASSUTI	Enric	IEO, Malaga, Spain	enric.massuti@ieo.es
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18	CERTAIN	Gregoire	IFREMER, France	gregoire.certain@ifremer.fr
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20	LUKIC	Petra	IZOR, Split, Croatia	lucic@izor.hr
21	LAURIA	Valentina	CNR-IRBIM, Italy	valentina.lauria@cnr.it
22	MUSUMECI	Claudia	CIBM, Italy	clamusu@gmail.com
23	PERISTERAKI	Panagiota	HCMR, Crete, Greece	notap@hcmr.gr
24	SBRANA	Mario	CIBM, Italy	msbrana@cibm.it
25	CARBONARA	Pierluigi	COISPA, Italy	carbonara@coispa.it
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30	FANELLI	Emanuela	UNIVPM, Italy	e.fanelli@univpm.it
31	AGOSTINI	Igor	Univ. Salento, Italy	igor.agostini@unisalento.it
32	JONA LASINIO	Giovanna	Univ. Rome, Italy	giovanna.jonalasinio@uniroma1.it
33	BRATINA	Petra	FRI, Slovenia	petra.bradna@zzrs.si
34	TSERPES	George	HCMR, Crete, Greece	gtserpes@hcmr.gr

APPENDIX 3 - Documents

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Workshop on Sexual Maturity staging from histological tools (WKMATHIS)

In September 2017 a *Workshop on Sexual Maturity staging from histological tools* (*WKMATHIS*) was held in Caen (France). The aim of the workshop is to identify the state of art of histological studies to applied to sexual maturity staging, compile an international agreed histological descriptions of maturity stages and to identify the need for further studies on histological tools to validate the macroscopic stages of gonadal development. The ToRs of the workshop were:

1. to identify the state of the art of histological studies applied to validate the macroscpic sexual maturity stages
2. To Explore the classification criteria and prepare an international description of histological features
3. To identify the limits of macroscopic staging for the use of gonadal development studies
4. To identify the needs for histological studies to improve the quality of the macroscopic maturity staging

General histological descriptions of the WKMATCH macro scale, already done in 2012 during the WKMATCH workshop , were constructed for female and male teleosts, oviparous and viviparous elasmobranches and cephalopods, as well as for female crustaceans.

The main conclusions were: 1) to develop a platform available to everyone to store and share macro and microscopic images for the maturity staging. 2) to organize workshops focusing on description of the histological structures. 3) maturity ogive should be based on recent maturity staging data for the stock assessment of species

In February 2018 a workshop on Sexual Maturity Staging of Elasmobranchs (WKMSEL3) with the objective to update the common scales used inside the GFCM and ICES laboratories and also of define new objective criteria to classify the maturity stages in those scales.

The ToRs of the workshop were the following:

a) Update the international maturity scales based on macroscopic features both for oviparous and viviparous species

b) Validate both maturity scales based on macroscopic features through histological analysis

c) Update the conversion tables both for oviparous and viviparous species;

d) Compile an Atlas using both macroscopical and histological gonad pictures

e) Increase the number of case studies with particular attention to the viviparous species.

For Elasmobranches Oviparous scale, the main changes were done on the description and names of the stages of the WKSEL2 macroscale.

Regarding the Elasmobranches viviparous, the WKSEL2 scale was modified taking into consideration the sincronicity or not of the development of both uterus and gonad.

Finally in may 2018 a Workshop for Advancing Sexual Maturity Staging in Fish chaired by Maria Cristina Follesa, Italy, and Cindy van Damme, The Netherlands, in Copenhagen, Denmark, was carried out to:

- Prepare a historical overview of (national) maturity scales used for uploading sexual maturity staging data into the ICES and GFCM databases;
- Create an overview, or prepare new, conversion tables from national maturity scales to the international agreed maturity scales;
- Establish an implementation plan for the international agreed maturity scales of WKMATCH and MEDITS, as the only scales for reporting to ICES and GFCM databases, respectively
- Expand general histological criteria, for validation of macroscopic maturity staging, as established by WKMATHIS for the different reproductive strategies in teleosts.

Outline of the report by GSA for presentation in the draft agenda:

GSA 01 and GSA 02

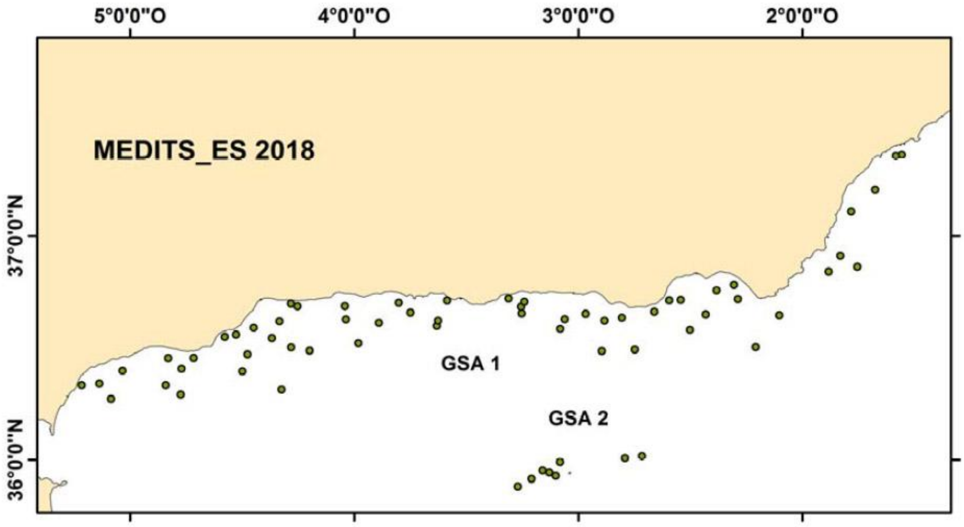
1. **<u>Review of 2017 survey by GSA</u>**

   1.1. Period in which the survey was carried out:
   April 26 to May 14 - 2018

   1.2. Vessel (indicate eventual changes with the previous years):
   V/R Miguel Oliver

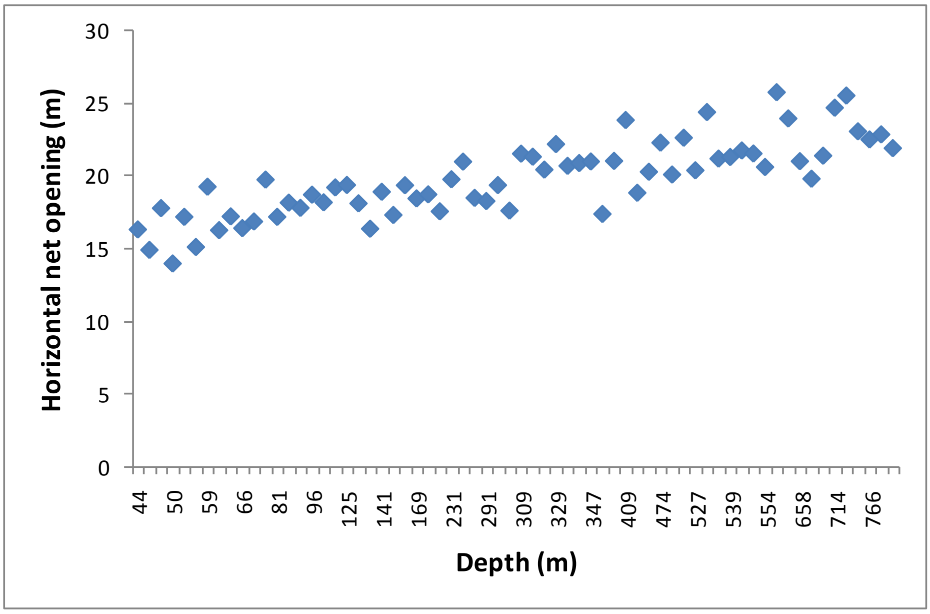
   1.3. Number of hauls performed, possible difficulties encountered:
   GSA 01: 58
   GSA 02: 8

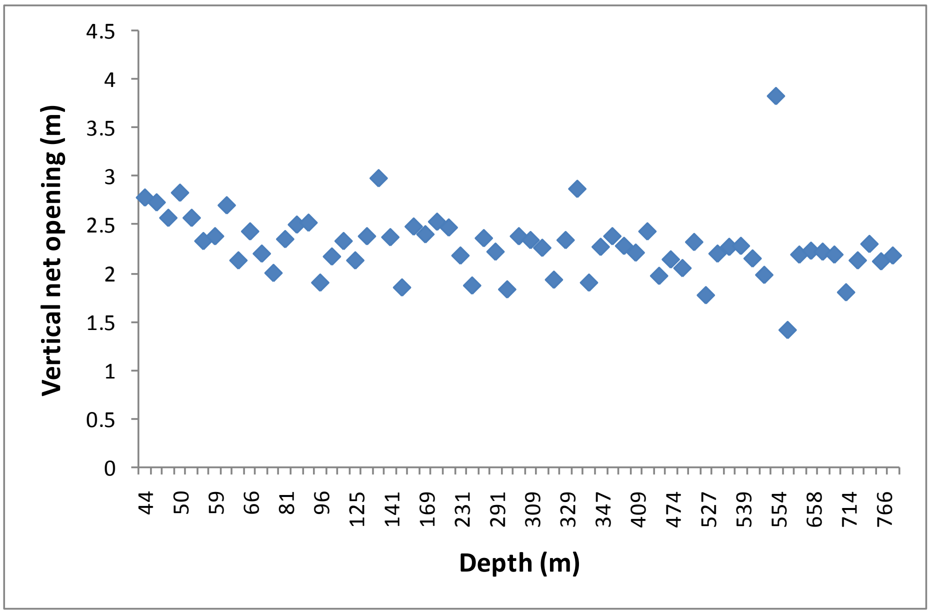
   1.4. The geographic area covered with a map showing haul locations:



1.5. Number of hauls in which scanmar (or equivalent equipment) was used and add a scatter plot of HO and VO vs. depth:

GSA 01: 58; GSA 02: 8





1.6. Number of hauls in which minilog (or equivalent equipment) was used:

CTD SBE-37 was used:
GSA 01: 43 hauls
GSA 02:8 hauls

1.7. Other measures of environmental variables carried out:

None

1.8. Litter recording: comments on the results of the last survey and feedback on the protocol:

Litter was recorded in all hauls and classified according to the following scheme:

CATEGORY	Weight (kg)	
	GSA-01	GSA-02
Coal	67.12	7.88
Clothes	12.21	2.18
Crystal	3.62	0.87
Wood	3.02	0.07---
Metal	3.16	0.14
Plastics	34.28	1.17
Rest of fishing gears	9.77	6.42
Others	61.52	1.76

1.9. Number of species classified by taxa:

CATEGORY	Species number	
	GSA-01	GSA-02
Fish	147	64
Crustaceans	80	34
Molluscs	92	37
Others	116	36

1.10 Total number of classified individuals of the MEDITS reference list:

	GSA 1	GSA 2
ELASMOBRANCHES		
Centrophorus granulosus	2	
Dalatias licha	4	1
Etmopterus spinax	368	159
Galeus melastomus	6496	2495
Leucoraja circularis	3	
Oxynotus centrina	4	
Raja asterias	24	
Raja clavata	1	1
Scyliorhinus canicula	852	346
Torpedo marmorata	31	
TELEOSTEANS		
Aspitrigla cuculus	18	8
Boops boops	612	56
Citharus linguatula	24	
Engraulis encrasicolus	1224	
Eutrigla gurnardus	2	
Helicolenus dactylopterus	1774	23

	GSA 1	GSA 2
Lepidorhombus boscii	6	
Lophius budegassa	81	9
Lophius piscatorius	1	
Merluccius merluccius	1208	
Micromesistius poutassou	4	
Mullus barbatus	682	
Mullus surmuletus	172	1
Pagellus acarne	727	142
Pagellus bogaraveo	48	
Pagellus erythrinus	369	
Pagrus pagrus	12	
Phycis blennoides	1571	38
Sardina pilchardus	333	
Spicara maena	210	
Spicara smaris	108	
Trachurus mediterraneus	3472	
Trachurus trachurus	6542	9641
Trigla lucerna		1
Trigloporus lastoviza	11	23
Zeus faber	14	2
CRUSTACEANS		
Aristaeomorpha foliacea	1	
Aristeus antennatus	389	78
Nephrops norvegicus	110	19
Parapenaeus longirostris	3327	142
Squilla mantis	8	
CEPHALOPODS		
Eledone cirrhosa	27	
Eledone moschata	28	9
Illex coindettii	95	
Loligo vulgaris	10	
Octopus vulgaris	204	10
Sepia officinalis	18	
Todarodes sagittatus	84	18

1.11 Total number of sampled individuals for length distributions:

	GSA 1	GSA 2
ELASMOBRANCHES		
Centrophorus granulosus	2	
Dalatias licha	4	1
Etmopterus spinax	363	155
Galeus melastomus	3638	1260
Leucoraja circularis	3	
Oxynotus centrina	4	
Raja asterias	2	
Raja clavata	1	1
Scyliorhinus canicula	852	346
Torpedo marmorata	29	
TELEOSTEANS		
Aspitrigla cuculus	18	8
Boops boops	411	56
Citharus linguatula	24	
Engraulis encrasicolus	252	
Eutrigla gurnardus	2	
Helicolenus dactylopterus	1251	23
Lepidorhombus boscii	6	
Lophius budegassa	81	9
Lophius piscatorius	1	
Merluccius merluccius	1208	
Micromesistius poutassou	4	
Mullus barbatus	532	
Mullus surmuletus	147	1
Pagellus acarne	663	142
Pagellus bogaraveo	48	
Pagellus erythrinus	369	
Pagrus pagrus	12	
Phycis blennoides	1469	36
Sardina pilchardus	333	
Spicara maena	210	
Spicara smaris	108	
Trachurus mediterraneus	1702	
Trachurus trachurus	2310	234
Trigla lucerna		1
Trigloporus lastoviza	11	23
Zeus faber	14	2
CRUSTACEANS		
Aristaeomorpha foliacea	1	
Aristeus antennatus	371	78
Nephrops norvegicus	109	19
Parapenaeus longirostris	2875	142
CEPHALOPODS		

	GSA 1	GSA 2
Eledone cirrhosa	27	
Eledone moschata	28	9
Illex coindettii	95	
Loligo vulgaris	10	
Octopus vulgaris	204	10
Sepia officinalis	18	
Todarodes sagittatus	84	18

1.12 Total number of sampled individuals for sex and maturity:

	GSA 1	GSA 2
ELASMOBRANCHES		
Centrophorus granulosus	2	
Dalatias licha	4	1
Etmopterus spinax	363	155
Galeus melastomus	3638	1260
Leucoraja circularis	3	
Oxynotus centrina	4	
Raja asterias	2	
Raja clavata	1	1
Scyliorhinus canicula	852	346
Torpedo marmorata	29	
TELEOSTEANS		
Merluccius merluccius	1208	
Mullus barbatus	532	
Mullus surmuletus	147	1
CRUSTACEANS		
Aristaeomorpha foliacea	1	
Aristeus antennatus	371	78
Nephrops norvegicus	109	19
Parapenaeus longirostris	2875	142
CEPHALOPODS		
Illex coindettii	95	
Loligo vulgaris	10	

1.13 Number of samples of hard tissues collected for ageing by target species:

SPECIE	TOTAL	
	GSA 01	GSA 02
Teleosteans		
Merluccius merluccius	124	---
Mullus barbatus	110	---
Mullus surmuletus	118	---

1.14 Otolith reading, difficulties encountered:

Otoliths of *Merluccius merluccius* have been collected but not read because of the agreement reached during MEDITS coordination meeting held on Ljubljana (2012)

2 Focus on historical trends

2.12 Abundance and biomass indices of target species (MEDITS G1)
2.13 minimum, mean and maximum length of target species (MEDITS G1)

GSA 01

Table 1.-Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Merluccius merluccius* during MEDITS surveys (GSA 01).

	Abundance ± S.E.	Biomass ± S.E.	Lmin	Lmed	Lmax
1994			4.5	15.7	78.5
1995	112.46 ± 37.47	4.61 ± 1.26	4.5	15.2	55.5
1996	406.22 ± 154.62	14.38 ± 2.83	6.0	13.4	72.0
1997	448.34 ± 175.65	13.50 ± 4.64	5.0	13.3	58.0
1998	211.33 ± 71.19	8.01 ± 2.67	5.5	12.6	58.0
1999	316.74 ± 192.24	6.49 ± 3.03	5.5	12.6	37.5
2000	259.56 ± 93.59	9.19 ± 2.31	6.0	15.2	51.0
2001	328.38 ± 153.84	12.25 ± 2.26	6.0	14.2	56.0
2002	859.94 ± 473.36	15.34 ± 5.74	5.0	12.4	56.0
2003	409.26 ± 180.10	11.64 ± 2.39	5.5	13.4	46.0
2004	266.30 ± 120.11	5.51 ± 1.38	5.5	14.0	37.0
2005	276.48 ± 93.55	8.88 ± 1.57	4.0	12.2	64.5
2006	101.96 ± 29.58	8.54 ± 1.81	5.5	17.3	66.5
2007	591.00 ± 334.00	11.42 ± 3.13	5.0	13.1	57.5
2008	521.00 ± 276.00	13.68 ± 3.54	6.0	14.2	57.0
2009	681.00 ± 279.00	24.48 ± 7.41	7.0	16.6	56.5
2010	340.00 ± 92.00	28.47 ± 925	5.5	18.1	53.5
2011	250.00 ± 80.00	13.71 ± 4.04	0.5	15.0	47.0
2012	112.00 ± 48.00	4.94 ± 1.15	5.0	14.0	57.5
2013	67.51±19.99	5.82±0.96	6	25.0	44.0
2014	439.82±202.74	9.14±1.78	8.0	10.0	39.0
2015	198.35±58.22	7.57±1.40	0.5	39.5	67.5
2016	280.14±92.24	5.9±0.59	5.5	12	43.5
2017	148.48±42.75	9.40±1.81	9.4	17.9	64.4
2018	247.01±93.54	12.77±4.79	0.5	16.7	55.0

Table 2.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Mullus barbatus* during MEDITS surveys (GSA 01).

	Abundance ± S.E.	Biomass ± S.E.	Lmin	Lmed	Lmax
1994			11.0	15.1	22.5
1995	443.33 ± 230.7	17.43 ± 9.28	9.5	14.9	22.5
1996	94.21 ± 52.84	3.15 ± 1.75	11.0	14.4	22.0
1997	55.08 ± 25.06	2.25 ± 0.94	12.0	15.6	21.5
1998	137.31 ± 67.59	5.93 ± 2.74	11.0	15.4	24.0
1999	69.03 ± 33.76	3.01 ± 1.48	9.0	14.9	24.5
2000	95.91 ± 52.75	4.13 ± 2.3	11.5	15.2	23.0
2001	167.33 ± 67.23	8.32 ± 3.71	10.5	15.6	27.5
2002	180.76 ± 90.31	6.34 ± 3.01	9.5	14.3	21.5

	Abundance ± S.E.	Biomass ± S.E.	Lmin	Lmed	Lmax
2003	117.02 ± 69.63	5.84 ± 3.22	9.5	16.0	24.0
2004	421.05 ± 304.92	12.83 ± 7.38	9.0	14.0	23.0
2005	51.71 ± 23.22	3.07 ± 1.41	10.0	16.5	36.5
2006	969.34 ± 728.48	25.29 ± 17.28	10.0	14.3	23.5
2007	741.00 ± 413.00	26.46 ± 12.23	10.0	14.8	26.0
2008	542.00 ± 297.00	21.98 ± 11.23	8.0	15.3	26.0
2009	650.00 ± 478.00	21.20 ± 14.31	9.5	14.5	26.0
2010	268.00 ± 120.00	12.99 ± 5.53	7.5	15.3	24.0
2011	366.00 ± 168.00	15.85 ± 6.65	10.0	14.8	25.0
2012	155.00 ± 89.00	9.47 ± 5.08	12.5	17.1	23.5
2013	199.17±105.16	7.96±4.02	10	14.5	24.0
2014	206.47±91.77	8.82±3.30	11.0	15.0	25.0
2015	174.87±61.40	6.93±2.38	10.5	14.5	23.5
2016	217±24.67	8.00±1.00	10.5	14.5	24.0
2017	160.19±46.34	6.99±1.91	11.0	15.1	24.5
2018	190.43±98.8	6.7±3.35	10.0	14.5	22.5

Table 3.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Mullus surmuletus* during MEDITS surveys (GSA 01).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1994			13.0	19.2	32.0
1995	106.76 ± 54.37	6.71 ± 3.35	13.0	16.9	32.5
1996	67.99 ± 36.94	8.37 ± 4.53	13.5	19.8	36.5
1997	18.16 ± 9.66	2.44 ± 1.64	15.5	21.8	33.0
1998	58.45 ± 17.08	6.50 ±2.05	11.0	19.5	33.0
1999	23.81 ± 11.88	2.66 ± 1.35	16.0	19.8	32.0
2000	31.44 ± 27.71	2.28 ± 1.96	14.5	17.4	22.0
2001	26.94 ± 8.65	3.27 ± 0.95	10.5	21.2	44.5
2002	93.63 ± 58.15	11.88 ± 6.67	15.0	21.5	41.0
2003	26.39 ± 11.6	4.62 ± 3.17	13.0	22.8	36.5
2004	164.2 ± 140.08	27.97 ± 25.78	14.5	21.3	39.0
2005	18.94 ± 6.57	2.73 ± 1.04	16.0	23.2	31.0
2006	36.51 ± 16.07	6.17 ± 3.3	14.5	23.3	32.0
2007	77.00 ± 36.00	9.89 ± 4.31	14.0	21.0	31.5
2008	24.00 ± 13.00	3.18 ± 1.47	15.5	21.4	33.5
2009	94.00 ± 49.00	11.84 ± 6.07	10.5	20.1	29.5
2010	21.00 ± 11.00	2.72 ±1.28	14.0	22.4	35.5
2011	30.00 ± 14.00	5.01 ± 2.20	15.0	22.4	33.5
2012	53.00 ± 28.00	7.69 ± 4.34	16.0	21.2	31.0
2013	11.56±5.09	1.2±0.64	16.0	21.0	31.0
2014	26.26±10.02	3.00±0.92	19.5	20.5	36.5
2015	26.52±8.16	3.11±0.93	14.5	21	33.5
2016	50.25±19.06	3.85±0.92	11.0	19.5	32.0
2017	91.13±73.12	8.62±5.91	14.5	19.5	31.0
2108	37.46±13.46	3.63±1.25	14.0	19.4	28.0

Table 4.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Etmopterus spinax* during MEDITS surveys (GSA 01).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1994			9.0	19.0	38.0
1995	70.40 ± 16.35	6.29 ± 1.62	9.0	25.5	38.0
1996	124.10 ± 31.86	8.69 ± 2.33	7.0	22.0	37.0
1997	221.38 ± 56.36	18.54 ± 4.81	10.0	25.0	41.0
1998	332.62 ± 136.25	24.4 ± 9.03	10.0	22.5	42.0
1999	77.41 ± 19.05	8.47 ± 2.16	10.0	28.0	40.0
2000	95.29 ± 27.41	10.37 ± 3.26	9.0	26.5	40.0
2001	105.78 ± 23.60	10.42 ± 2.25	10.0	25.5	39.0
2002	58.14 ± 14.47	6.70 ± 2.04	9.0	26.5	40.0
2003	84.02 ± 23.84	5.82 ± 1.42	10.0	21.5	42.0
2004	122.03 ± 35.25	11.1 ± 3.78	10.0	23.5	39.0
2005	159.74 ± 58.63	17.74 ± 7.1	9.0	25.5	40.0
2006	183.99 ± 49.52	19.43 ± 6.01	10.0	27.5	41.0
2007	147.78 ± 61.55	15.85 ± 7.91	8.0	26.8	40.5
2008	66.65 ± 28.00	4.59 ± 2.07	9.5	23.6	39.5
2009	82.01 ± 34.48	5.24 ± 2.41	9.0	22.2	34.5
2010	95.03 ± 25.34	15.55 ± 4.68	10.0	26.4	40.0
2011	62.32 ± 22.21	6.45 ± 2.87	10.0	27.4	39.0
2012	81.16 ± 28.43	8.85 ± 3.61	10.0	28.4	39.0
2013	135.96±31.98	14.89±4.58	10.0	28.4	39.0
2014	76.92±11.83	7.45±1.78	9.0	25.0	41.0
2015	76.03±26.41	5.40±1.14	10.0	20.0	38.5
2016	166±58.63	15.46±6.03	9.0	21.0	39.5
2017	73.02±15.66	7.19±1.95	9.5	25.4	39.5
2018	81.43±16.76	7.53±1.63	9.5	25.7	39.0

Table 5.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Galeus melastomus* during MEDITS surveys (GSA 01).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1994			10.0	37.0	61.0
1995	828.19 ± 186.42	153.81 ± 41.88	10.0	36.0	59.0
1996	1488.47 ± 402.48	216.49 ± 56.44	10.0	37.0	57.0
1997	2670.03 ± 750.57	441.37 ± 137.78	11.0	34.5	60.0
1998	1161.52 ± 292.32	153.10 ± 34.06	11.0	37.5	62.0
1999	468.78 ± 163.98	91.04 ± 32.60	10.0	36.0	60.5
2000	717.16 ± 194.81	170.86 ± 58.70	9.5	36.2	57.5
2001	558.83 ± 134.33	132.24 ± 30.71	10.5	38.3	63.0
2002	1214.03 ± 292.3	189.21 ± 61.19	10.5	29.2	60.5
2003	904.94 ± 287.65	158.65 ± 42.69	11.5	35.0	64.5
2004	1328.05 ± 359.60	226.65 ± 70.19	10.5	35.5	62.5
2005	1100.11 ± 330.64	238.71 ± 80.59	11.0	35.1	62.0
2006	2250.85 ± 504.66	397.36 ± 108.21	10.5	32.6	58.5
2007	1241.10 ± 457.17	202.53 ± 84.83	9.5	31.7	58.0
2008	801.55 ± 420.46	110.68 ± 58.66	11.0	35.7	60.0

2009	1015.96 ± 398.23	136.70 ± 63.41	11.0	31.2	57.0
2010	921.95 ± 281.92	369.72 ± 123.31	10.0	39.8	61.0
2011	2109.69 ± 1189.67	256.46 ± 115.20	10.0	26.6	66.0
2012	1504.30 ± 543.39	193.64 ± 71.10	10.0	29.8	62.0
2013	1911±448.48	441.18±78.90	10.0	38.3	62.0
2014	1783±323.41	355.70±84.54	10.0	36.2	62.0
2015	1167.74±260.56	183.76±23.70	8.0	31.0	63.0
2016	2087.90±711.02	184.90±38.41	10.0	31.5	61.0
2017	1191.93±134.73	224.84±34.75	8.0	37.5	61.0
2018	1340.98±341.29	193.7±40.36	10.0	33.0	62.0

Table 6.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Scyliorhinus canicula* during MEDITS surveys (GSA 01).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmed**	**Lmax**
1994			7.0	35.5	50.0
1995	29.66 ± 12.35	4.59 ± 1.70	9.0	31.1	54.0
1996	30.39 ± 10.19	6.51 ± 2.08	16.0	37.2	50.0
1997	79.89 ± 29.02	11.86 ± 4.03	13.0	31.8	52.0
1998	98.55 ± 30.15	21.65 ± 6.16	9.0	39.5	51.0
1999	12.32 ± 5.92	3.42 ± 2.17	10.0	37.9	51.5
2000	21.98 ± 8.49	5.33 ± 2.13	10.5	39.9	53.0
2001	58.27 ± 19.24	12.59 ± 3.60	11.0	38.5	56.5
2002	406.97 ± 111.37	73.56 ± 16.59	6.5	37.1	55.0
2003	218.36 ± 70.14	41.31 ± 11.16	9.0	39.2	54.5
2004	87.09 ± 18.11	21.47 ± 5.23	9.0	41.3	52.0
2005	212.81 ± 74.18	33.59 ± 10.66	10.0	35.6	52.5
2006	238.25 ± 98.37	53.97 ± 17.06	10.0	39.8	56.5
2007	247.91 ± 57.46	54.39 ± 10.96	11.5	38.7	56.5
2008	142.89 ± 65.59	22.92 ± 6.92	9.0	34.8	51.0
2009	102.07 ± 25.06	19.16 ± 3.17	11.0	34.8	60.0
2010	27.31 ± 11.51	3.54 ± 1.08	10.0	27.8	52.0
2011	417.76 ± 240.93	35.51 ± 18.69	9.0	31.3	50.0
2012	166.65 ± 76.49	20.12 ± 8.30	10.0	30.9	51.0
2013	114.90±50.49	18.56±6.71	13.0	34.7	50.0
2014	113.91±25.97	18.50±3.12	9.0	34.5	54.0
2015	463.43±225.19	41.46±15.53	7.0	30.7	53.0
2016	292.23±92.57	36.70±10.73	9.0	32.5	51.0
2017	127.45±44.19	15.89±4.43	9.0	33.2	54.0
2018	161.08±55.42	24.55±7.46	8.0	32.8	58.0

Table 7.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Torpedo marmorata* during MEDITS surveys (GSA 01).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmed**	**Lmax**
1994	0	0	----	----	----
1995	2.77 ± 1.07	1.76 ± 0.85	21.0	31.0	41.0
1996	0.49 ± 0.42	0.24 ± 0.21	30.0	30.0	30.0
1997	8.98 ± 3.10	2.57 ± 1.10	14.0	22.0	33.0
1998	2.21 ± 1.15	0.24 ± 0.13	12.0	15.5	21.0

1999	1.71 ± 1.22	0.55 ± 0.47	16.0	21.5	30.0
2000	1.28 ± 0.87	0.23 ± 0.17	17.0	19.0	21.0
2001	3.87 ± 2.59	1.57 ± 0.94	18.0	23.0	37.0
2002	3.65 ± 2.40	1.89 ± 1.56	13.0	27.0	34.0
2003	2.60 ± 1.94	1.47 ± 1.13	23.0	29	35.0
2004	3.77 ± 1.98	1.66 ± 0.90	20.0	26.5	33.0
2005	6.71 ± 1.90	1.35 ± 0.41	12.0	20.0	29.0
2006	4.86 ± 2.26	0.97 ± 0.43	15.0	20.5	32
2007	2.85 ± 2.02	0.72 ± 0.54	14.5	21.3	32.0
2008	2.34 ± 1.57	0.97 ± 0.65	22.0	25.5	29.5
2009	7.49 ± 3.91	3.43 ± 1.82	20.0	27.2	46.5
2010	2.54 ± 1.18	1.31 ± 0.82	21.0	25.7	34.0
2011	3.14 ± 1.27	1.60 ± 0.83	19.0	25.0	35.0
2012	9.29 ± 3.32	4.99 ± 2.77	13.0	24.8	48.5
2013	6.40±2.15	4.00±1.51	13.0	24.5	48.0
2014	4.40±1.24	1.95±0.67	17.0	25.8	41.5
2015	3.95±2.07	0.84±0.44	12	19.7	25
2016	3.01±0.93	1.00±0.36	13.5	22.5	30.5
2017	3.16±1.61	1.70±1.51	16.5	31.0	50.0
2018	7.34±4.76	3.27±2.77	12.0	24.5	47.0

Table 8.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Aristeus antennatus* during MEDITS surveys (GSA 01).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmed**	**Lmax**
1994			21	35	56
1995	196.96 ± 103.96	2.57 ± 1.38	16	31	53
1996	97.17 ± 54.06	1.52 ± 0.80	16	31	63
1997	204.42 ± 101.49	2.37 ± 1.17	18	28	58
1998	153.95 ± 85.22	1.77 ± 0.96	17	29	62
1999	89.89 ± 38.52	1.49 ± 0.77	15	32	55
2000	454.84 ± 246.31	4.75 ± 2.53	18	28	60
2001	124.02 ± 50.78	2.12 ± 0.83	20	31	55
2002	82.02 ± 48.26	1.17 ± 0.67	19	31	56
2003	111.25 ± 67.24	2.50 ± 1.52	20	37	60
2004	102.13 ± 73.34	1.54 ± 1.09	16	32	58
2005	121.95 ± 108.56	1.78 ± 1.58	18	32	60
2006	178.72 ± 123.08	3.03 ± 1.99	18	33	57
2007	7.53 ± 103.42	0.57 ± 0.59	20	36	56
2008	18.29 ± 12.40	0.15 ± 0.12	16	28	58
2009	0.62 ± 0.45	0.00 ± 0.00	26	19	36
2010	40.00 ± 34.00	0.71 ± 0.60	22	34	54
2011	1.17 ± 1.11	0.02 ± 0.02	30	34	61
2012	47.72 ± 26.75	0.94 ± 0.52	21	37	57
2013	1.43±1.43	0.13±0.13	20	31	50
2014	118.20±63.48	2.40±1.28	20	36	59
2015	136±83.94	2.12±1.13	20	31	60
2016	93.74±26.39	2.05±0.58	20	37	61
2017	78.74±45.54	1.43±0.81	19	33	59
2018	88.75±70.11	1.49±1.07	17	33	59

Table 9.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Neprhops norvegicus* during MEDITS surveys (GSA 01).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmed**	**Lmax**
1994			34	43	53
1995	22.12 ± 6.22	1.12 ± 0.33	24	40	60
1996	32.46 ± 12.84	2.09 ± 0.83	27	44	71
1997	72.08 ± 35.89	3.50 ± 1.90	18	36	57
1998	14.56 ± 5.74	0.50 ± 0.22	18	36	52
1999	20.34 ± 11.9	0.70 ± 0.46	15	35	58
2000	24.62 ± 9.46	1.15 ± 0.41	22	39	65
2001	18.52 ± 6.91	1.03 ± 0.39	24	39	55
2002	66.50 ± 31.44	2.51 ± 0.95	20	36	72
2003	103.26 ± 39.89	4.81 ± 1.95	19	39	88
2004	109.33 ± 59.06	5.81 ± 3.13	15	40	63
2005	45.34 ± 19.76	2.38 ± 1.04	23	41	62
2006	70.77 ± 26.18	4.42 ± 1.54	29	43	67
2007	37.32 ± 13.11	2.29 ± 0.78	29	44	65
2008	19.52 ± 7.87	1.30 ± 0.52	24	43	68
2009	55.68 ± 37.30	3.00 ± 1.91	20	45	50
2010	38.60 ± 14.98	2.34 ± 0.85	17	42	55
2011	27.54 ± 12.26	1.26 ± 0.58	32	44	67
2012	5.78 ± 3.31	0.55 ± 0.30	37	50	62
2013	22.71±12.74	1.75±0.97	30	46	60
2014	34.44±12.88	2.27±0.77	25	43	69
2015	35.24±11.06	2.07±0.64	18	42	66
2016	34.43±12.88	2.27±0.77	12	39	69
2017	38.69±14.33	1.85±0.63	13	38	68
2018	21.67±12.8	1.14±0.56	22	41	63

Table 10.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Parapenaeus longirostris* during MEDITS surveys (GSA 01).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmed**	**Lmax**
1994			22	24	27
1995	44.13 ± 14.06	0.28 ± 0.11	8	19	37
1996	111.15 ± 33.31	0.91 ± 0.26	9	24	41
1997	289.73 ± 143.05	2.04 ± 0.97	11	22	39
1998	477.35 ± 194.81	2.4 ± 0.94	7	19	34
1999	180.23 ± 64.49	1.39 ± 0.62	6	23	34
2000	228.48 ± 79.54	1.87 ± 0.67	9	24	35
2001	187.75 ± 82.97	1.69 ± 0.77	5	22	35
2002	241.35 ± 63.09	1.71 ± 0.42	9	22	34
2003	37.72 ± 13.16	0.4 ± 0.15	10	25	36
2004	157.62 ± 66.40	1.38 ± 0.61	6	23	40
2005	60.79 ± 43.15	0.59 ± 0.39	17	25	37
2006	106.79 ± 74.87	1.05 ± 0.66	5	26	41
2007	70.27 ± 51.36	0.51 ± 0.32	8	23	34
2008	80.19 ± 39.69	0.76 ± 0.38	15	26	35
2009	568.24 ± 205.71	5.49 ± 1.99	11	27	29

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
2010	270.74 ± 191.08	1.53 ± 0.79	13	25	38
2011	329.46 ± 105.37	3.11 ± 1.27	10	24	40
2012	583.72 ± 206.82	3.54 ± 1.38	9	23	36
2013	142.36±37.54	1.63±0.45	5	17	30
2014	129.11±39.12	1.21±0.36	5	25	36
2015	94.25±24.13	1.03±0.33	9	25	37
2016	101.71±14.14	10.09±0.15	11	26	39
2017	105.76±24.03	1.09±0.24	10	26	40
2018	516.42±124.73	4.6±0.86	3	24	38

Table 11.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Illex coindietti* during MEDITS surveys (GSA 01).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1994			15.0	15.0	15.0
1995	5.47 ± 1.94	0.46 ± 0.17	8.5	13.4	25.0
1996	38.78 ± 12.92	9.76 ± 6.09	6.5	14.1	22.5
1997	62.63 ± 19.58	4.3 ± 1.17	5.5	11.6	22.0
1998	252.14 ± 175.74	6.85 ± 2.34	5.5	13.3	23.5
1999	97.92 ± 30.91	14.03 ± 3.87	5.5	16.4	27.0
2000	47.68 ± 18.7	6.51 ± 2.75	6.0	16.1	24.0
2001	90.16 ± 30.14	12.81 ± 3.63	4.0	16.5	24.0
2002	80.99 ± 22.42	7.1±2.07	4.5	13.1	22.5
2003	152.58 ± 45.35	20.45 ± 4.81	6.0	16.2	24.0
2004	13.7 ± 5.42	1.7 ± 0.62	6.5	14.6	21.0
2005	65.04 ± 21.27	9.46 ± 3.49	4.0	16.2	26.0
2006	5.09 ± 1.90	0.82 ± 0.32	7.0	14.7	21.0
2007	17.92 ± 10.46	2.46 ± 1.55	8.0	15.8	22.0
2008	9.87 ± 3.77	1.39 ± 0.53	6.5	13.9	25.5
2009	51.30 ± 15.02	3.07 ± 0.95	6.5	12.3	19.0
2010	24.82 ± 9.40	1.44 ± 0.54	2.0	10.8	18.5
2011	141.88 ± 36.72	14.34 ± 3.29	4.5	13.8	21.0
2012	137.75 ± 41.10	13.09 ± 3.91	7.0	14.5	20.5
2013	99.94±22.45	9.77±2.36	5	17.1	30
2014	184.86±46.82	7.13±1.62	5.5	10.6	20
2015	98.44±24.59	6.66±1.48	1	7.10	22.5
2016	120.78±25.43	10.67±2.03	7.0	14.0	20.0
2017	41.82±23.54	3.84±1.99	5.5	14.2	19.0
2018	18.24±12.26	2.37±1.61	5.5	15.5	27.5

Table 12.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Loligo vulgaris* during MEDITS surveys (GSA 01).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1994			23.0	23.0	23.0
1995	3.2 0 ± 1.80	0.56 ± 0.28	16.0	20.2	26.0
1996	0.74 ± 0.64	0.03 ± 0.03	10.0	10.0	10.0
1997	0 ± 0	0 ± 0	----	----	----
1998	2.29 ± 1.14	0.37 ± 0.19	15.5	17.5	19.5

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1999	1.55 ± 1.13	0.48 ± 0.37	19.0	21.2	24.0
2000	0.50 ± 0.49	0.13 ± 0.13	19.0	19.0	19.0
2001	3.91 ± 1.73	0.89 ± 0.45	11.5	19.1	24.0
2002	19.00 ± 7.61	3.69 ± 1.55	4.0	15.8	27.5
2003	6.17 ± 2.70	1.99 ± 1.13	11.5	21.6	26.5
2004	6.39 ± 2.33	1.56 ± 0.85	10.0	17.7	30.0
2005	2.91 ± 1.28	0.70 ± 0.37	5.5	17.7	25.5
2006	8.70 ± 6.25	4.21 ± 2.95	14.5	27.5	50.0
2007	7.00 ± 3.73	1.13 ± 0.62	12.0	15.9	28.5
2008	13.09 ± 10.58	1.91 ± 1.62	10.0	15.0	29.0
2009	28.54 ± 14.37	5.09 ± 3.12	12.0	18.7	45.0
2010	1.00 ± 0.85	0.50 ± 0.42	27.0	27.0	27.0
2011	5.42 ± 3.05	1.21 ± 0.93	7.0	18.8	38.5
2012	2.07 ± 1.57	0.08 ± 0.07	5.0	8.3	14.0
2013	0.98±0.55	0.036±0.027	5.0	8.3	14.0
2014	1.85±0.76	0.25±0.13	8.5	14.2	22.5
2015	1.86±0.97	0.33±0.18	1.0	2.7	24.0
2016	7.19±2.24	0.73±0.21	3.5	11.4	27.5
2017	0.43±0.30	0.15±0.15	4.0	15.7	27.5
2018	2.81±1.71	0.51±0.32	7.0	17.1	26.5

GSA 02

Table 1.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Merluccius merluccius* during MEDITS surveys (GSA 02).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
2006	0.03 ± 0.35	0.28 ± 4.01	21.0	22.5	23.5
2007	0.00	0.00	-----	-----	-----
2008	0.33 ± 3.35	0.26 ± 2.66	46.0	46.0	46.0
2009	0.08 ± 1.34	0.19 ± 3.23	64.0	64.0	64.0
2011	0.00	0.00	----	----	----
2012	2.32 ± 33.00	0.03 ± 0.48	10.0	12.0	15.0
2013	0.00	0.00	----	----	----
2014	4.11±0.00	6160.62±0.00	60.0	60.0	60.0
2015	3.86±0.00	2.31±0.00	43.0	43.0	43.0
2016	3.03±0.00	2.40±0.00	45.0	45.0	45.0
2017	0.00	0.00	----	----	----
2018	0.00	0.00	-----	-----	-----

Table 2.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Mullus barbatus* during MEDITS surveys (GSA 02).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
2006	0.00	0.00	----	----	----
2007	0.00	0.00	----	----	----
2008	0.00	0.00	----	----	----
2009	0.00	0.00	----	----	----
2011	0.00	0.00	----	----	----
2012	0.00	0.00	----	----	----
2013	0.00	0.00	----	----	----
2014	0.00	0.00	----	----	----
2015	0.00	0.00	----	----	----
2016	0.00	0.00	----	----	----
2017	0.00	0.00	----	----	----
2018	0.00	0.00	-----	-----	-----

Table 3.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Mullus surmuletus* during MEDITS surveys (GSA 02).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
2006	2.2 ± 19.32	0.37 ± 3.34	17.0	23.0	28.5
2007	1.00 ± 17.00	0.26 ± 4.24	23.5	26.5	33.0
2008	0.00	0.00	----	----	----
2009	6.00 ± 105.85	0.32 ± 5.29	13.0	15.5	20.5
2011	0.00	0.00	----	----	----
2012	0.00	0.00	----	----	----
2013	0.00	0.00	----	----	----
2014	0.00	0.00	----	----	----
2015	3.86±0.00	0.24±0.00	18.0	18.0	18.0

2016	0.00	0.00	----	----	----
2017	0.00	0.00	----	----	----
2018	3.13±0	0.27±0	20.5	20.5	20.5

Table 4.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Etmopterus spinax* during MEDITS surveys (GSA 02).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmed**	**Lmax**
2006	48.36 ± 633.94	1.78 ± 18.19	10.0	26.5	39.0
2007	8.55 ± 84.57	0.73 ± 7.81	8.5	25.6	38.0
2008	7.72 ± 40.44	0.67 ± 4.78	10.5	25.0	37.5
2009	18.13 ± 161.10	1.79 ± 15.71	10.0	24.0	36.5
2011	5.42 ± 42.45	0.63 ± 6.05	10.0	27.0	38.0
2012	35.22 ± 209.49	2.83 ± 20.02	9.0	24.0	39.0
2013	49.53±25.01	3.81±1.83	9	24.5	. 39.0
2014	198.84±96.26	22.83±12.00	11.0	28.4	36.0
2015	187.99±14.49	17.53±3.75	10.5	26.3	38.5
2016	239.20±115.59	23.73±11.95	10.0	27.7	41.0
2017	120.48±26.30	12.90±3.85	9.5	28.3	15.5
2018	124.9±29.36	14.49±3.16	17.0	29.2	40.0

Table 5.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Galeus melastomus* during MEDITS surveys (GSA 02).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmed**	**Lmax**
2006	156.3 ± 683.26	12.52 ± 59.49	11.5	30.2	63.0
2007	83.88 ± 471.06	10.17 ± 91.99	10.0	26.8	58.0
2008	125.07 ± 626.46	18.44 ± 126.2	10.0	32.4	62.0
2009	160.85 ± 469.52	18.27 ± 106.03	8.5	32.4	69.0
2011	1446.85 ± 18179.65	12.11 ± 100.26	7.0	24.0	61.0
2012	399.44 ± 1758.54	32.4 ± 129.01	9.0	30.6	61.0
2013	6046.00±3395.62	44.24±76.00	9.0	30.0	61.0
2014	2684.34±412.02	546.18±109.64	11.0	35.8	62.0
2015	2476.17±888.14	281.72±107.47	8.5	32.6	62.0
2016	2951.14±293.26	302.46±25.03	10.0	35.5	62.0
2017	1058.30±271.99	164.31±17.50	9.0	35.3	63.0
2018	2514.5±907.04	145.7±52.55	10.0	24.8	60.0

Table 6.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Scyliorhinus canicula* during MEDITS surveys (GSA 02).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmed**	**Lmax**
2006	43.56 ± 400.47	7.49 ± 50.11	13.0	32.6	55.5
2007	20.01 ± 143.94	6.18 ± 41.83	18.5	44.0	54.0
2008	32.86 ± 240.96	4.78 ± 28.73	16.0	30.0	53.0
2009	32.16 ± 355.11	9.79 ± 68.58	21.0	40.5	54
2011	50.84 ± 346.1	8.57 ± 52.91	23.0	38.0	73.0
2012	53.06 ± 558.16	7.65 ± 65.2	22.0	35.5	50.0

2013	102.71±10.29	14.49±17.12	22.0	35.5	50.0
2014	700.62±86.52	12.18±1.20	24.0	37.3	52.0
2015	1113.10±475.66	112.69±31.02	13.0	29.4	52.0
2016	1427.41±108.76	145.92±19.23	18.0	31.8	49.0
2017	737.15±63.91	87.27±3.78	14.0	33.7	49.5
2018	739.59±100.09	88.48±10.99	18.0	33.1	51.0

Table 7.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Torpedo marmorata* during MEDITS surveys (GSA 02).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmed**	**Lmax**
2006	0.18 ± 1.57	0.09 ± 0.97	18.0	25.0	32.0
2007	0.11 ± 1.68	0.22 ± 3.43	43.5	43.5	43.5
2008	0.00	0.00	----	----	----
2009	0.19 ± 3.02	0.03 ± 0.42	16.0	16.0	16.0
2011	0.09 ± 1.16	0.04 ± 0.48	19.0	19.0	19.0
2012	0.00	0.00	----	----	----
2013	0.00	0.00	----	----	----
2014	3.21±0.03	1.73±66.16	28.0	28.2	28.5
2015	1.51±1.51	0.51±0.51	22.0	22.0	22.0
2016	0.00	0.00	----	----	----
2017	0.00	0.00	----	----	----
2018	0.00	0.00	----	----	----

Table 8.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Aristeus antennatus* during MEDITS surveys (GSA 02).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmed**	**Lmax**
2006	4.72 ± 43.13	0.10 ± 0.89	14	34	56
2007	7.53 ± 103.42	0.13 ± 1.78	21	32	58
2008	12.63 ± 127.90	0.18 ± 1.84	21	32	56
2009	17.20 ± 166.50	0.36 ± 3.62	22	37	62
2011	6.77 ± 77.43	0.14 ± 1.47	22	36	59
2012	22.19 ± 182.78	0.41 ± 3.92	20	40	57
2013	29.57±18.90	2.21±1.93	20	35	50
2014	173.93±128.37	4.68±3.36	23	39	59
2015	81.67±47.22	1.59±0.96	19	37	57
2016	211.81±62.66	4.58±1.35	18	37	61
2017	149.77±82.47	3.26±1.74	19	37	60
2018	50.38±38.63	1.19±1	18	38	52

Table 9.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Nephrops norvegicus* during MEDITS surveys (GSA 02).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
2006	0.89 ± 5.80	0.08 ± 0.59	37	48	62
2007	0.54 ± 2.79	0.05 ± 0.33	33	47	63
2008	0.63 ± 4.89	0.05 ± 0.31	33	45	69
2009	0.75 ± 9.04	0.03 ± 0.40	35	41	48
2011	0.81 ± 8.88	0.06 ± 0.41	33	46	63
2012	1.28 ± 5.74	0.55 ± 0.30	34	46	68
2013	1.88±8.14	1.2±0.802	40	40	60
2014	8.04±3.11	0.66±0.31	41	48	64
2015	20.15±10.48	1.51±0.73±	34	46	60
2016	6.34±1.71	0.66±0.18	37	51	66
2017	16.75±9.69	1.0±60.57	34	51	68
2018	20.4±15.68	1.87±1.41	38	51	67

Table 10.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Parapenaeus longirostris* during MEDITS surveys (GSA 02).

	Abundance ±S.E.	Biomass ± S.E.	Lmin	Lmed	Lmax
2006	3.26 ± 45.51	0.03 ± 0.36	15	23	27
2007	7.03 ± 113.89	0.05 ± 0.85	11	23	34
2008	10.18 ± 103.11	0.06 ± 0.63	10	24	28
2009	40.28 ± 465.09	0.29 ± 3.48	10	23	18
2011	4.07 ± 57.68	0.01 ± 3.64	12	18	30
2012	38.62 ± 513.44	0.25 ± 99.23	12	21	30
2013	65.03±70.84	0.11±0.14	10	18	30
2014	73.94±73.94	0.62±0.62	14	24	32
2015	6.08±6.08	0.03±0.03	13	18	32
2016	59.40±29.70	0.61±0.31	11	29	32
2017	9.38±8.59	0.08±0.07	13	25	33
2018	183.7±169.58	0.94±0.91	11	18	28

Table 11.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Illex coindietti* during MEDITS surveys (GSA 02).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
2006	0.08 ± 0.84	0.31 ± 2.92	8.5	9.0	9.5
2007	0.00	0.00	----	----	----
2008	0.00	0.00	----	----	----
2009	0.19 ± 3.00	0.01 ± 0.12	12.0	12.0	12.0
2011	3.20 ± 16.70	0.01 ± 3.15	9.5	16.5	20.5
2012	54.03 ± 688.40	0.01 ± 76.70	11.1	16.7	21.0
2013	106.30±29.58	12.10±39.80	11.0	16.0	21
2014	0.00	0.00	----	----	----
2015	19.44±7.29	2.59±1.31	13.5	15.7	18.5
2016	0.00	0.00	----	----	----
2017	0.00	0.00	----	----	----
2018	0.00	0.00	----	----	----

Table 12.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the specie *Loligo vulgaris* during MEDITS surveys (GSA 02).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmed**	**Lmax**
2006	5.39 ± 77.07	1.72 ± 24.61	13.5	22.4	30.5
2007	0.00	0.00	----	----	----
2008	0.66 ± 6.71	0.27 ± 2.78	25.0	26.3	27.5
2009	0.00	0.00	----	----	----
2011	5.12 ± 30.09	0.72 ± 3.94	8.0	16.8	32.5
2012	0.00	0.00	----	----	----
2013	0.00	0.00	----	----	----
2014	0.00	0.00	----	----	----
2015	0.00	0.00	----	----	----
2016	3.03±0.00	1.82±0.00	28.0	28.0	28.0
2017	0.00	0.00	----	----	----
2018	0.00	0.00	----	----	----

3- **Planning for the next survey**

3.1. **Indication of the period and vessel specifying if it is in line with the previous ones, emrging issues if any**

In 2019, the Spanish MEDITS survey in GSA 01 and 02 is planned from April 27th to May 15th on board the research vessel *Miguel Oliver*.

Outline of the report by GSA for presentation in the draft agenda

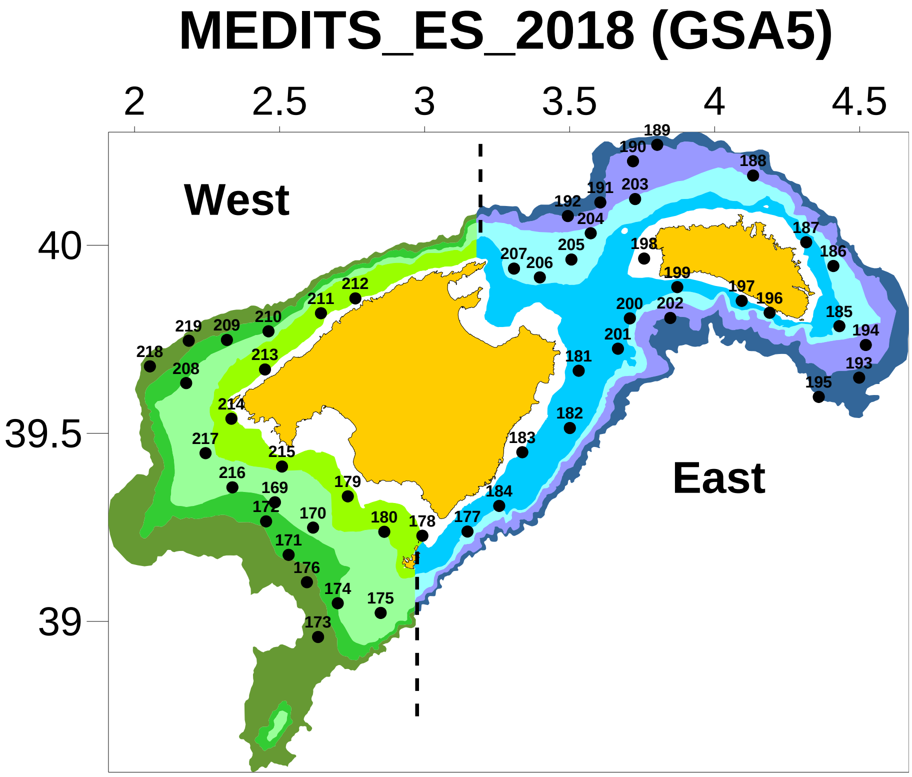
1. <u>Review of 2018 survey by GSA</u>

   1.1. period in which the survey was carried out
   10^{th}- 24^{th} June 2018

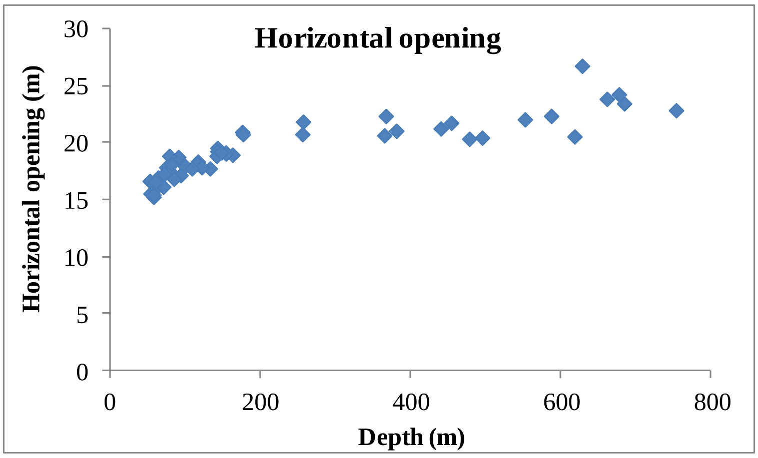
   1.2. vessel (indicate eventual changes with the previous years)
   R/V Miguel Oliver

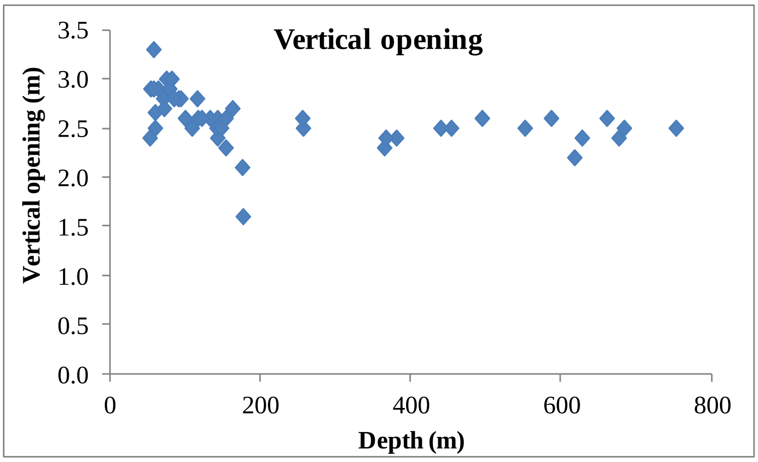
   1.3. number of hauls performed, possible difficulties encountered
   51

   1.4. the geographic area covered with a map showing haul locations



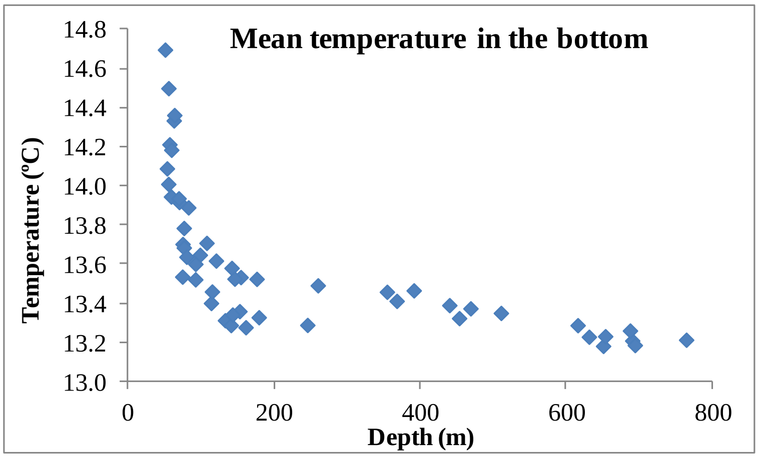
   1.5. number of hauls in which scanmar (or equivalent equipment) was used and add a scatter plot of HO and VO vs. Depth
   48





1.6. number of hauls in which minilog (or equivalent equipment) was used and add a plot of temperature bottom profiles

51



1.7. other measures of environmental variables carried out

Salinity (from CTD)

1.8. litter recording: comments on the results of the last survey and feedback on the protocol

Category	**Weigh (kg)**
Coal	0.97
Ceramics	0.084
Crystal	0.531
Wood	0.049
Metal	0.534
Others	2.557
Plastics	6.031
Clothes	0.727

1.9. number of species classified by taxa

Taxa	**Number**
Fish	153
Crustaceans	64
Molluscs	59
Echinoderms	35
Algae	34
Others	75

1.10. total number of classified individuals of the MEDITS reference list

Species	**Individuals**
Teleosteans	
Boops boops	1470
Chelidonichthys cuculus	1904
Chelidonichthys lucerna	1
Citharus linguatula	242
Diplodus vulgaris	4
Engraulis encrasicolus	12487
Eutrigla gurnardus	9
Helicolenus dactylopterus	793
Lepidorhombus boscii	399
Lophius budegassa	49
Lophius piscatorius	23
Merluccius merluccius	3124
Micromesistius poutassou	97
Mullus barbatus barbatus	881
Mullus surmuletus	2040
Pagellus acarne	6181
Pagellus bogaraveo	9
Pagellus erythrinus	348
Pagrus pagrus	2
Phycis blennoides	1379
Sardina pilchardus	236
Spicara smaris	10418
Trachurus mediterraneus	206
Trachurus trachurus	22782
Trigloporus lastoviza	1051
Trisopterus minutus	53
Zeus faber	97

Species	**Individuals**
Elasmobranches	
Dipturus oxyrinchus	8
Etmopterus spinax	79
Galeorhinus galeus	1
Galeus melastomus	2545
Leucoraja circularis	1
Mustelus mustelus	15
Myliobatis aquila	1
Raja clavata	233
Raja miraletus	45
Raja polystigma	52
Rostroraja alba	4
Scyliorhinus canicula	2443
Scyliorhinus stellaris	1
Squalus blainvillei	2
Torpedo marmorata	10
Crustaceans	
Aristaeomorpha foliacea	85
Aristeus antennatus	998
Nephrops norvegicus	562
Palinurus elephas	15
Parapenaeus longirostris	2295
Cephalopods	
Eledone cirrhosa	104
Eledone moschata	30
Illex coindetii	714
Loligo vulgaris	55
Octopus vulgaris	518
Sepia officinalis	55
Todarodes sagittatus	34

1.11. total number of sampled individuals for length distributions

Species	Individuals
Teleosteans	
Boops boops	1470
Chelidonichthys cuculus	1904
Chelidonichthys lucerna	1
Citharus linguatula	242
Diplodus vulgaris	4
Engraulis encrasicolus	12487
Eutrigla gurnardus	9
Helicolenus dactylopterus	793
Lepidorhombus boscii	399
Lophius budegassa	49
Lophius piscatorius	23
Merluccius merluccius	3124
Micromesistius poutassou	97
Mullus barbatus barbatus	881
Mullus surmuletus	2040
Pagellus acarne	6181
Pagellus bogaraveo	9
Pagellus erythrinus	348
Pagrus pagrus	2
Phycis blennoides	1379
Sardina pilchardus	236
Spicara smaris	10418
Trachurus mediterraneus	206
Trachurus trachurus	22782
Trigloporus lastoviza	1051
Trisopterus minutus	53
Zeus faber	97

Species	Individuals
Elasmobranches	
Dipturus oxyrinchus	8
Etmopterus spinax	79
Galeorhinus galeus	1
Galeus melastomus	2545
Leucoraja circularis	1
Mustelus mustelus	15
Myliobatis aquila	1
Raja clavata	233
Raja miraletus	45
Raja polystigma	52
Rostroraja alba	4
Scyliorhinus canicula	2443
Scyliorhinus stellaris	1
Squalus blainvillei	2
Torpedo marmorata	10
Crustaceans	
Aristaeomorpha foliacea	85
Aristeus antennatus	998
Nephrops norvegicus	562
Palinurus elephas	15
Parapenaeus longirostris	2295
Cephalopods	
Eledone cirrhosa	104
Eledone moschata	30
Illex coindetii	714
Loligo vulgaris	55
Octopus vulgaris	518
Sepia officinalis	55
Todarodes sagittatus	34

1.12. total number of sampled individuals for sex and maturity

Species	**Individuals**
Teleosteans	
Merluccius merluccius	1042
Mullus barbatus barbatus	292
Mullus surmuletus	915
Elasmobranches	
Dipturus oxyrinchus	8
Etmopterus spinax	80
Galeorhinus galeus	1
Galeus melastomus	648
Leucoraja circularis	1
Mustelus mustelus	15
Myliobatis aquila	1
Raja clavata	221
Raja miraletus	42
Raja polystigma	53
Rostroraja alba	4
Scyliorhinus canicula	1740
Torpedo marmorata	1

Species	**Individuals**
Crustaceans	
Aristaeomorpha foliacea	69
Aristeus antennatus	456
Nephrops norvegicus	348
Parapenaeus longirostris	309
Cephalopods	
Illex coindetii	501
Loligo vulgaris	52

1.13. number of samples of hard tissues collected for ageing by target species

Species	**Individuals**
Merluccius merluccius	325
Mullus barbatus barbatus	150
Mullus surmuletus	202

1.14. otolith reading, difficulties encountered

Otoliths of *M. merluccius* have been collected but not read because of the agreement reached during MEDITS coordination meeting held on Ljubljana (2012). Otoliths of *M. barbatus* and *M. surmuletus* are in the process of being read.

2. Focus on historical trends

2.1. abundance and biomass indices of target species (MEDITS G1);
2.2. minimum, mean and maximum length of target species (MEDITS G1)

Table 1.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Centrophorus granulosus* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	0.00±0.00	0.00±0.00	-	-	-
2008	0.19±0.19	0.77±0.77	94	94	94
2009	0.31±0.31	0.15±0.15	-	-	-
2010	0.00±0.00	0.00±0.00	-	-	-
2011	0.61±0.61	2.40±2.40	87	89	91
2012	0.00±0.00	0.00±0.00	-	-	-
2013	0.00±0.00	0.00±0.00	-	-	-
2014	0.00±0.00	0.00±0.00	-	-	-
2015	0.00±0.00	0.00±0.00	-	-	-
2016	0.21±0.21	0.78±0.78	118.5	118.5	118.5
2017	0.00±0.00	0.00±0.00	-	-	-
2018	0.00±0.00	0.00±0.00	-	-	-

Table 2.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Dalatias licha* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	0.39±0.39	1.22±1.22	94.0	94.0	94.0
2008	0.00±0.00	0.00±0.00	-	-	-
2009	0.20±0.20	0.05±0.05	40.0	40.0	40.0
2010	0.00±0.00	0.00±0.00	-	-	-
2011	0.36±0.36	1.04±1.04	91.0	91.0	91.0
2012	0.28±0.28	1.69±1.69	100.0	100.0	100.0
2013	0.00±0.00	0.00±0.00	-	-	-
2014	0.00±0.00	0.00±0.00	-	-	-
2015	0.00±0.00	0.00±0.00	-	-	-
2016	0.00±0.00	0.00±0.00	-	-	-
2017	0.00±0.00	0.00±0.00	-	-	-
2018	0.00±0.00	0.00±0.00	-	-	-

Table 3.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Dipturus oxyrinchus* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmean	Lmax
2007	10.47±4.12	11.63±8.41	19.0	52.2	126.0
2008	11.93±5.24	7.50±6.73	16.5	45.7	108.0
2009	4.67±1.67	6.18±4.95	16.5	56.8	116.0
2010	8.35±2.40	4.37±2.06	18.5	46.7	92.0
2011	6.86±2.64	5.22±2.76	17.0	50.2	80.5
2012	7.73±3.08	9.42±7.00	16.0	57.1	107.5
2013	3.22±1.58	10.54±4.75	11.0	76.3	127.5
2014	4.33±1.99	9.52±6.07	11.0	21.2	60.0
2015	2.46±1.01	5.52±3.31	22.5	67.7	108.0
2016	9.17±2.77	10.99±4.74	17.0	52.9	104.0
2017	3.04±1.21	2.20±1.42	29.5	51.1	96.0
2018	2.14±0.80	6.18±3.28	18.0	75.3	111.0

Table 4.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Etmopterus spinax* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmean	Lmax
2007	12.53±2.35	1.66±0.72	10.0	25.6	48.5
2008	7.58±4.47	0.50±0.17	12.0	21.7	40.5
2009	2.87±0.66	0.68±0.32	20.5	33.4	42.5
2010	7.58±2.91	0.78±0.35	9.5	23.5	48.0
2011	5.03±1.33	1.10±0.37	17.5	33.1	45.0
2012	6.54±1.64	1.06±0.32	11.0	30.6	43.0
2013	11.50±4.95	0.72±0.23	9.5	19.6	41.5
2014	8.69±3.00	0.47±0.18	10.5	20.3	35.5
2015	13.19±9.70	0.47±0.22	10.5	17.7	45.0
2016	44.20±34.40	2.03±0.92	10.5	20.1	48.5
2017	20.09±14.71	1.03±0.46	10.0	19.7	45.0
2018	20.94±14.30	0.78±0.36	11.0	17.2	44.5

Table 5.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Galeorhinus galeus* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmean	Lmax
2007	0.00±0.00	0.00±0.00	-	-	-
2008	0.00±0.00	0.00±0.00	-	-	-
2009	0.00±0.00	0.00±0.00	-	-	-
2010	0.00±0.00	0.00±0.00	-	-	-
2011	0.00±0.00	0.00±0.00	-	-	-
2012	0.00±0.00	0.00±0.00	-	-	-
2013	0.00±0.00	0.00±0.00	-	-	-
2014	0.00±0.00	0.00±0.00	-	-	-
2015	0.00±0.00	0.00±0.00	-	-	-
2016	0.45±0.45	11.20±11.20	185	185	185

2017	0.21±0.21	1.98±1.98	130	130	130
2018	0.37±0.37	8.91±8.91	172.0	172.0	172.0

Table 6.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Galeus melastomus* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	714.29±226.01	28.81±11.48	9.5	20.7	60.5
2008	822.67±247.41	30.15±7.58	11.0	21.6	60.0
2009	525.00±269.00	24.78±13.10	12.0	24.9	63.0
2010	268.89±96.66	19.69±7.92	10.0	24.1	60.5
2011	173.03±52.75	23.84±8.37	10.5	30.5	69.0
2012	625.21±158.66	35.96±8.76	12.0	22.5	61.0
2013	484.85±141.17	22.23±8.47	12.0	23.1	59.5
2014	543.32±127.60	16.27±3.86	11.0	21.2	60.0
2015	640.77±208.06	17.95±5.16	9.5	20.1	57.5
2016	1110.80±334.85	46.95±14.64	10.5	20.6	59.0
2017	619.36±157.93	26.44±8.33	11.0	21.6	58.5
2018	567.11±161.44	29.02±7.90	10.0	21.4	59.5

Table 7.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Leucoraja circularis* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	0.72±0.72	0.58±0.58	49.0	54.5	64.5
2008	0.39±0.39	0.80±0.80	73.0	73.0	73.0
2009	0.00±0.00	0.00±0.00	-	-	-
2010	0.57±0.57	1.75±1.75	62.0	71.6	77.5
2011	0.83±0.83	0.23±0.23	32.0	37.8	42.0
2012	0.00±0.00	0.00±0.00	-	-	-
2013	2.32±1.56	1.55±1.10	37.0	49.5	62.0
2014	0.92±0.66	0.41±0.27	30.0	42.5	60.0
2015	0.00±0.00	0.00±0.00	-	-	-
2016	1.76±1.51	0.84±0.62	39.5	48	60
2017	0.21±0.21	0.06±0.06	40.0	40.0	40.0
2018	0.26±0.26	0.94±0.94	87.5	87.5	87.5

Table 8.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Mustelus asterias* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	0.00±0.00	0.00±0.00	-	-	-
2008	0.00±0.00	0.00±0.00	-	-	-
2009	0.34±0.34	0.35±0.35	-	-	-
2010	0.00±0.00	0.00±0.00	-	-	-
2011	0.00±0.00	0.00±0.00	-	-	-
2012	0.00±0.00	0.00±0.00	-	-	-

2013	0.00±0.00	0.00±0.00	-	-	-
2014	0.00±0.00	0.00±0.00	-	-	-
2015	0.00±0.00	0.00±0.00	-	-	-
2016	0.00±0.00	0.00±0.00	-	-	-
2017	0.00±0.00	0.00±0.00	-	-	-
2018	0.00±0.00	0.00±0.00	-	-	-

Table 9.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Mustelus mustelus* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmean	Lmax
2007	1.09±0.83	0.37±0.27	47.5	49.0	51.5
2008	3.95±3.95	1.50±1.50	47.0	50.7	53.0
2009	1.09±1.09	5.73±5.73	105.0	117.5	130.0
2010	7.63±3.94	15.19±11.49	47.0	63.0	155.0
2011	0.96±0.68	0.33±0.23	49.0	50.4	51.5
2012	1.11±1.11	0.39±0.39	49.0	49.0	49.0
2013	2.56±1.60	5.14±4.86	46.0	68.4	144.0
2014	0.43±0.43	0.16±0.16	51.5	51.5	51.5
2015	1.97±0.87	6.24±5.57	6.5	62.8	146.0
2016	3.43±2.93	1.96±1.75	38.0	65.6	120.5
2017	0.40±0.40	0.11±0.11	50.5	50.5	50.5
2018	6.18±4.08	2.13±1.43	36.0	48.8	52.0

Table 10.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Myliobatis aquila* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmean	Lmax
2007	1.94±1.16	5.16±4.70	70.0	81.9	95.0
2008	8.45±4.90	17.89±9.12	51.0	81.8	116.0
2009	13.29±10.52	10.65±7.99	46.5	67.4	84.0
2010	0.00±0.00	0.00±0.00	-	-	-
2011	5.57±3.24	8.75±4.92	57.5	80.2	99.5
2012	6.08±3.33	9.17±4.70	64.5	80.5	110.0
2013	0.00±0.00	0.00±0.00	-	-	-
2014	5.35 ±4.32	9.56±7.70	59.5	82.95	93
2015	3.72±2.52	8.88±7.24	73.0	84.7	100.5
2016	4.36±2.41	9.78±6.93	44.5	75.7	142
2017	8.47±4.54	14.75±8.07	52.5	81.6	102.5
2018	0.49±0.49	1.22±1.22	98.0	98.0	98.0

Table 11.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Raja asterias* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmean	Lmax
2007	0.00±0.00	0.00±0.00	-	-	-
2008	0.00±0.00	0.00±0.00	-	-	-
2009	0.00±0.00	0.00±0.00	-	-	-

2010	0.00±0.00	0.00±0.00	-	-	-
2011	1.00±1.00	1.02±1.02	43.0	52.8	62.5
2012	0.00±0.00	0.00±0.00	-	-	-
2013	0.00±0.00	0.00±0.00	-	-	-
2014	0.00±0.00	0.00±0.00	-	-	-
2015	0.00±0.00	0.00±0.00	-	-	-
2016	0.00±0.00	0.00±0.00	-	-	-
2017	0.00±0.00	0.00±0.00	-	-	-
2018	0.00±0.00	0.00±0.00	-	-	-

Table 12.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Raja clavata* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	84.49±22.55	93.79±34.05	16.0	51.7	90.0
2008	54.21±18.22	46.84±12.43	16.0	48.0	91.5
2009	62.00±11.00	66.53±12.40	15.5	51.6	111.5
2010	72.73±15.81	69.75±13.75	10.5	47.1	91.5
2011	69.58±13.55	77.16±13.44	11.0	50.2	91.5
2012	61.66±16.52	50.37±11.12	16.0	47.7	85.0
2013	50.32±14.34	52.71±13.79	21.0	49.4	86.5
2014	92.95±28.89	121.96±45.06	14.0	54.15	92.0
2015	60.46±18.37	52.60±14.23	18.5	48.2	93.0
2016	77.8±23.4	67.06±13.94	18.5	48.2	93.0
2017	69.98±22.58	69.10±17.37	6.0	51.1	91.0
2018	79.47±22.94	79.80±15.94	19.5	50.4	94.0

Table 13.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Raja miraletus* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	17.63±6.75	3.70±1.26	21.5	33.6	43.0
2008	14.22±4.50	2.95±0.95	21.5	34.8	42.5
2009	12.41±4.66	3.21±1.14	27.0	35.7	44.0
2010	20.44±5.66	4.12±1.39	16.0	32.9	41.5
2011	23.29±9.10	4.26±1.43	17.5	32.7	44.0
2012	19.71±6.50	3.87±1.42	19.0	34.4	41.0
2013	21.69±13.89	2.65±1.20	21.0	28.1	43.0
2014	20.02±9.27	3.08±1.28	14.0	29.9	39.5
2015	19.01±8.60	3.14±1.29	22.0	32.0	39.5
2016	36.61±15.94	5.82±2.28	16.0	31.6	39.5
2017	24.09±7.80	5.14±1.59	19.0	33.5	42.5
2018	18.40±6.06	3.54±1.28	15.5	32.2	40.0

Table 14.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Raja polystigma* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**

2007	14.66±5.39	3.67±1.18	18.0	33.5	55.5
2008	17.70±6.99	3.75±1.19	21.0	32.4	88.5
2009	6.94±2.44	1.99±0.77	25.5	36.6	55.5
2010	18.54±4.92	6.55±2.24	20.0	36.2	50.5
2011	15.51±5.41	6.40±3.27	22.5	39.8	55.0
2012	45.43±13.12	7.04±1.99	18.0	30.0	53.0
2013	17.35±4.50	2.58±1.00	10.5	28.8	48.5
2014	26.07±6.24	6.16±1.53	19.5	32.98	50.0
2015	10.79±4.31	12.15±9.68	18.5	40.7	100.0
2016	57.66±12.92	12.07±2.88	18.0	32.8	55.0
2017	24.19±8.26	10.23±5.63	27.5	39.1	56.0
2018	18.93±3.93	5.29±1.37	24.0	34.9	47.5

Table 15.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Rostroraja alba* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	1.04±1.04	0.103±0.103	23.0	25.5	28.0
2008	0.58±0.58	470.86±470.86	53.0	53.0	53.0
2009	0.36±0.36	3.32±3.32	11.5	11.5	11.5
2010	0.00±0.00	0.00±0.00	-	-	-
2011	0.00±0.00	0.00±0.00	-	-	-
2012	0.80±0.80	6.62±5.57	72.0	93.9	142.0
2013	0.49±0.49	17.96±17.96	168.0	168.0	168.0
2014	0.00±0.00	0.00±0.00	-	-	-
2015	0.00±0.00	0.00±0.00	-	-	-
2016	0.45±0.45	0.06±0.06	29.0	29.0	29.0
2017	0.56±0.56	0.76±0.76	57.5	57.5	57.5
2018	1.65±1.24	1.00±0.78	39.5	46.3	61.0

Table 16.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Scyliorhinus stellaris* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	0.00±0.00	0.00±0.00	-	-	-
2008	0.00±0.00	0.00±0.00	-	-	-
2009	0.00±0.00	0.00±0.00	-	-	-
2010	0.00±0.00	0.00±0.00	-	-	-
2011	0.00±0.00	0.00±0.00	-	-	-
2012	0.00±0.00	0.00±0.00	-	-	-
2013	0.00±0.00	0.00±0.00	-	-	-
2014	0.00±0.00	0.00±0.00	-	-	-
2015	0.00±0.00	0.00±0.00	-	-	-
2016	0.00±0.00	0.00±0.00	-	-	-
2017	0.00±0.00	0.00±0.00	-	-	-
2018	0.54±0.54	0.25±0.25	24.0	24.0	24.0

Table 17.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Scyliorhinus canicula* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmean	Lmax
2007	880.71±130.42	126.93±21.75	10.0	33.5	51.5
2008	981.18±345.19	101.06±18.94	9.0	31.5	51.0
2009	924.00±233.00	89.64±13.70	9.0	28.4	67.0
2010	1059.66±214.44	118.55±18.64	10.5	29.7	51.5
2011	774.40±86.99	110.97±16.07	8.0	33.4	51.5
2012	879.41±114.60	106.51±15.11	10.5	31.1	52.0
2013	797.35±131.06	87.70±15.25	11.0	29.2	51.0
2014	1132±175.33	145.18±25.84	10.0	32.19	52.5
2015	859.4±98.84	96.23±12.24	9.5	30.4	50.0
2016	1276.72±176.34	128.48±17.44	10.0	29.5	51.5
2017	914.78±163.50	116.89±20.13	10.0	31.3	52.0
2018	882.26±152.32	92.78±12.90	10.0	30.1	49.5

Table 17.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Squalus acanthias* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmean	Lmax
2007	19.08±19.08	8.54±8.54	29.0	45.4	61.0
2008	0.64±0.64	0.15±0.15	37.0	37.5	38.0
2009	0.00±0.00	0.00±0.00	-	-	-
2010	0.69±0.69	0.33±0.33	27.0	41.0	55.0
2011	0.32±0.32	0.03±0.03	26.0	26.0	26.0
2012	0.00±0.00	0.00±0.00	-	-	-
2013	0.00±0.00	0.00±0.00	-	-	-
2014	0.00±0.00	0.00±0.00	-	-	-
2015	0.00±0.00	0.00±0.00	-	-	-
2016	0.00±0.00	0.00±0.00	-	-	-
2017	0.00±0.00	0.00±0.00	-	-	-
2018	0.00±0.00	0.00±0.00	-	-	-

Table 19.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Squalus blainvillei* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmean	Lmax
2007	0.23±0.23	0.03±0.03	30.0	30.0	30.0
2008	0.00±0.00	0.00±0.00	-	-	-
2009	5.66±4.57	2.76±2.27	25.0	45.8	65.0
2010	0.00±0.00	0.00±0.00	-	-	-
2011	8.38±8.38	8.38±8.38	26.0	56.0	81.5
2012	6.73±4.99	2.71±2.10	15.0	42.2	63.0
2013	0.00±0.00	0.00±0.00	-	-	-
2014	0.39±0.39	0.96±0.96	-	-	-
2015	0.37±0.37	0.05±0.05	32	32	32
2016	1.27±0.92	0.64±0.59	26.5	41.9	59.5

2017	0.00±0.00	0.00±0.00	-	-	-
2018	0.58±0.44	0.51±0.42	46.5	53.8	61.0

Table 20.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Torpedo marmorata* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	0.80±0.58	0.23±0.16	22.5	23.3	24.5
2008	0.00±0.00	0.00±0.00	-	-	-
2009	0.37±0.37	0.03±0.03	15.0	15.0	15.0
2010	0.76±0.54	0.10±0.07	17.5	17.7	18.0
2011	0.40±0.40	0.03±0.03	16.0	16.0	16.0
2012	1.24±0.84	1.30±1.00	30.5	35.2	39.0
2013	0.85±0.50	0.40±0.29	17.5	20.0	22.5
2014	0.76±0.49	0.07±0.05	18.5	19.25	20.0
2015	0.98±0.57	0.43±0.33	19.5	25.3	34.5
2016	1.30±0.74	0.34±0.29	13.5	19	29
2017	1.41±0.70	0.47±0.38	14.0	20.0	32.0
2018	3.19±1.32	0.41±0.16	13.5	17.3	23.0

Table 21.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Merluccius merluccius* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	745.23±176.06	28.69±3.53	5.5	14.7	63.5
2008	257.69±106.14	13.87±2.22	4.5	14.9	56.5
2009	1015.00±445.00	21.81±6.64	4.0	12.8	47.0
2010	710.09±258.52	24.82±4.31	4.0	13.1	44.5
2011	553.77±214.89	18.28±3.01	5.5	13.4	55.0
2012	1125.41±447.65	28.14±7.78	4.0	13.6	59.0
2013	1358.52±570.96	40.82±13.81	5.5	14.4	62.5
2014	662.27±189.41	24.55±4.14	5.0	13.98	57.0
2015	426.66±141.57	15.08±2.71	5.5	13.9	55.0
2016	501.93±171.63	13.29±2.54	6.0	13.2	52.0
2017	165.00±76.64	10.12±1.55	5.5	15.1	49.0
2018	1032.80±394.99	26.18±6.39	5.0	13.1	59.5

Table 22.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Mullus barbatus* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	579.11±274.21	27.44±13.08	10.0	15.5	25.0
2008	282.77±109.83	14.82±5.14	10.5	16.5	25.0
2009	260.00±128.00	13.34±7.32	9.5	15.7	24.0
2010	172.45±67.32	10.21±3.95	11.0	17.1	23.0
2011	94.39±40.02	5.87±2.53	12.0	17.3	23.0
2012	67.70±24.10	3.68±1.37	9.5	16.6	23.0
2013	27.62±17.81	1.49±1.02	11.0	16.4	22.0

2014	64.03±42.08	4.80±3.59	11.5	17.82	24.0
2015	38.99±23.63	1.98±1.18	12.0	16.5	21.5
2016	42.03±22.32	2.32±1.25	12.5	16.7	25.0
2017	407.80±364.16	21.00±18.86	11.0	16.4	22.5
2018	319.83±171.03	13.89±7.07	7.0	17.3	28.0

Table 23.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Mullus surmuletus* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	1488.15±651.25	102.88±50.04	12.5	17.7	29.0
2008	476.83±183.59	35.02±13.25	13.5	18.5	27.5
2009	2050.00±1495.00	169.37±123.95	11.0	19.0	56.0
2010	468.80±224.85	38.82±22.28	11.0	18.6	30.5
2011	350.96±142.18	22.52±9.44	5.5	17.6	27.0
2012	650.64±327.76	44.06±23.78	8.0	18.0	36.5
2013	135.49±41.19	9.87±3.20	13.5	18.0	25.0
2014	320.89±111.94	21.77±7.07	13.5	17.46	26.5
2015	259.13±110.87	18.43±9.46	13.0	17.7	27.0
2016	272.57±126.02	16.28±6.31	12.5	16.9	24.5
2017	909.98±569.11	66.47±44.01	6.0	18.0	28.0
2018	810.31±202.30	50.84±14.02	11.5	15.6	29.0

Table 24.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Pagellus erythrinus* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	133.16±54.15	10.18±4.32	9.0	17.1	27.0
2008	128.85±56.49	11.96±5.57	8.0	18.1	31.0
2009	61.78±18.39	4.48±1.03	9.0	16.2	31.0
2010	43.56±17.73	4.89±2.11	11.0	19.5	29.0
2011	117.52±55.81	3.85±1.34	9.0	13.5	29.0
2012	106.62±35.92	6.49±1.92	10.0	15.9	34.0
2013	42.82±20.69	3.06±1.24	9.5	16.6	28.5
2014	149.34±70.95	6.84±2.86	7.5	14.5	31.5
2015	61.08±36.19	3.48±1.94	10.0	16.2	26.0
2016	107.61±39.8	6.05±2.27	10.0	16.0	28.0
2017	82.43±24.72	5.04±1.37	10.5	16.2	28.5
2018	130.68±54.54	9.35±4.01	10.5	17.3	29.5

Table 25.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the species *Aristaeomorpha foliacea* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	1.48±0.88	0.01±0.01	25.0	29.6	35.0
2008	0.25±0.25	0.01±0.01	35.0	35.0	35.0
2009	0.99±0.63	0.03±0.02	35.0	43.4	50.0
2010	1.70±1.45	0.01±0.01	24.0	24.0	24.0

2011	1.93±1.33	0.04±0.03	30.0	36.8	40.0
2012	14.74±14.74	0.34±0.34	15.0	34.3	50.0
2013	5.47±3.89	0.17±0.12	30.0	42.7	54.0
2014	3.62±1.26	0.07±0.03	20.0	35.7	54.0
2015	5.17±4.13	0.11±0.09	22.0	37.0	54.0
2016	42.45±33.85	0.43±0.31	20.0	30.8	57.0
2017	7.44±5.03	0.12±0.09	21.0	34.3	50.0
2018	26.81±26.56	0.60±0.60	27.0	37.9	54.0

Table 26.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the species *Aristeus antennatus* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	121.08±25.13	2.44±0.54	18.0	35.8	56.0
2008	322.31±46.77	4.35±0.51	16.0	29.9	63.0
2009	178.00±39.00	3.47±0.96	18.0	34.9	65.0
2010	113.40±18.98	2.10±0.57	11.0	33.0	62.0
2011	128.44±56.65	1.53±0.51	17.0	28.7	55.0
2012	372.94±115.35	3.56±1.06	14.0	26.2	57.0
2013	228.43±67.40	3.05±0.70	14.0	31.1	57.0
2014	119.22±30.29	3.72±1.98	17.0	32.5	61.0
2015	156.02±33.10	1.74±0.37	15.0	28.0	61.0
2016	373.6±93.6	5.54±1.32	16.0	30.6	60.0
2017	198.14±43.89	2.50±0.50	15.0	29.5	59.0
2018	267.61±41.61	3.70±0.79	9.0	28.7	64.0

Table 27.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the species *Nephrops norvegicus* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	164.72±99.9	5.25±2.73	18.0	33.4	66.0
2008	179.15±90.31	7.12±3.11	19.0	35.8	69.0
2009	69.00±45.00	2.43±1.34	9.0	34.9	64.0
2010	120.25±44.21	4.21±1.48	6.0	36.1	63.0
2011	49.64±24.81	2.00±1.00	25.0	38.0	71.0
2012	65.66±25.94	2.64±0.93	24.0	37.8	61.0
2013	107.40±40.66	4.21±1.53	18.0	38.0	62.0
2014	52.86±17.21	2.16±0.59	16.0	36.8	65.0
2015	45.23±16.89	1.92±0.68	23.0	38.0	60.0
2016	83.06±31.21	3.93±1.49	24.0	39.0	64.0
2017	39.69±11.19	1.65±0.47	22.0	37.9	63.0
2018	136.27±58.33	4.00±1.47	18.0	33.6	66.0

Table 28.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the species *Parapenaeus longirostris* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	8.27±3.69	0.07±0.03	10.0	24.1	37.0

2008	56.18±24.41	0.46±0.19	20.0	24.0	36.0
2009	43.00±21.00	0.47±0.22	19.0	27.7	52.0
2010	67.29±30.10	0.68±0.27	14.0	25.1	40.0
2011	15.26±5.85	0.17±0.07	21.0	28.6	39.0
2012	70.23±23.31	0.63±0.23	12.0	24.2	38.0
2013	64.95±26.11	0.81±0.33	21.0	29.3	39.0
2014	47.98±16.93	0.45±0.16	7.0	25.6	23.0
2015	15.74±9.07	0.19±0.12	20.0	28.0	36.0
2016	140.08±45.99	0.93±0.36	6.0	21.2	38.0
2017	649.95±198.23	4.55±1.40	7.0	22.8	36.0
2018	509.59±174.56	4.87±1.76	9.0	25.3	36.0

Table 29.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Illex coindetii* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	13.15±3.96	1.90±0.67	7.0	15.9	23.0
2008	11.98±2.18	1.89±0.35	2.0	14.4	21.0
2009	216.20±41.64	29.02±4.57	7.0	16.2	23.0
2010	393.10±77.80	59.31±10.84	5.0	17.2	27.0
2011	46.92±7.88	6.54±1.27	5.0	16.3	30.0
2012	93.78±14.89	10.84±1.86	7.0	15.0	21.0
2013	240.63±28.61	28.61±4.40	4.0	15.4	23.5
2014	241.95±31.66	25.52±52.37	5.0	14.19	22.0
2015	85.43±11.46	6.44±0.72	1.5	12.6	20.5
2016	218.9±69.24	10.54±1.96	4.5	10.2	20.5
2017	355.32±264.60	33.14±24.42	5.5	15.3	20.5
2018	192.62±55.73	18.27±4.77	4.5	14.1	22.5

Table 30.- Historical trends of abundance (n/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (cm) of the species *Loligo vulgaris* during MEDITS surveys (GSA 5).

	Abundance ±S.E.	**Biomass ±S.E.**	**Lmin**	**Lmean**	**Lmax**
2007	14.03±4.90	1.96±0.54	7.0	15.7	26.0
2008	98.33±29.18	5.38±1.58	2.0	8.9	38.0
2009	245.49±162.15	7.99±2.11	1.0	7.5	28.0
2010	21.16±5.12	2.27±0.52	2.0	13.0	24.0
2011	40.35±11.37	7.52±2.47	3.0	18.0	38.0
2012	2786.27±2239.64	7.39±1.74	1.0	3.2	44.0
2013	291.62±136.99	4.32±1.76	2.0	5.6	36.5
2014	131.24±54.39	5.11±1.26	2.5	8.96	29.0
2015	95.21±25.54	8.55±1.53	1.5	11.7	33.5
2016	24.09±8.4	2.62±0.69	4.0	14.4	34.5
2017	39.63±10.95	3.69±1.11	4.0	12.9	40.0
2018	25.30±13.75	2.11±0.71	5.5	12.1	22.5

No catches of the following species: *Dipturus batis*, *Heptranchias perlo*, *Hexanchus griseus*, *Leucoraja melitensis*, *Mustelus punctulatus*, *Oxynotus centrina*, *Raja undulata*, *Rhinobatos cemiculus*, *Rhinobatos rhinobatos*, *Scyliorhinus stellaris*, *Squatina aculeata*, *Squatina oculata* and *Squatina squatina.*

3. Planning for the next survey

    3.1. indication of the period and vessel specifying if it is in line with the previous ones, emerging issues if any

In 2019, the Spanish MEDITS survey in GSA 5 is planned from June 11th-25th on board the research vessel *Miguel Oliver*.

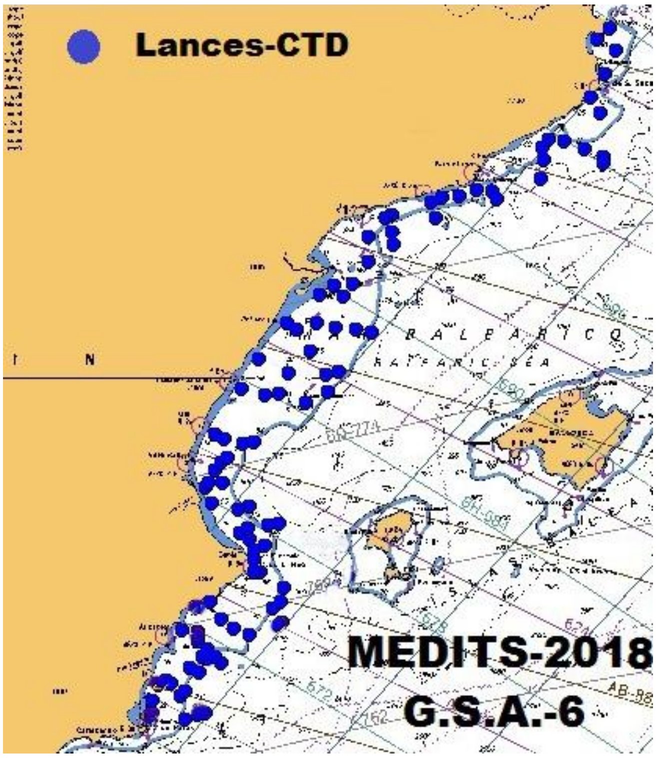
1. Review of 2018 survey. GSA 06 (Northern Spain)

1.1. Period in which the survey was carried out: May 14th- June 9th

1.2. Vessel: R/V *Miguel Oliver*

1.3. Number of hauls performed, possible difficulties encountered: 102 hauls. None.

1.4. The geographic area covered with a map showing haul locations



1.5. Number of hauls in which Scanmar was used: 102

1.6. Number of hauls in which CTD SeaBird 37 was used: 102.

1.7. Other measures of environmental variables carried out: None.

1.8. Litter recording: 242.602 kg from 8 litter categories (see table).

Category	**Kgs**
Plastics (L1)	213.639
Rubber (L2)	0.455
Metals (L3)	0.218
Glass-Ceramics (L4)	4.453
Clothes (L5)	10.645
Wood (L6)	11.212
Papper (L7)	0.250
Others (L8)	2.000

1.9. Number of species classified by taxa:

Category	Number species
Fish	143
Crustaceans	90
Molluscs	64
Others	93

1.10. Total number of classified individuals of the MEDITS reference list:

Teleosteans	**Number**
Aspitrigla cuculus	189
Boops boops	779
Diplodus annularis	581
Diplodus vulgaris	18
Engraulis encrasicolus	29726
Eutrigla gurnardus	6
Helicolenus dactylopterus	3212
Lepidorhombus boscii	140
Lophius budegassa	231
Lophius piscatorius	6
Merluccius merluccius	3928
Micromesistius poutassou	11640
Mullus barbatus	3269
Mullus surmuletus	454
Pagellus acarne	512
Pagellus bogaraveo	103
Pagellus erythrinus	801
Pagrus pagrus	63
Phycis blennoides	3072
Sardina pilchardus	5738
Scomber colias	1
Scomber scombrus	302

Spicara flexuosa	1955
Spicara smaris	4215
Trachurus mediterraneus	445
Trachurus trachurus	23286
Trigla lucerna	1
Trigloporus lastoviza	1103
Trisopterus minutus capelanus	2541
Zeus faber	32
Elasmobranches	**Number**
Dipturus sp	3
Etmopterus spinax	25
Galeus melastomus	488
Leucoraja naevus	1
Raja asterias	32
Raja clavata	4
Raja montagui	40
Scyliorhinus canicula	1872
Torpedo marmorata	36
Crustaceans	**Number**
Aristaeomorpha foliacea	2
Aristeus antennatus	495
Nephrops norvegicus	1617
Parapenaeus longirostris	4402
Palinurus elephas	15
Squilla mantis	133
Cephalopods	**Number**
Eledone cirrhosa	206
Eledone moschata	9
Illex coindetii	2937
Loligo vulgaris	2
Octopus vulgaris	189
Sepia officinalis	6
Todarodes sagittatus	42

1.11. Total number of sampled individuals for length distributions

Teleosteans	**Number**
Aspitrigla cuculus	189
Boops boops	702
Diplodus annularis	581
Diplodus vulgaris	17
Engraulis encrasicolus	4618
Eutrigla gurnardus	6
Helicolenus dactylopterus	1947
Lepidorhombus boscii	14
Lophius budegassa	231
Lophius piscatorius	6
Merluccius merluccius	3252
Micromesistius poutassou	1694
Mullus barbatus	3147
Mullus surmuletus	447
Pagellus acarne	505
Pagellus bogaraveo	103
Pagellus erythrinus	801
Pagrus pagrus	55
Phycis blennoides	2890
Sardina pilchardus	1819
Scomber colias	1
Scomber scombrus	302
Spicara flexuosa	1135
Spicara smaris	805
Trachurus mediterraneus	441
Trachurus trachurus	6420
Trigla lucerna	1
Trigloporus lastoviza	463
Trisopterus minutus capelanus	2234
Zeus faber	32
Elasmobranches	**Number**
Dipturus sp	3
Etmopterus spinax	25
Galeus melastomus	488
Leucoraja naevus	1
Raja asterias	32
Raja clavata	2
Raja montagui	4
Scyliorhinus canicula	1870
Torpedo marmorata	36

Crustaceans	**Number**
Aristaeomorpha foliacea	2
Aristeus antennatus	495
Nephrops norvegicus	1614
Parapenaeus longirostris	4402
Palinurus elephas	15
Squilla mantis	133
Cephalopods	**Number**
Eledone cirrhosa	206
Eledone moschata	9
Illex coindetii	2937
Loligo vulgaris	2
Octopus vulgaris	189
Sepia officinalis	6
Todarodes sagittatus	42

1.12. Total number of sampled individuals for sex and maturity

Teleosteans	**Number**
Merluccius merluccius	2041
Mullus barbatus	1465
Mullus surmuletus	391
Elasmobranches	**Number**
Dipturus sp	3
Etmopterus spinax	25
Galeus melastomus	488
Leucoraja naevus	1
Raja asterias	32
Raja brachyura	2
Raja clavata	4
Raja montagui	38
Scyliorhinus canicula	1870
Torpedo marmorata	36
Crustaceans	**Number**
Aristaeomorpha foliacea	2
Aristeus antennatus	453
Nephrops norvegicus	961
Parapenaeus longirostris	2530
Cephalopods	**Number**
Illex coindetii	1560
Loligo vulgaris	2

1.13. Number of samples of hard tissues collected for ageing by target species

Teleosteans	**Number**
Merluccius merluccius	244
Mullus barbatus	349
Mullus surmuletus	211

1.14. Otolith reading, difficulties encountered: Otoliths of *Merluccius merluccius* have been collected but not read because of the agreement reached during MEDITS coordination meeting held on Ljubljana (2012).

1.15. Other samplings for common projects:

1.16. Difficulties encountered in the application of the new protocol, emerging issues and suggestions for improvements:

Table 1.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Etmopterus spinax* during MEDITS surveys (GSA 6).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1995	4.70+/-2.72	0.35+/-0.26			
1996	4.79+/-3.68	0.32+/-0.24			
1997	6.46+/-5.54	0.38+/-0.27			
1998	5.62+/-6.06	0.57+/-0.64			
1999	4.10+/-2.97	0.43+/-0.42			
2000	2.71+/-3.03	0.14+/-0.17			
2001	2.84+/-2.08	0.23+/-0.26			
2002	3.94+/-3.94	0.17+/-0.15			
2003	3.17+/-2.40	0.24+/-0.20			
2004	1.96+/-1.26	0.28+/-0.23			
2005	2.56+/-1.85	0.14+/-0.15			
2006	6.08+/-4.85	0.37+/-0.28			
2007	3.83+/-4.99	0.13+/-0.15	80	228	485
2008	0.99+/-1.17	0.08+/-0.09	95	240	420
2009	2.85+/-2.97	0.21+/-0.25	90	229	425
2010	0.77+/-0.62	0.05+/-0.06	95	244	480
2011	1.83+/-2.33	0.09+/-0.09	100	250	450
2012	0.39+/-0.43	0.04+/-0.06	90	264	430
2013	0.93+/-0.93	0.06+/-0.05	120	208	364
2014	2.46+/-1.15	0.19+/-0.09	90	235	435
2015	1.75+/-0.86	0.11+/-0.06	100	240	1070
2016	3.43+/-1.20	0.22+/-0.09	113	210	397
2017	4.95+/-2.75	0.21+/-0.11	90	235	390
2018	3.17+/-1.2	0.27+/-0.15	115	220	460

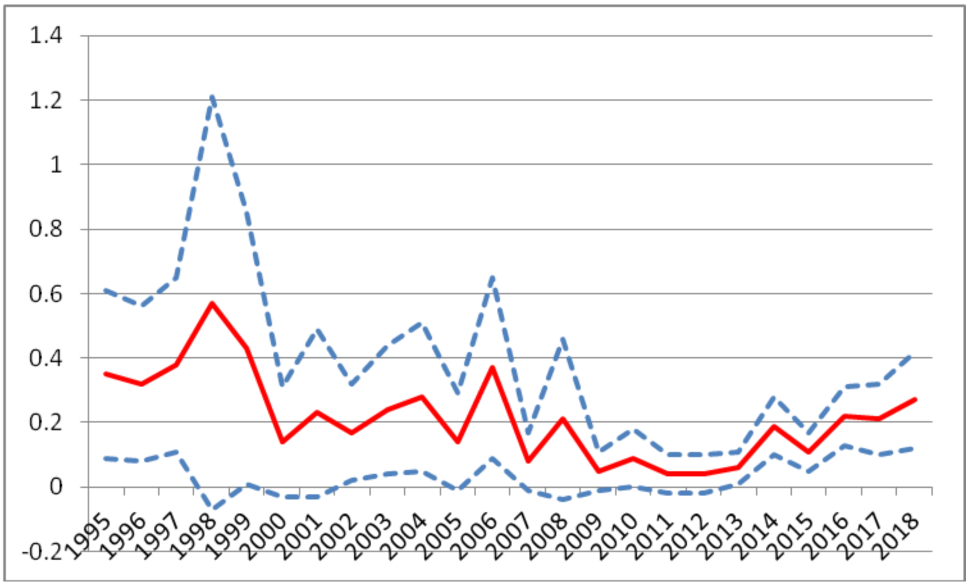


Table 1.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Galeus melastomus* during MEDITS surveys (GSA 6).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1995	32.07+/-21.08	4.95+/-3.30			
1996	25.68+/-14.25	4.05+/-2.83			
1997	32.27+/-20.06	5.56+/-4.62			
1998	29.78+/-28.30	2.81+/-2.69			
1999	26.03+/-12.91	4.42+/-2.15	100	360	680
2000	19.57+/-12.62	2.79+/-2.74	95	338	620
2001	80.59+/-43.99	5.52+/-2.41	100	326	630
2002	90.12+/-73.27	9.28+/-5.61	105	329	620
2003	40.40+/-20.92	6.63+/-3.64	110	364	645
2004	36.80+/-22.74	8.27+/-6.76	105	364	750
2005	50.80+/-32.07	8.29+/-6.37	105	344	620
2006	81.52+/-55.15	8.49+/-6.35	105	327	630
2007	143.71+/-151.89	11.39+/9.95	95	316	645
2008	35.15+/-43.17	3.03+/-2.08	100	317	630
2009	45.89+/-51.60	4.86+/-3.81	85	337	690
2010	18.44+/-15.46	3.30+/-3.48	100	347	610
2011	47.67+/-41.50	3.95+/-2.27	70	342	690
2012	60.04+/-38.55	4.59+/-2.97	105	314	620
2013	57.37+/-4.68	6.45+/-4.68	110	427	620
2014	209.6+/-66.9	20.6+/-5.6	105	365	615
2015	1043.3+/-818.5	40.2+/-17.5	80	310	630
2016	128.73+/-24.06	19.48+/-2.98	116	415	615
2017	75.67+/-16.49	9.36+/-1.46	80	300	625
2018	54.98+/-13.15	8.53+/-1.99	80	295	600

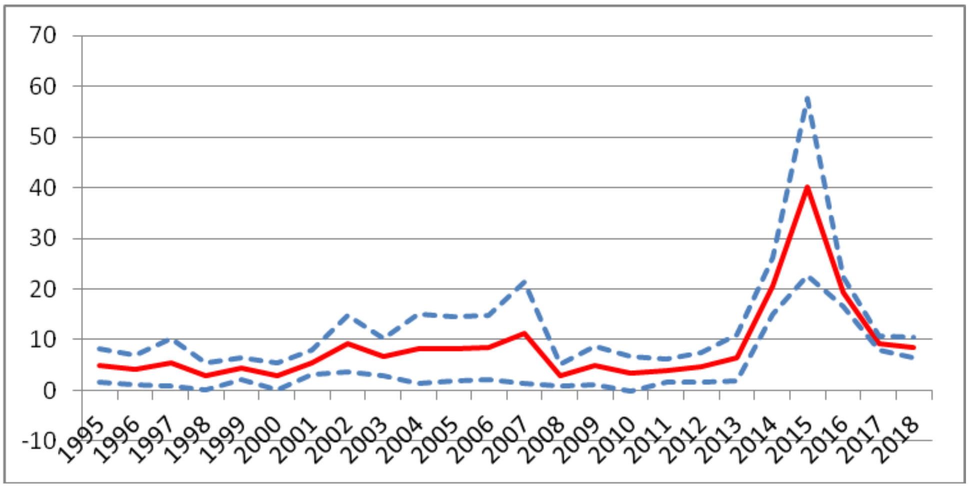


Table 1.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Scyliorhinus canicula* during MEDITS surveys (GSA 6).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1995	52.21+/-55.42	8.27+/-9.04			
1996	82.04+/-82.08	13.15+/13.50			
1997	153.34+/-103.24	16.57+/-10.26			
1998	19.37+/-19.37	2.26+/-1.75			
1999	20.32+/-15.28	3.41+/-2.43	100	350	520
2000	198.32+/-228.37	22.73+/-22.80	105	341	53
2001	77.91+/-49.37	7.42+/-3.75	95	312	565
2002	120.24+/-64.90	16.22+/-8.97	65	341	550
2003	128.22+/-108.40	17.52+/-14.78	90	353	545
2004	88.14+/-50.67	16.15+/-10.14	65	360	520
2005	167.09+/-91.40	22.54+/-11.65	95	330	550
2006	201.66+/-121.49	24.49+/-9.64	100	358	565
2007	159.25+/-113.61	20.93+/-11.21	40	346	565
2008	85.35+/-44.02	14.76+/-8.30	80	332	530
2009	284.12+/-193.61	24.49+/-12.11	30	336	670
2010	148.98+/-93.79	22.34+/-15.46	30	322	522
2011	208.38+/-112.26	29.97+/-18.58	30	342	596
2012	147.82+/-90.60	27.43+/-21.48	90	329	535
2013	178.66+/-75.87	29.14+/-10.35	90	335	520
2014	265.5+/-13.5	54.0+/-13.5	90	340	520
2015	457+/-104	51.8+/-13.2	70	320	530
2016	512.44+/-129.04	55.80+/-8.28	74	331	645
2017	258.47+/-44.76	32.55+/-6.07	39	335	540
2018	250.43+/-38.06	36.63+/-5.89	70	385	690

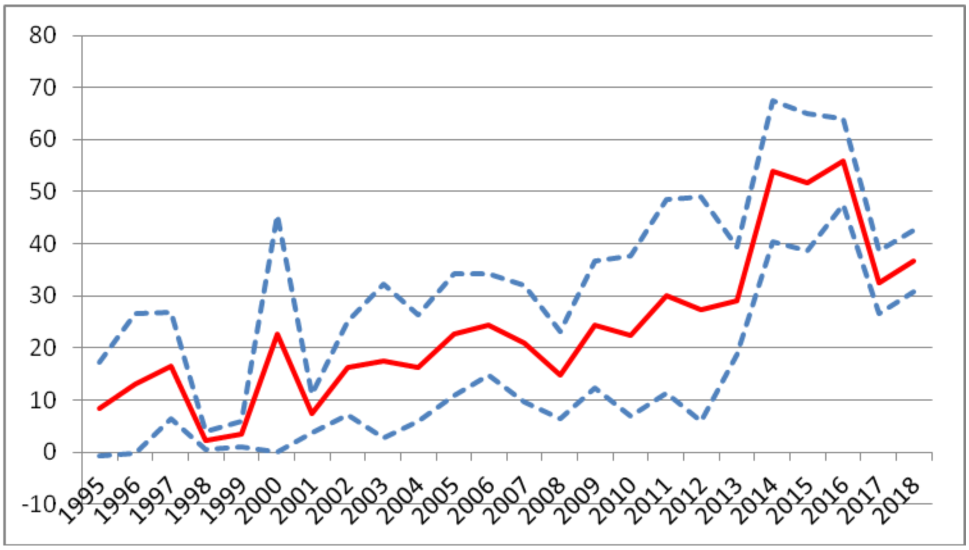


Table 1.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Merluccius merluccius* during MEDITS surveys (GSA 6).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1995	270.56+/-125.87	3.92+/-1.82	25	138	610
1996	751.30+/-334.54	12.57+/-3.82	35	155	720
1997	1130.53+/-510.82	12.60+/-4.27	10	146	705
1998	1081.17+/-605.04	13.08+/-6.00	45	137	580
1999	962.06+/-349.07	9.60+/-2.50	25	134	610
2000	2361.17+/-829.64	18.66+/-4.96	40	139	510
2001	849.06+/-339.58	12.07+/-2.78	35	154	685
2002	1364.66+/-492.38	16.14+/-4.08	50	148	560
2003	1094.10+/-458.02	21.65+/-11.48	30	153	660
2004	2026.45+/-616.79	24.79+/-7.84	45	134	510
2005	1965.01+/-696.91	17.97+/-4.52	35	130	645
2006	2620.80+/-1206.28	30.71+/-9.81	20	141	665
2007	794.46+/-365.72	9.77+/-2.42	30	204	635
2008	1038.85+/-589.05	13.81+/-5.74	25	205	620
2009	1138.84+/-545.08	18.75+/-6.51	25	215	640
2010	1398.92+/-795.54	17.47+/-6.68	10	204	900
2011	582.12+/-196.14	12.62+/-3.19	10	205	550
2012	752.24+/-261.36	13.93+/-3.87	40	181	625
2013	809.15+/-313.53	18.94+/-6.47	30	128	490
2014	1101.4+/-368.8	23.1+/-3.8	10	127	750
2015	943.9+/-132.8	15.5+/-1.4	50	180	670
2016	1242.06+/-198.22	19.43+/-2.48	51	194	990
2017	986.99+/-153.11	19.65+/-1.53	34	185	640
2018	688.76+/-149.61	19.27+/-2.69	30	175	560

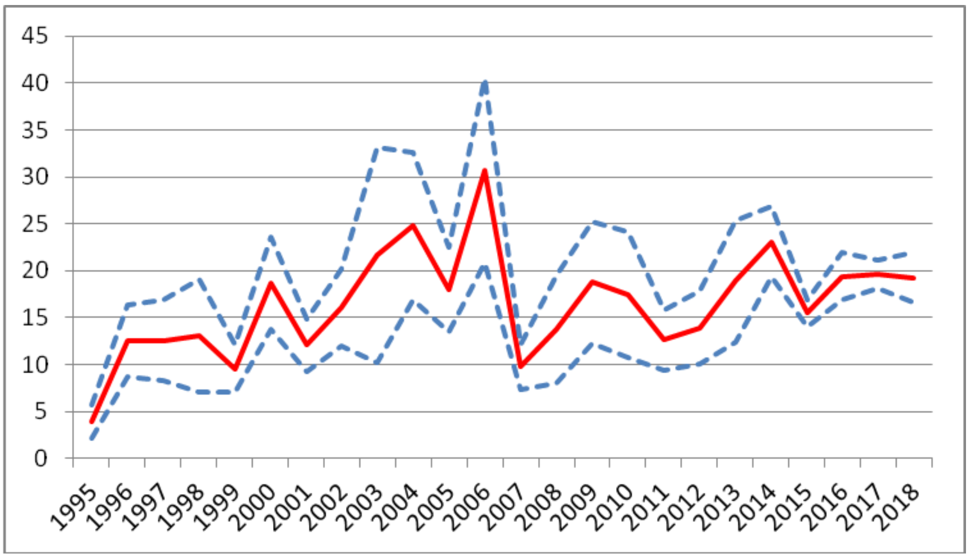


Table 1.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Mullus barbatus* during MEDITS surveys (GSA 6).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1995	174.14+/-76.03	5.79+/-2.60	95	148	250
1996	119.68+/-53.75	4.54+/-2.16	100	151	250
1997	69.15+/-45.06	3.66+/-2.20	110	165	250
1998	167.78+/-99.02	7.32+/-3.59	105	160	240
1999	126.97+/-51.46	5.39+/-2.01	90	155	250
2000	190.15+/-86.82	7.03+/-2.92	55	153	245
2001	86.91+/-36.69	4.20+/-1.17	105	164	275
2002	99.09+/-34.90	5.48+/-1.84	95	164	250
2003	205.70+/-77.99	8.82+/-3.50	85	154	260
2004	127.95+/-51.28	6.63+/-2.74	90	156	270
2005	119.25+/-54.21	6.71+/-3.04	100	165	365
2006	270.95+/-154.70	11.93+/-7.06	50	155	255
2007	562.27+/-307.98	22.89+/-11.94	100	170	260
2008	103.63+/-58.61	6.54+/-3.31	80	179	285
2009	183.80+/-72.45	8.23+/-3.11	70	163	300
2010	211.51+/-151.01	9.36+/-6.59	75	167	265
2011	108.05+/-51.96	5.81+/-2.63	80	172	260
2012	360.11+/-102.66	14.04+/-4.13	45	164	285
2013	245.09+/-107.90	10.73+/-3.97	100	151	270
2014	526.8+/-87.2	23.4+/-3.9	85	151	255
2015	593.1+/-97.7	29.7+/-4.1	25	170	260
2016	901.04+/-154.27	33.56+/-4.8	97	169	277
2017	541.91+/-90.32	26.82+/-4.16	60	172	300
2018	653.15+/-103.88	29.01+/-4.28	90	170	280

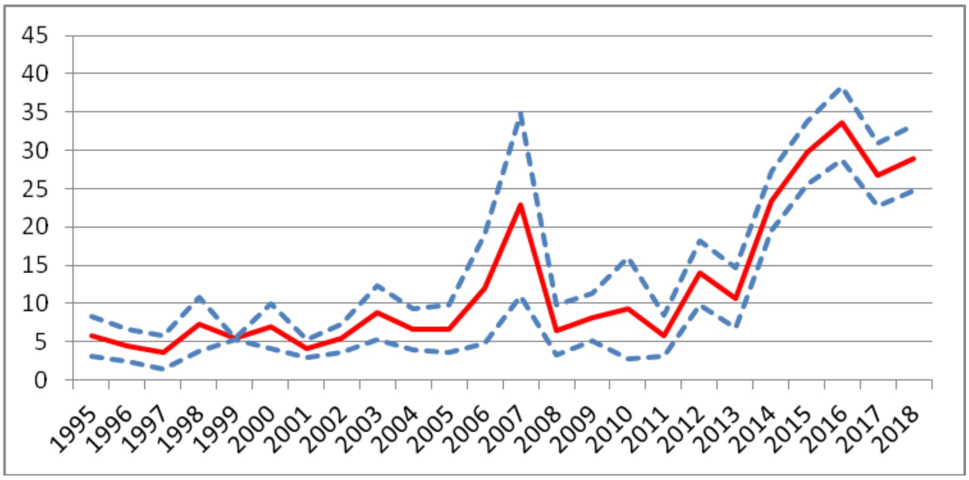


Table 1.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Mullus surmuletus* during MEDITS surveys (GSA 6).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1995	39.70+/-39.82	3.45+/-3.03	120	192	325
1996	18.01+/-10.01	1.89+/-1.19	135	204	365
1997	16.17+/-10.17	1.71+/-0.99	110	205	330
1998	18.28+/-9.54	1.64+/-0.89	110	197	330
1999	27.60+/-29.76	2.19+/-2.01	100	169	320
2000	19.05+/-12.98	1.95+/-1.23	130	195	285
2001	23.26+/-13.66	2.23+/-1.11	105	203	445
2002	16.76+/-8.47	1.78+/-0.84	150	211	410
2003	11.30+/-4.42	1.44+/-0.67	130	220	365
2004	17.06+/-10.15	1.91+/-0.92	140	206	390
2005	16.47+/-9.45	1.56+/-0.80	130	206	310
2006	59.32+/-76.60	4.62+/-3.85	55	204	360
2007	52.23+/-37.68	6.70+/-5.79	125	201	330
2008	10.36+/-3.98	1.38+/-0.51	35	209	335
2009	21.94+/-11.19	2.48+/-1.01	15	201	560
2010	24.95+/-32.19	2.38+/-2.64	11	203	355
2011	34.82+/-37.66	3.20+/-3.32	55	199	335
2012	36.54+/-25.73	3.22+/-2.47	40	196	365
2013	48.58+/-33.78	4.38+/-2.70	130	188	300
2014	65.4+/-17.7	6.3+/-1.6	110	196	315
2015	72.3+/-19.8	6.1+/-1.6	20	190	335
2016	86.88+/-19.97	6.62+/-1.43	121	196	349
2017	58.13+/-15.11	5.21+/-1.23	140	192	310
2018	88.97+/-34.83	7.17+/-2.35	130	200	300

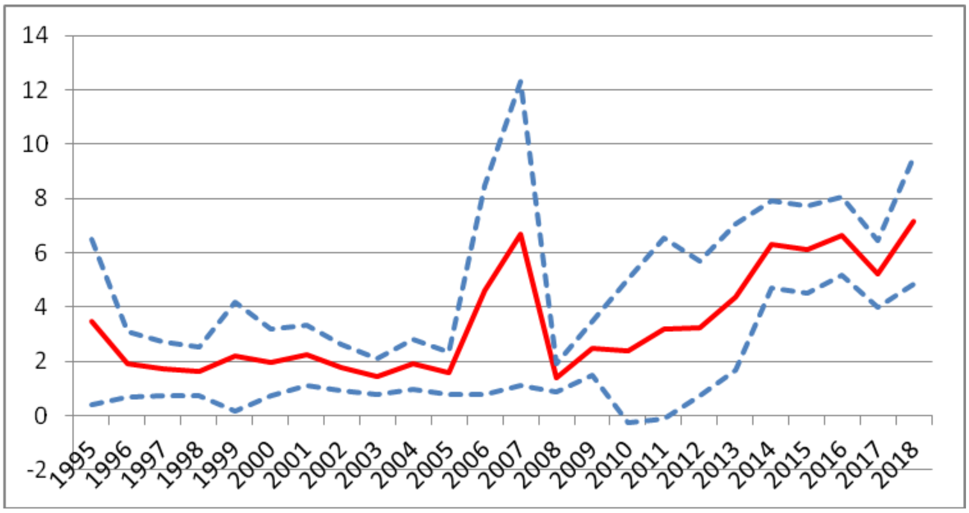


Table 1.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Pagellus erythrinus* during MEDITS surveys (GSA 6).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1995	6.40+/-3.91	0.55+/-0.26	110	209	325
1996	10.56+/-4.76	1.23+/-0.61	100	199	370
1997	10.98+/-7.91	1.24+/-0.89	45	202	315
1998	22.52+/-14.86	2.10+/-1.29	40	195	435
1999	39.43+/-23.03	3.76+/-1.72	85	196	365
2000	34.30+/-26.30	4.25+/-2.99	90	209	400
2001	46.96+/-28.02	6.07+/-3.19	85	204	460
2002	42.59+/-21.06	5.85+/-3.32	50	214	500
2003	36.06+/-29.39	4.72+/-3.83	65	209	540
2004	29.17+/-15.66	3.87+/-1.90	70	201	405
2005	17.00+/-7.54	2.27+/-1.09	90	216	390
2006	54.38+/-38.74	6.60+/-4.35	55	199	450
2007	260.52+/-232.73	13.11+/8.11	85	213	410
2008	81.91+/-63.87	6.61+/-4.30	100	223	515
2009	65.51+/-52.51	5.81+/-4.83	70	214	490
2010	183.01+/-180.01	11.80+/9.07	75	211	380
2011	125.98+/-98.93	9.27+/-7.24	65	200	370
2012	103.77+/-50.34	10.34+/5.11	80	194	340
2013	174.30+/-34.08	16.12+/-3.09	70	195	365
2014	162.04+/-31.66	18.99+/-3.54	75	195	430
2015	165.78+/-37.3	18.1+/-4.2	70	210	470
2016	160.54+/-34.2	17.5+/-3.66	71	197	341
2017	232.17+/-45.45	22.57+/-4.51	73	199	425
2018	182.01+/-49.91	17.68+/-5.61	85	185	340

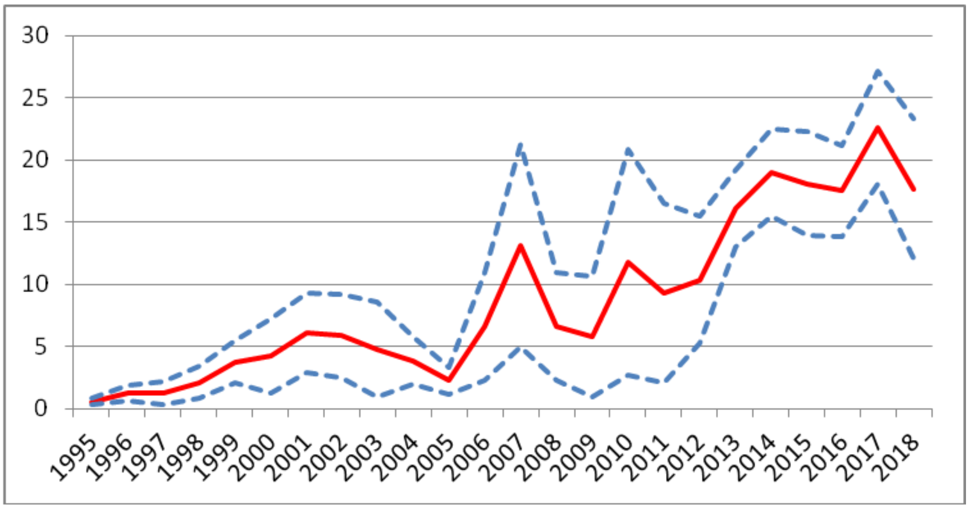


Table 1.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Aristeus antennatus* during MEDITS surveys (GSA 6).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1995	45.50+/-42.75	0.64+/-0.55	16	34	57
1996	79.76+/-68.23	1.38+/-1.17	16	36	63
1997	59.43+/-47.20	1.08+/-0.85	17	34	66
1998	30.29+/-26.80	0.42+/-0.37	17	33	62
1999	35.89+/-28.17	0.45+/-0.35	14	31	60
2000	63.27+/-67.92	0.78+/-0.75	18	32	60
2001	40.31+/-48.90	0.53+/-0.60	10	32	55
2002	34.25+/-29.11	0.49+/-0.40	18	33	62
2003	39.92+/-27.51	0.74+/-0.45	20	37	61
2004	32.39+/-29.42	0.53+/-0.44	16	34	64
2005	12.43+/-15.26	0.28+/-0.28	16	33	62
2006	42.62+/-50.35	0.68+/-0.81	14	35	60
2007	27.57+/-31.77	0.41+/-0.39	13	34	58
2008	63.00+/-46.47	0.82+/-0.60	11	33	63
2009	46.031+/-34.74	0.74+/-0.55	10	36	36
2010	31.26+/-31.89	0.47+/-0.50	7	34	62
2011	37.30+/-30.75	0.55+/-0.42	11	53	61
2012	66.06+/-58.30	0.91+/-0.76	12	33	57
2013	37.26+/-33.13	0.69+/-0.63	18	32	56
2014	110.4+/-44.00	3.01+/-1.40	16	31	83
2015	221.6+/-143.1	3.1+/-1.7	5	35	61
2016	101.89+/-49.04	1.41+/-0.56	18	34	62
2017	44.77+/-16.33	0.75+/-0.24	17	33	55
2018	74.88+/-21.57	1.36+/-0.36	17	33	53

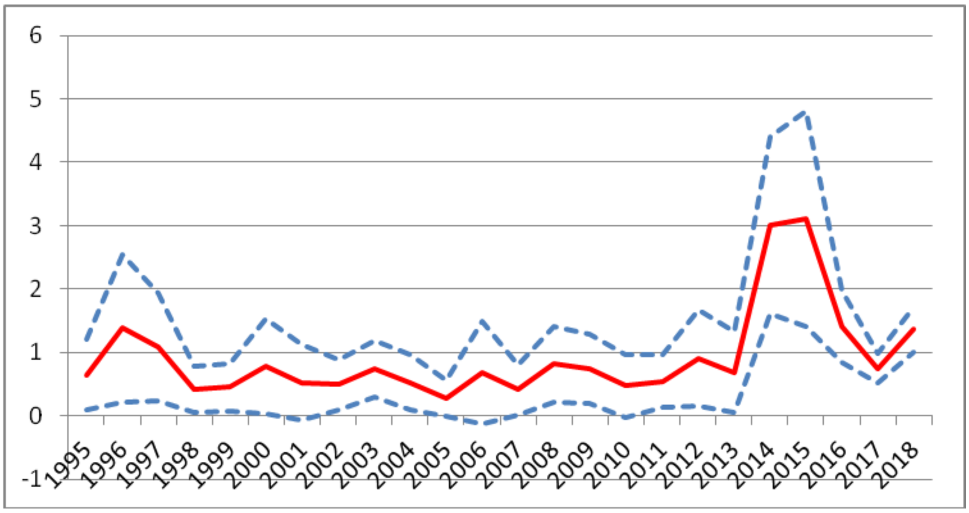


Table 1.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Nephrops norvegicus* during MEDITS surveys (GSA 6).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1995	69.17+/-33.84	1.95+/-0.85	16	35	65
1996	86.22+/-64.89	2.47+/-1.78	17	37	71
1997	93.83+/-73.66	2.48+/-1.76	14	34	63
1998	36.62+/-33.46	1.02+/-0.91	18	35	59
1999	32.02+/-27.20	0.74+/-0.51	10	32	64
2000	74.82+/-104.75	1.28+/-1.44	16	33	65
2001	173.07+/-110.55	4.74+/-2.75	15	34	55
2002	89.28+/-58.28	2.41+/-1.41	9	35	72
2003	69.07+/-47.65	1.99+/-1.22	15	35	88
2004	103.96+/-89.51	2.57+/-1.81	15	36	63
2005	47.17+/-31.33	1.50+/-0.99	16	37	65
2006	77.87+/-41.41	2.53+/-1.36	14	37	67
2007	61.38+/-40.64	2.08+/-1.21	14	40	68
2008	39.52+/-30.62	1.11+/-0.80	17	40	74
2009	123.94+/-97.12	3.37+/-2.44	9	38	51
2010	57.14+/-45.55	1.63+/-1.20	6	40	48
2011	60.20+/-37.46	1.77+/-1.11	17	42	63
2012	183.95+/-179.73	4.05+/-3.05	10	36	68
2013	133.63+/-100.21	3.14+/-2.23	17	32	62
2014	197.54+/-50.54	5.75+/-1.43	13	33	65
2015	714.2+/-13.7	20.0+/-13.7	10	38	66
2016	159.51+/-40.02	4.62+/-1.12	18	41	97
2017	108.04+/-25.47	4.06+/-1.08	14	35	68
2018	153.15+/-45.33	5.02+/-1.74	17	33	59

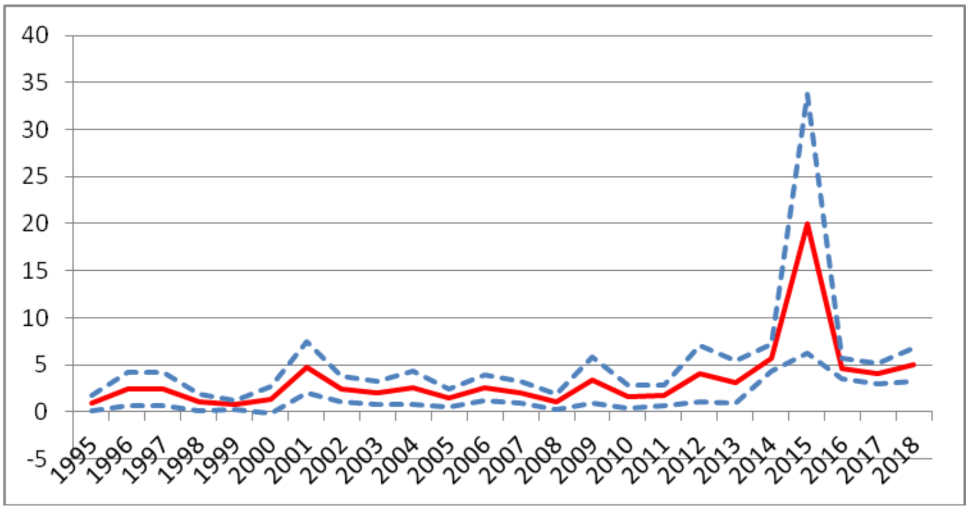


Table 1.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Parapenaeus longirostris* during MEDITS surveys (GSA 6).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1995	10.34+/-9.97	0.10+/-0.11	8	21	37
1996	21.07+/-27.96	0.18+/-0.23	9	24	41
1997	6.54+/-7.57	0.06+/-0.07	11	23	39
1998	7.10+/-6.27	0.07+/-0.07	7	22	39
1999	19.99+/-17.95	0.17+/-0.15	6	22	37
2000	86.04+/-77.65	0.58+/-0.45	8	23	37
2001	77.80+/-50.37	0.97+/-0.70	5	23	40
2002	30.15+/-25.17	0.31+/-0.25	9	23	41
2003	2.84+/-1.70	0.03+/-0.02	10	25	36
2004	23.30+/-23.50	0.27+/-0.29	6	24	40
2005	7.61+/-5.34	0.10+/-0.07	17	27	39
2006	7.15+/-4.32	0.10+/-0.06	5	26	41
2007	9.81+/-10.57	0.11+/-0.13	8	24	41
2008	5.40+/-4.97	0.06+/-0.06	10	26	38
2009	31.64+/-19.76	0.28+/-0.19	7	25	29
2010	32.28+/-28.19	0.39+/-0.33	13	36	37
2011	21.12+/-13.52	0.21+/-0.14	10	25	41
2012	61.19+/-61.92	0.75+/-0.82	9	25	52
2013	33.40+/-21.00	0.45+/-0.28	10	28	54
2014	223.28+/-63.16	2.17+/-0.54	12	26	47
2015	159.8+/-25.9	1.1+/-0.2	4	24	43
2016	376.57+/-74.11	3.56+/-0.68	10	24	40
2017	227.86+/-56.77	2.12+/-0.46	7	23	44
2018	537.45+/-97.06	5.34+/-0.92	10	25	43

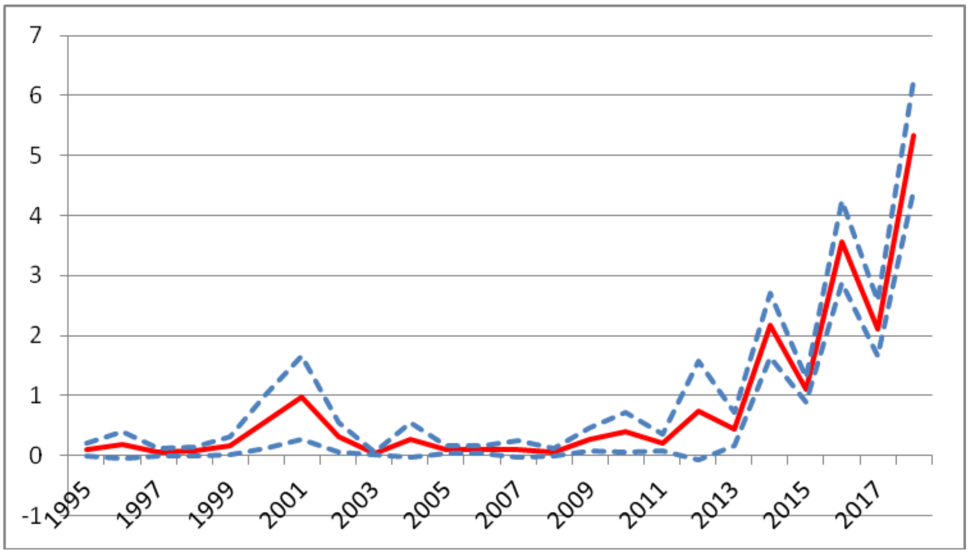


Table 1.- Historical trends of abundance (nº/km^2) and biomass (kg/km^2) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Ilex coindetti* during MEDITS surveys (GSA 6).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed
1995	10.11+/-3.68	0.97+/-0.40	48	133
1996	102.57+/-62.49	4.26+/-1.46	30	127
1997	28.73+/-10.12	3.90+/-1.31	50	147
1998	9.87+/-6.49	1.27+/-0.87	55	151
1999	26.73+/-10.97	3.19+/-1.26	40	158
2000	584.01+/-436.76	14.19+/6.88	35	147
2001	10.58+/-4.18	1.03+/-0.47	40	151
2002	26.65+/-11.58	1.68+/-0.65	35	130
2003	50.23+/-23.60	5.22+/-2.75	40	154
2004	60.71+/-30.66	4.97+/-2.33	30	132
2005	52.22+/-27.14	3.08+/-1.02	30	131
2006	10.17+/-4.46	1.34+/-0.67	35	139
2007	5.38+/-4.31	0.65+/-0.61	30	159
2008	274.72+/-176.60	9.37+/-4.19	20	125
2009	136.50+/-38.14	10.09+/2.16	45	147
2010	122.10+/-34.34	11.18+/3.38	20	160
2011	311.97+/-118.78	22.62+/8.18	45	136
2012	264.55+/-90.44	10.96+/2.56	30	128
2013	618.57+/-174.20	44.35+/-12.9	30	126
2014	610.07+/-64.87	44.56+/-5.12	35	123
2015	125.1+/-18.37	8.7+/-1.1	15	190
2016	750.66+/-88.01	41.31+/-3.53	40	161
2017	280.03+/-51.94	13.03+/-2.62	30	170
2018	529.33+/-60.31	36.39+/-3.38	40	159

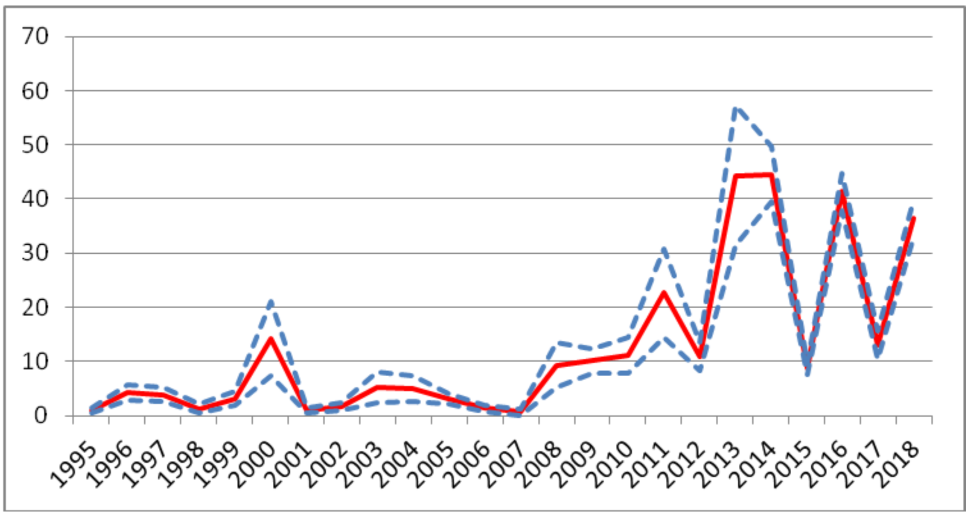
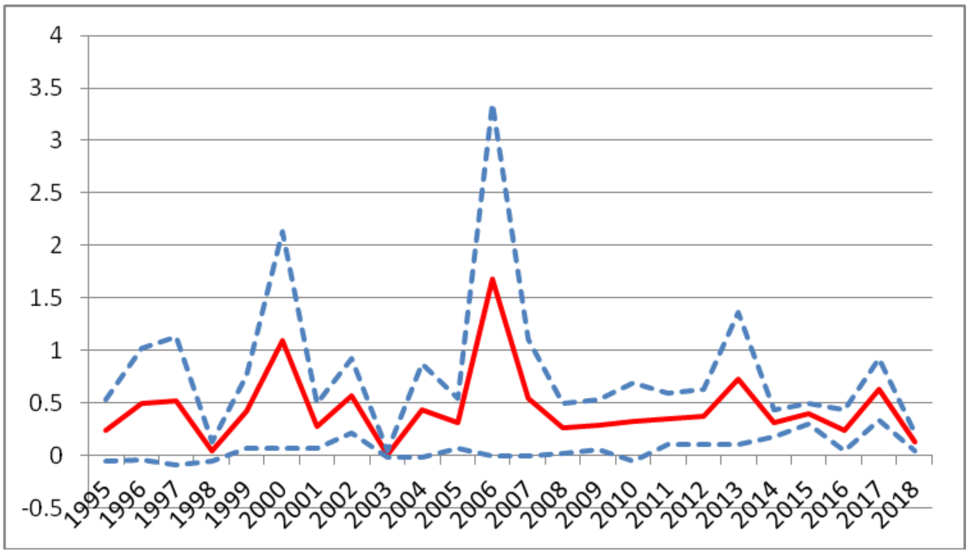


Table 1.- Historical trends of abundance (nº/km²) and biomass (kg/km²) indices (±standard error) and minimum, mean and maximum length (mm) of the specie *Loligo vulgaris* during MEDITS surveys (GSA 6).

	Abundance ±S.E.	Biomass ±S.E.	Lmin	Lmed	Lmax
1995	1.82+/-2.82	0.24+/-0.29	85	164	271
1996	3.00+/-3.40	0.49+/-0.53	100	164	280
1997	1.15+/-1.19	0.52+/-0.61	160	251	370
1998	0.16+/-0.33	0.04+/-0.09	155	183	216
1999	3.35+/-2.88	0.42+/-0.35	115	161	240
2000	11.69+/-19.67	1.10+/-1.03	70	138	265
2001	1.89+/-1.15	0.28+/-0.21	80	164	260
2002	4.75+/-3.38	0.57+/-0.35	40	145	275
2003	0.24+/-0.58	0.01+/-0.03	115	208	265
2004	3.15+/-2.51	0.43+/-0.45	30	155	300
2005	1.27+/-0.86	0.31+/-0.24	55	190	255
2006	9.47+/-9.06	1.68+/-1.68	100	200	500
2007	3.55+/-3.82	0.55+/-0.56	75	166	320
2008	2.01+/-1.66	0.26+/-0.24	20	147	380
2009	2.91+/-2.27	0.29+/-0.24	15	166	450
2010	1.58+/-1.68	0.32+/-0.37	20	164	270
2011	2.09+/-1.58	0.35+/-0.24	30	199	820
2012	2.16+/-1.39	0.37+/-0.26	15	149	440
2013	4.90+/-4.71	0.73+/-0.63	62	153	250
2014	3.86+/-1.31	0.31+/-0.13	110	154	205
2015	4.5+/-1.8	0.4+/-.01	15	140	335
2016	0.40+/-0.28	0.24+/-0.20	146	159	167
2017	4.62+/-2.04	0.63+/-0.29	40	175	330
2018	0.43+/-0.31	0.13+/-0.09	220	225	250



MEDITS REPORT, France GSA 7 and 8

Review of MEDITS France, GSA7 and 8, 2018, Angélique Jadaud

The MEDITS survey was conducted in GSA 7 and 8, from the 23rd May until the 26th of June 2018. All the hauls were performed with success (23 in GSA 8–Eastern Corsica and 65 in GSA 7-Gulf of Lions). The openings of the net were measured using MARPORT system, on all the hauls and the bottom temperature and salinity were measured using an Oddistar CTD sensor. The bottom temperature oscillated around 13 and 15 °C and salinity between 33 and 37. Macro litters were collected, weighted and counted by sub-category and mostly plastic were analyzed. In GSA 7 and 8 joined, 414 taxa were identified. Considering sex and maturity 25 taxa (GSA7) and 24 taxa (GSA 8) were sampled (G1 species). Focusing on Total numbers of hard tissues collected for ageing, 5 species were analysed *(Mullus barbatus, M. surmuletus, Lophius budegassa, L. piscatorius and M. Merluccius),* around 1500 hard tissues were collected in GSA 7 (mainly *M. barbatus* with 615 otoliths) and 600 in GSA 8 (mainly *M. barbatus with 400 otoliths).* Moreover, samplings were done considering Marine Strategy Framework Directive (MSFD):

-characterization of abundance of zooplankton taxa by use of WP2 for 8 stations in the Eastern Corsica (1 station by depth strata), samples were stored in formol and were analysed in 2018

- CTD points were also performed

- determination of jelly fish

The following year, 2019, the survey will be conducted from the 22nd of may until the 25th June (first Eastern Corsica, then Gulf of Lions). Some samplings will be done for MSFD (WP2, CTD).

MEDITS 2018 SURVEY GSA 17

Adriatic Sea

Abstract

The MEDITS survey 2018 in GSA 17 was jointly performed by the Laboratory of Marine Biology and Fishery of Fano (Italy), Institute of Oceanography and Fisheries of Split (IOF, Croatia) and the Fishery Research Institute of Slovenia. The survey in GSA 17 took place from 30th of June to the 31st of August 2019. on a board of two research vessels. M/V ANDREA operated in Italian territorial waters, Slovenian territorial waters and in the extraterritorial water from 8th of August to 31st August 2018, while M/V BIOS DVA performed the survey in Croatian territorial waters from the 30th of June to 22th of July 2018. In total 189 valid hauls were made in Italian, Croatian, Slovenian and extraterritorial waters. Bottom water temperature was measured using Star-Oddi temperature sensors in total of 150 hauls.

Marine Litter was collected on a board of BIOS DVA and ANDREA.

Biological sampling in GSA 17 was performed according to MEDITS 2017 protocol with minor difficulties in the application of the new protocol.

Review of 2018 survey in GSA 17 – western side

The MEDITS survey 2018 in the Italian side of the GSA 17 was performed by the Laboratory of Marine Biology and Fishery of Fano (Italy).

In this area the sampling took place from 8^{th} August 2018 to 31^{st} August 2018, in line with the period of previous Medits surveys in the area.

The cruise was carried out on board the research vessel Andrea, used since 1999.

Figure 1. RV ANDREA

A total of 120 valid hauls and 2 not valid hauls were performed in the international and Italian territorial waters in the depth range 10-500 m (Figure 2). The 2 not valid hauls were repeated due to entanglement of the trawl net on the obstacle of the bottom that caused the damage of the gear.

Two additional hauls were performed in the Slovenian territorial waters in cooperation with the Fishery Research Institute of Slovenia and samples have been analysed by Slovenian researchers. The two hauls were sampled on 28/08/2018.

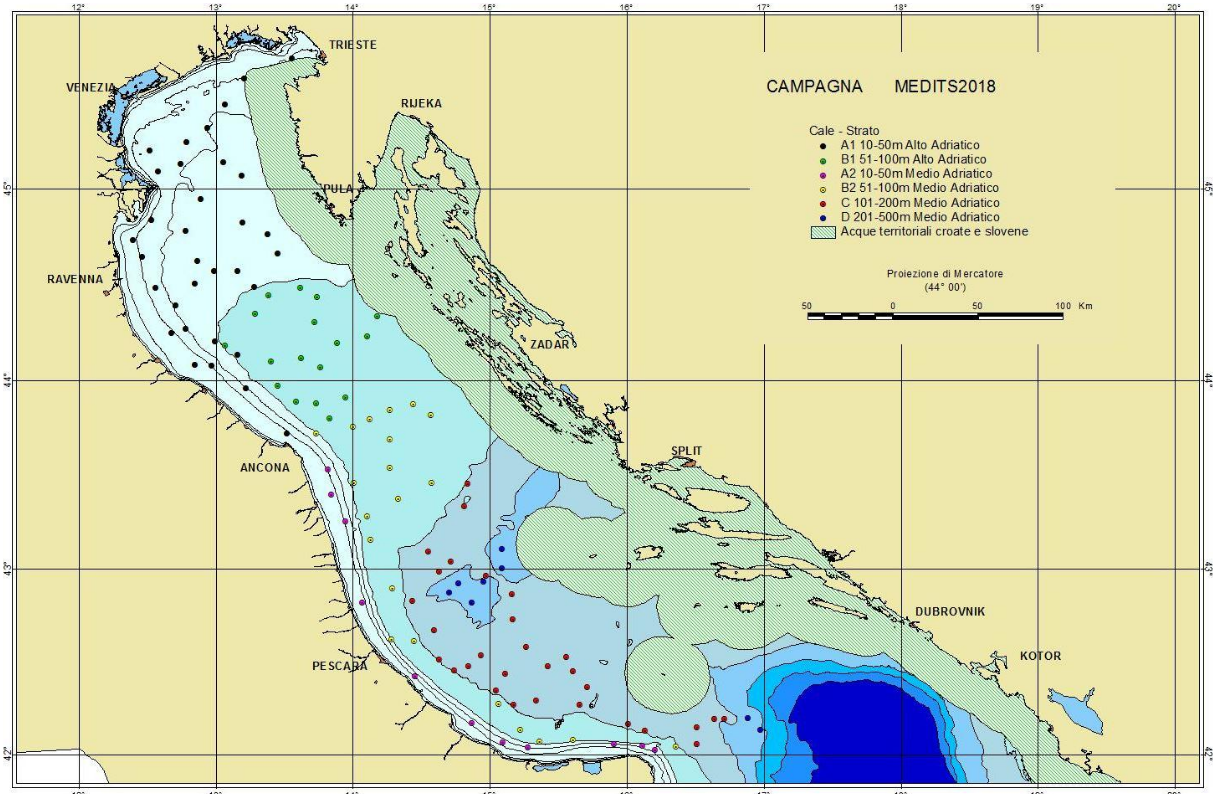


Figure 2. Map position of MEDITS 2018 sampling stations in international and Italian territorial waters (GSA 17).

The bottom water temperature was recorded by a Star-Oddi temperature sensor (Temperature/Depth) only in 86 valid hauls due to the breakage of the temperature sensor (Figure 3).

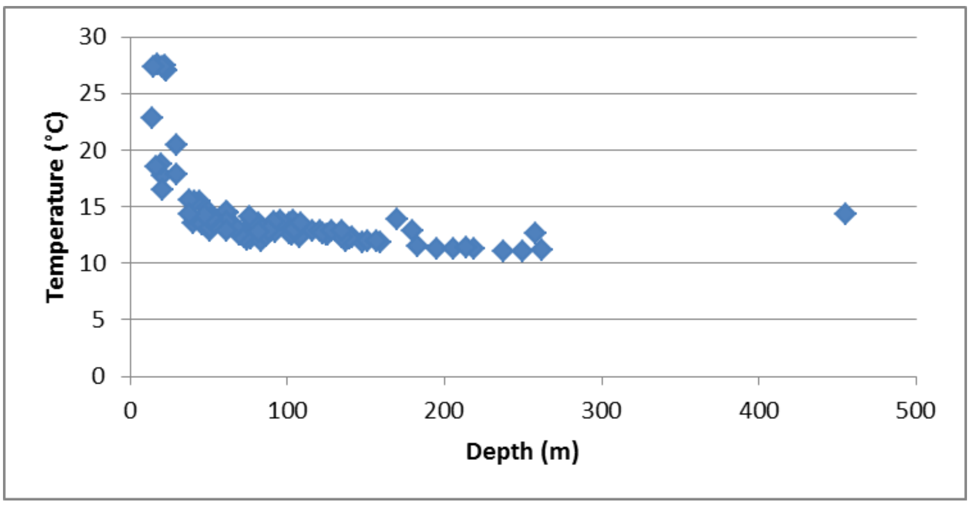


Figure 3. Bottom temperature vs depth plot during MEDITS 2018 survey in International and Italian territorial waters.

A total number of 232 taxa were identified, subdivided as follows: Osteichthyes 94 species plus 1 taxon at genus level; Elasmobranchs 13 species plus 1 taxon at genus level; Crustaceans (Decapoda and Stomatopoda) 21 species plus 1 taxon at genus level; Cephalopods 18 species plus 2 taxa at genus level and 80 taxa belonging to other Faunistic categories. The weight percentage of catch for faunistic categories is reported in Figure 4.

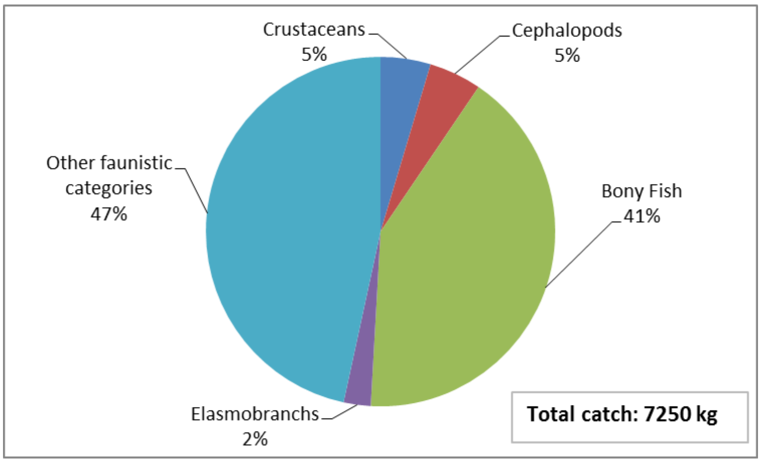


Figure 4. Faunistic categories caught during MEDITS 2018 in the GSA 17 - western side (Percentage in weight).

Total number and weight of species caught during the survey and belonging to G1 and G2 Medits list are reported in Table 1.

The total number of sampled individuals for length and weigth measurement was 46869.

The total number of sampled individuals for sex and maturity was 16689.

The total number of samples of hard tissues (otolith pairs) collected for ageing by target species were: *M. merluccius* 297 (124M+173F), *M. barbatus* 488 (194M+294F) and *M. surmuletus* 82 (45M+37F). The samples were collected by sex and size according to the protocol.

In keeping with the sampling of previous years, the samples size has been adapted to the characteristic and size of the GSA17 and 100 individuals per target species in each haul were sampled for sex and maturity. The sample size of individuals collected for age reading agrees with the protocol.

No difficulties were encountered in the application of the MEDITS protocol.

Marine litter was collected during the survey (Table 3 and Figure 5).

Table 1. The list of G1 and G2 reference species caught during MEDITS 2018 survey in International and Italian territorial waters (GSA 17) and number of specimens sampled for total length.

Faunistic category	Species code	Weight (kg)	Specimens caught	Specimens measured	Percentage of measured specimens (%)
Bony fish	ASPICUC	6.01	297	297	100.0
	BOOPBOO	37.31	1279	708	55.4
	CITHMAC	3.39	188	187	99.5
	DIPLANN	8.69	279	246	88.2
	DIPLSAR	0.04	1	1	100.0
	DIPLVUL	0.41	8	8	100.0
	ENGRENC	815.66	127090	6897	5.4
	EUTRGUR	3.64	170	170	100.0
	HELIDAC	13.73	266	261	98.1
	LEPMBOS	9.07	80	80	100.0
	LITHMOR	1.25	16	16	100.0
	LOPHBUD	35.41	131	130	99.2
	LOPHPIS	1.47	1	1	100.0
	MERLMER	215.78	6357	3839	60.4
	MICMPOU	82.77	1414	707	50.0
	MULLBAR	514.32	48114	5047	10.5
	MULLSUR	3.19	108	108	100.0
	PAGEACA	1.70	37	36	97.3
	PAGEBOG	11.95	130	130	100.0
	PAGEERY	19.61	762	656	86.1
	PHYIBLE	7.18	69	67	97.1
	SARDPIL	378.69	35326	4259	12.1
	SCOMPNE	39.69	2693	1051	39.0
	SCOMSCO	19.25	268	182	67.9
	SOLEVUL	1.97	13	13	100.0
	SPARPAG	3.11	198	198	100.0
	SPICFLE	19.39	2511	914	36.4
	SPICSMA	0.78	31	30	96.8
	TRACMED	162.87	17808	2524	14.2
	TRACTRA	198.35	21706	4588	21.1
	TRIGLUC	17.65	368	359	97.6
	TRIPLAS	2.59	53	47	88.7
	TRISCAP	18.55	1498	1444	96.4
	ZEUSFAB	2.37	29	26	89.7
Cephalopods	ILLECOI	229.65	11895	6113	51.4
	LOLIVUL	20.85	1308	977	74.7
	SEPIOFF	13.73	332	328	98.8
	TODASAG	2.54	12	11	91.7
	ELEDCIR	6.90	124	123	99.2
	ELEDMOS	65.89	407	397	97.5
	OCTOVUL	4.63	17	17	100.0
Crustaceans	ARISFOL	0.11	4	4	100.0
	NEPRNOR	2.43	73	73	100.0
	PAPELON	24.21	4215	2842	67.4
	PENAKER	0.17	8	8	100.0
	SQUIMAN	10.29	392	392	100.0
Elasmobranchs	GALUMEL	12.73	219	101	46.1
	MUSTMED	7.06	16	16	100.0
	MUSTMUS	14.70	5	5	100.0
	MYLIAQU	12.33	10	10	100.0
	RAJAAST	3.11	8	8	100.0
	RAJACLA	61.91	50	50	100.0
	RAJAMIR	1.01	6	6	100.0
	RAJAPOL	0.26	1	1	100.0
	SCYOCAN	13.39	99	97	98.0
	SQUAACA	46.79	60	60	100.0
	TORPMAR	2.16	3	3	100.0

Table 2. Total number of specimens sampled for sex and maturity stage

Faunistic category	Species code	Specimens caught	Specimens sampled for sex and maturity	Percentage of measured specimens (%)
Bony fish	MERLMER	6357	2959	46.5
	MULLBAR	48114	4130	8.6
	MULLSUR	108	96	88.9
Cephalopods	ILLECOI	11895	5508	46.3
	LOLIVUL	1308	740	56.6
Crustaceans	ARISFOL	4	4	100.0
	NEPRNOR	73	71	97.3
	PAPELON	4215	2825	67.0
Elasmobranchs	GALUMEL	219	101	46.1
	MUSTMED	16	16	100.0
	MUSTMUS	5	5	100.0
	MYLIAQU	10	10	100.0
	RAJAAST	8	8	100.0
	RAJACLA	50	49	98.0
	RAJAMIR	6	6	100.0
	RAJAPOL	1	1	100.0
	SCYOCAN	99	97	98.0
	SQUAACA	60	60	100.0
	TORPMAR	3	3	100.0

Table 3. Occurrence of Marine Litter collected during MEDITS 2018 survey in international and Italian territorial waters (GSA 17).

Category	Number of hauls	Occurrence %
No Litter	43	35.8
Plastic	77	64.2
Rubber	5	4.2
Metal	11	9.2
Glass/Ceramic	5	4.2
Cloth(textil)/Natural fibres	7	5.8
Wood processed	0	0.0
Paper and cardboard	0	0.0
Other	0	0.0

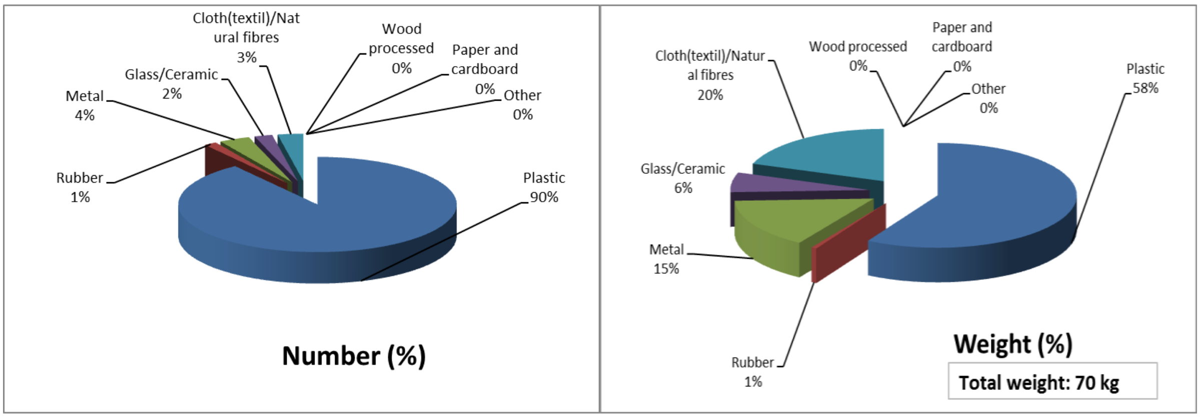


Figure 5. Marine litter collected during MEDITS 2018 in the GSA 17 - western side (Percentage in number and weight).

Review of 2018 survey in GSA 17 – eastern side

In the Croatian territorial waters in 2018, MEDITS survey was performed from 30th of June to 22nd of July on board by research vessel BIOS DVA (BIOS TWO) in property of the IOF, Split

Figure 6. Research vessel BIOS DVA

During the survey, sampling was performed on 65 stations in different depth strata (10-50 m; 50-100 m; 100-200 m; and 200-500 m) in the Croatian territorial and extraterritorial waters.

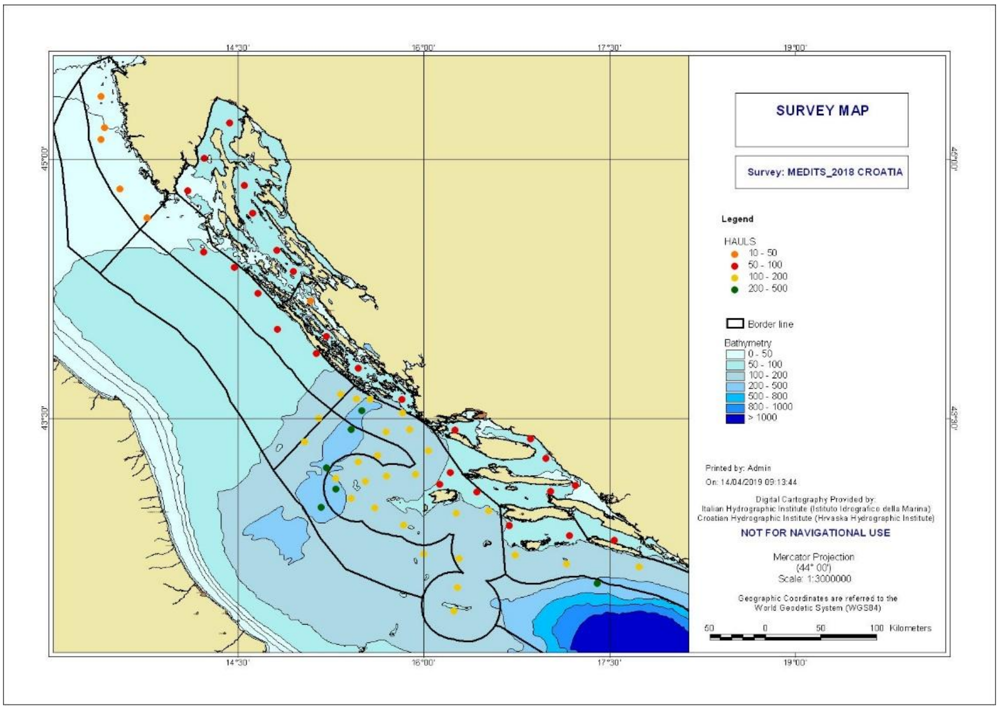


Figure 7. Map position of MEDITS 2018 sampling stations in Croatian territorial waters (GSA 17)

A total number of 350 taxa were identified, subdivided as follows: Osteichthyes 87 species plus 1 taxon at genus level; Elasmobranchs 12 species, Crustaceans 9; Cephalopods 13 species plus 2 taxa at genus level, and 228 taxa belonging to other Faunistic categories.

Table 4. The list of G1 and G2 reference species caught during MEDITS 2018 survey in Croatian territorial waters (GSA 17)

SCIENTIFIC NAME		
Acantholabrus palloni	Hoplostethus mediterraneus	Raja polystigma
Alloteuthis media	Illex coindetii	Rissoides desmaresti
Alosa fallax	Lepidopus caudatus	Sardina pilchardus
Antonogadus megalokynodon	Lepidorhombus boscii	Sardinella aurita
Aphia minuta	Lepidorhombus whiffiagonis	Scomber (Pneumatophorus) japonicus
Argentina sphyraena	Lepidotrigla cavillone	Scomber scombrus
Arnoglossus laterna	Lepidotrigla dieuzeidei	Scorpaena notata
Arnoglossus rueppelli	Lestidiops sphyrenoides	Scorpaena porcus
Arnoglossus thori	Loligo forbesi	Scorpaena scrofa
Aspitrigla cuculus	Loligo vulgaris	Scyliorhinus canicula
Blennius ocellaris	Lophius budegassa	Scyliorhinus stellaris
Boops boops	Lophius piscatorius	Sepietta spp
Buglossidium luteum	Macrorhamphosus scolopax	Sepia elegans
Callionymus maculatus	Maja crispata	Sepia officinalis
Capros aper	Maja squinado	Sepia orbignyana
Carapus acus	Maurolicus muelleri	Sepiola spp
Centrolophus niger	Merluccius merluccius	Serranus cabrilla
Dactylopterus (Cephalacanthus) volitans	Micromesistius poutassou	Serranus hepatus
Cepola rubescens (macrophthalma)	Microchirus ocellatus	Solea vulgaris
Chlorotocus crassicornis (gracilipes)	Microchirus variegatus	Sparus aurata
Citharus linguatula (macrolepidotus)	Molva dipterygia	Pagrus (Sparus) pagrus
Chlorophthalmus agassizii	Mullus barbatus	Spicara flexuosa
Coelorhynchus coelorhynchus	Mullus surmuletus	Spicara smaris
Conger conger	Mustelus asterias	Spondyliosoma cantharus
Dasyatis pastinaca	Mustelus mediterraneus	Sprattus sprattus
Dentex dentex	Mustelus mustelus	Squalus acanthias
Dentex gibbosus	Myliobatis aquila	Squilla mantis
Dentex macrophthalmus	Nephrops norvegicus	Symphurus nigrescens
Diplodus annularis	Octopus salutii	Todarodes sagittatus
Diplodus vulgaris	Octopus spp	Todaropsis eblanae
Echelus myrus	Octopus vulgaris	Torpedo marmorata
Eledone cirrosa	Pagellus acarne	Trachurus mediterraneus
Eledone moschata	Pagellus bogaraveo	Trachurus picturatus
Engraulis encrasicholus	Pagellus erythrinus	Trachurus trachurus
Eutrigla gurnardus	Parapenaeus longirostris	Trachinus draco
Gadiculus argenteus	Pasiphaea sivado	Trigla lucerna
Merlangius merlangus	Pecten jacobaeus	Trigla lyra
Gaidropsarus mediterraneus	Peristedion cataphractum	Trigloporus lastoviza
Leusueurigobius (Gobius) friesii	Phycis blennoides	Trisopterus minutus capelanus
Gobius niger	Plesionika heterocarpus	Uranoscopus scaber
Deltentosteus(Gobius)quadrimaculatus	Raja clavata	Zeus faber
Helicolenus dactylopterus	Raja miraletus	

The total number of sampled individuals for length measurement was 19566.

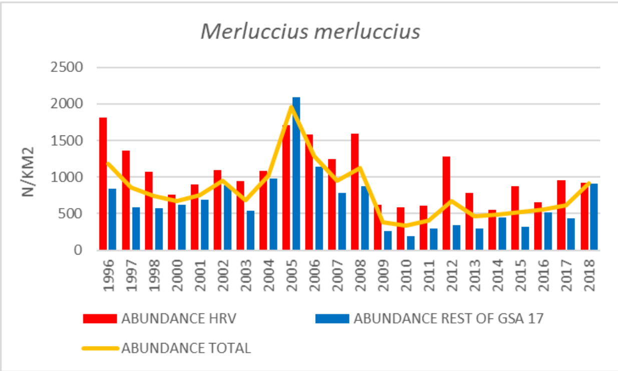
The total number of sampled individuals for sex, maturity and weight was 8122.

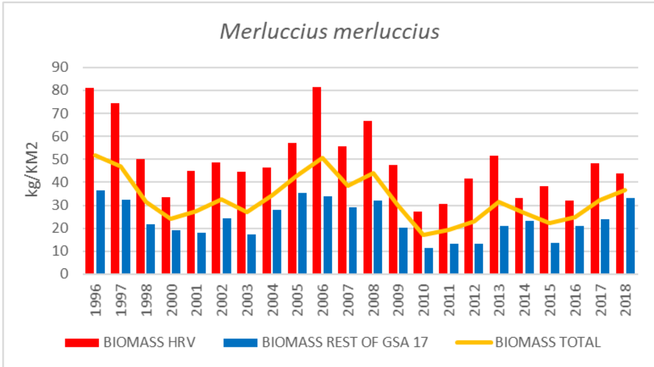
The total number of samples of hard tissues (otolith pairs) collected for ageing by target species were *M. merluccius* 263, *M. barbatus* 230, *T. trachurus* 100 and *T. mediterraneus* 23. The samples were collected by sex and size according to the protocol.

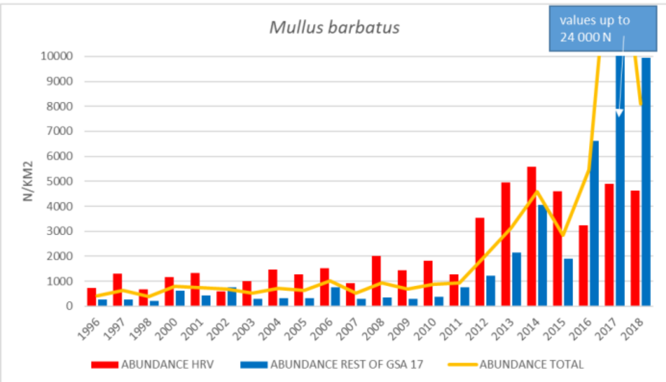
Table 5. Review of species by biomass index recorded during the MEDITS 2018 expedition

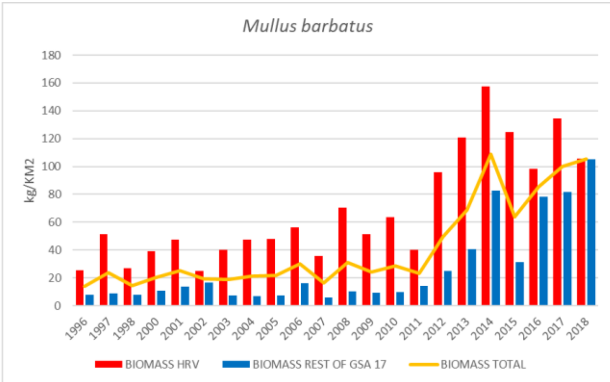
SPECIES	N/Km2	Kg/Km2
SARDPIL	3394.387	265.85502
PAPELON	1717.526	240.43402
MULLBAR	4632.302	105.45976
ENGRENC	3841.91	44.357817
MERLMER	927.3903	43.813376
SPRASPR	3201.796	43.223214
PAGEERY	691.0498	29.887998
MICMPOU	350.8629	25.317615
SCYOCAN	114.8181	22.003564
SPICFLE	845.763	18.145258
TRACTRA	1147.866	18.053153
MUSTMED	12.62043	15.800162
ILLECOI	358.5259	13.823482
SERAHEP	1350.12	12.227425
DENTMAC	276.4659	10.292948
MUSTMUS	8.59906	9.6994671

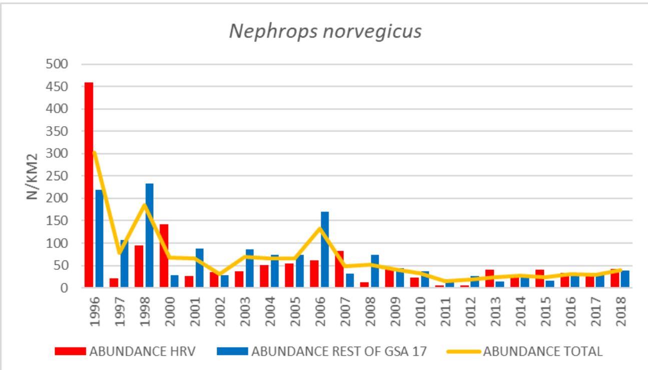
Historical trends

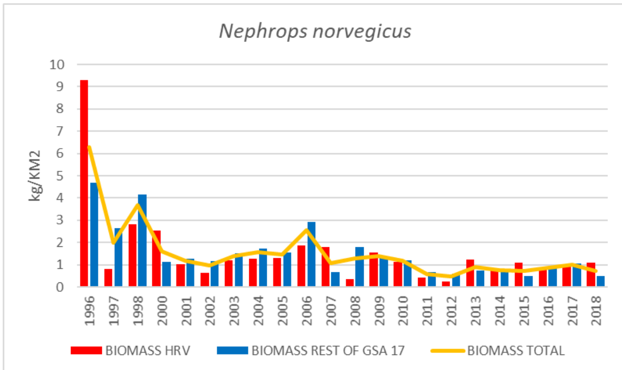


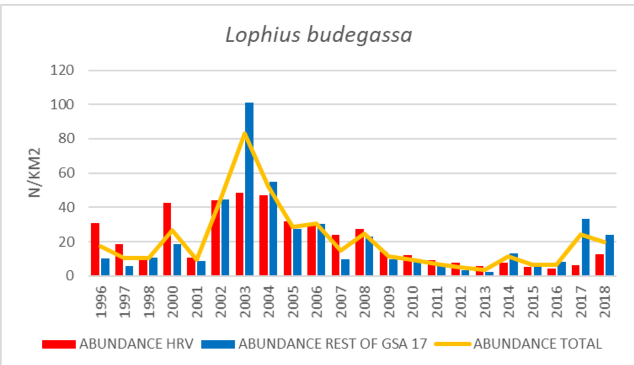


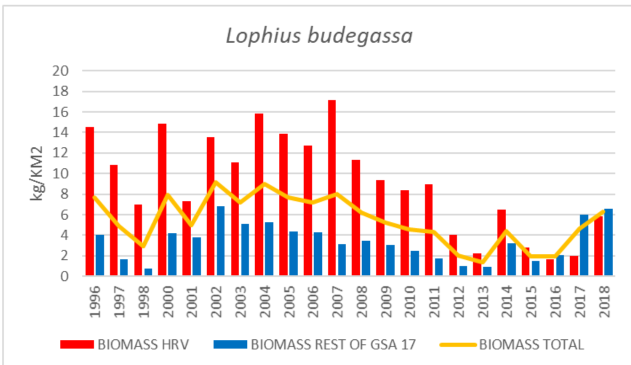


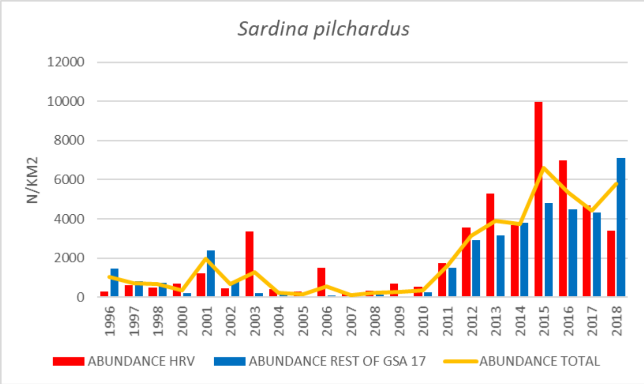


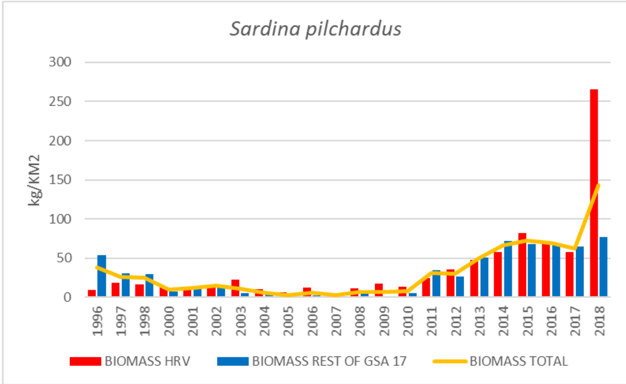









Sardina pilchardus
N/KM2
ABUNDANCE HRV
ABUNDANCE REST OF GSA 17
ABUNDANCE TOTAL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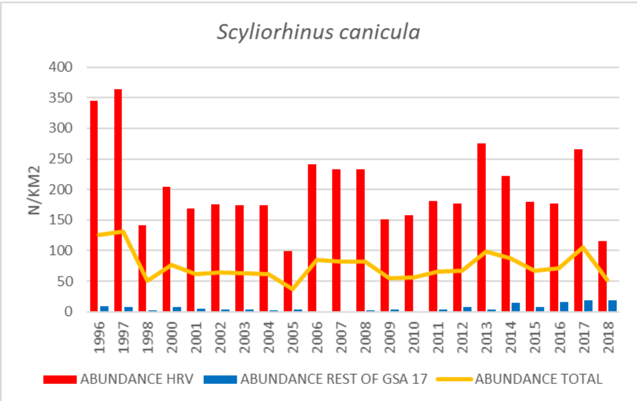
kg/KM2
BIOMASS HRV
BIOMASS REST OF GSA 17
BIOMASS TOTAL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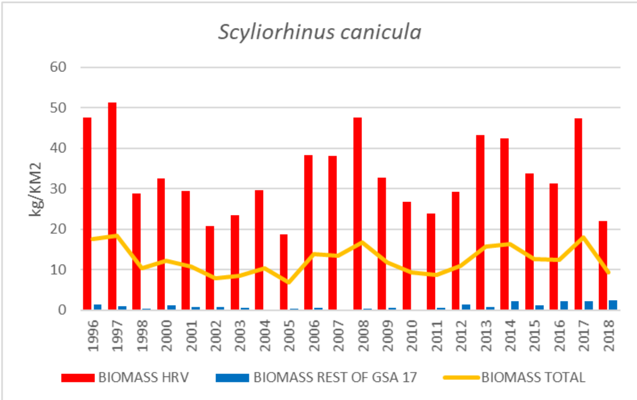
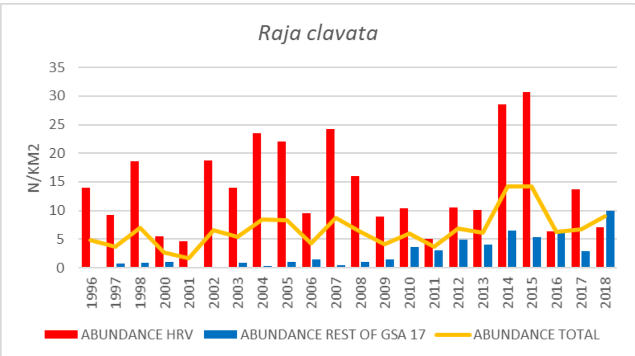
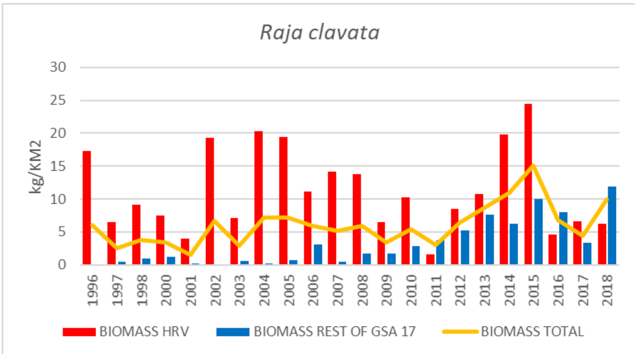
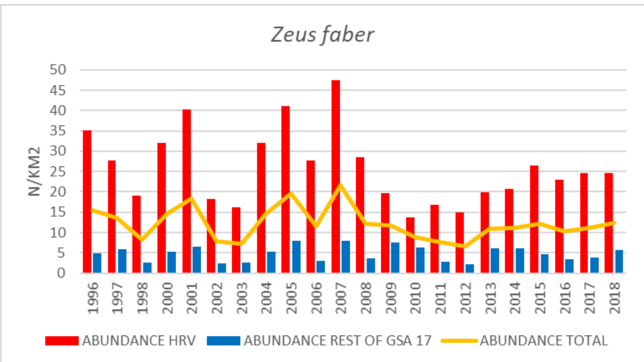
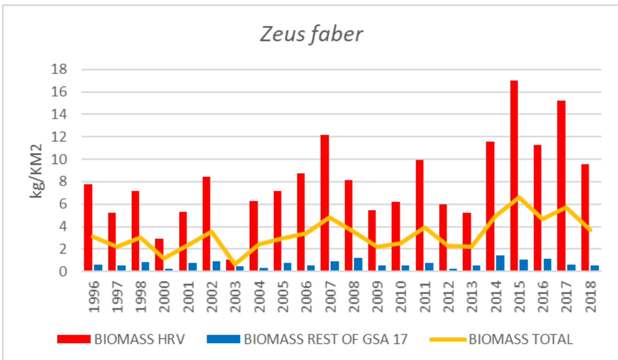
N/KM2
ABUNDANCE HRV
ABUNDANCE REST OF GSA 17
ABUNDANCE TOTAL


Scyliorhinus canicula
kg/KM2
BIOMASS HRV
BIOMASS REST OF GSA 17
BIOMASS TOTAL


Raja clavata
N/KM2
ABUNDANCE HRV
ABUNDANCE REST OF GSA 17
ABUNDANCE TOTAL


Raja clavata
kg/KM2
BIOMASS HRV
BIOMASS REST OF GSA 17
BIOMASS TOTAL


Zeus faber
N/KM2
ABUNDANCE HRV
ABUNDANCE REST OF GSA 17
ABUNDANCE TOTAL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kg/KM2
BIOMASS HRV
BIOMASS REST OF GSA 17
BIOMASS TOTAL

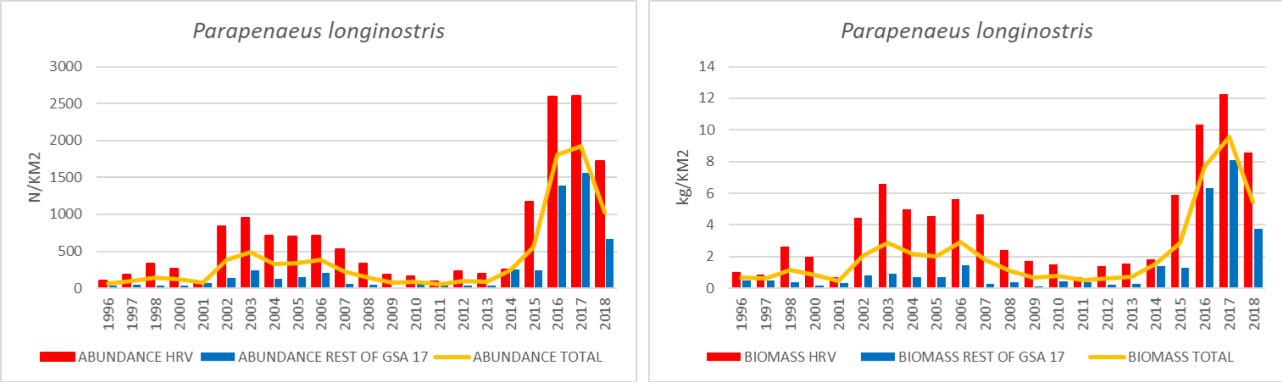

Figure 8. Abundance and biomass trends for the period from 1996 – 2018

Planning for the next survey

The next MEDITS survey is planned for end of June – begging of the July of 2019 in the Croatian side and will be performed with M/V BIOS DVA.

The next MEDITS survey is planned for June - July 2019 in the Italian side and will be performed with the same boat of previous years, the M/V Andrea.

Outline of the report by GSA for presentation of the item 5 in the draft agenda

GSA18

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[3]Institute of Marine Biology of Montenegro

Abstract

The survey was carried out from 14.07.2018 to 26.08.2018. The vessel utilized was Mizar (MIZ), as the vessel used (PEC) in the previous years was scrapped. It was therefore no possible to carry out an intercalibration exercise. Thus, exercises on data standardization were carried out, using the R routine **BioStand**, presented at the Subregional Committees for the Eastern (SRC-EM) and Central Mediterranean (SRC-CM) - Session on deep water red shrimp fisheries in the eastern-central Mediterranean Sea in Rome, March 20, 2019.

The number of hauls performed was 89, on 90 planned. We used Simrad in 68 hauls and DST centi-TD in 89 hauls. We monitored litter by each haul following the common protocol. Species classified by taxa were 318 and 16 faunistic categories. The total number of classified individuals of the MEDITS reference list was 23005 individuals. The total number of sampled individuals for length distributions was 81460 individuals. The total number of sampled individuals for sex and maturity was, respectively, 22434 and 22356. The numbers of samples of hard tissues collected for ageing by target species were: *M. merluccius* 673 otoliths, *M. barbatus* 970 otoliths, *M. surmuletus* 55 otoliths. No difficulties were encountered in the application of the common protocol. Significant increasing trends of abundance and biomass have been estimated for several target species, excluding *N. norvegicus,* while decreasing trends were observed for the mean length of some target species, as *M. barbatus* and *P. longirostris,* as consequence of the recruitment peaks.

<u>Review of 2018 survey by GSA18</u>

The survey was carried out from 14.07.2018 to 26.08.2018. The vessel utilized was Mizar (MIZ), as the vessel used (PEC) in the previous years was scrapped. It was therefore no possible to carry out an intercalibration exercise. Thus, exercises on data standardization were carried out, using the R routine **BioStand**, presented at the Subregional Committees for the Eastern (SRC-EM) and Central Mediterranean (SRC-CM) - Session on deep water red shrimp fisheries in the eastern-central Mediterranean Sea in Rome, March 20, 2019.

The number of hauls performed was 89, on 90 planned. The geographic area covered and the map with haul locations is showed in Figure 1.1. We used Simrad in 68 hauls (results with relationship between wing opening and vertical opening *vs* the depth are in Figure 1.2) and DST centi-TD in 89 hauls. The relationship between the bottom temperature and depth hauls is in Figure 1.3. Other measures of environmental variables were not recorded. We monitored litter by each haul following the common protocol (Figure 1.4). Species classified by taxa were 318 and 16 faunistic categories: 16 species of Elasmobranchs, 120 species of Osteichthyes, 54 species of Crustaceans, 29 species of Cephalopods, 8 species of Mollusca Bivalvia, 28 species of Echinoderms, 11 species of Mollusca Gastropoda, 8 species of Opistobranchia, 13 species of

Tunicata, 1 species of Brachiopoda, 3 species of Bryozoa, 16 species of Cnidaria, 1 species of Hirudinea, 1 species of Polychaeta, 1 species of Sipunculida, 4 species of Porifera, 4 species of Vegetalia. Some specimens were identified at genus level, and the numbers of genus classified by taxa were 7: 2 genera of Crustaceans, 1 genus of Mollusca Bivalvia, 2 genera of Tunicata, 1 genus of Opistobranchia, 1 genus of Porifera.
The total number of classified individuals of the MEDITS reference list was 23005 individuals. The total number of sampled individuals for length distributions was 81460 individuals (Table 1.1). The total number of sampled individuals for sex and maturity was, respectively, 22434 and 22356 (Table 1.2). The numbers of samples of hard tissues collected for ageing by target species were: *M. merluccius* 673 otoliths, *M. barbatus* 970 otoliths, *M. surmuletus* 55 otoliths. No difficulties were encountered in the application of the common protocol.
Significant increasing trends of abundance and biomass have been estimated for several target species, excluding *N. norvegicus*, while decreasing trends were observed for the mean length of some target species, as *M. barbatus* and *P. longirostris*.

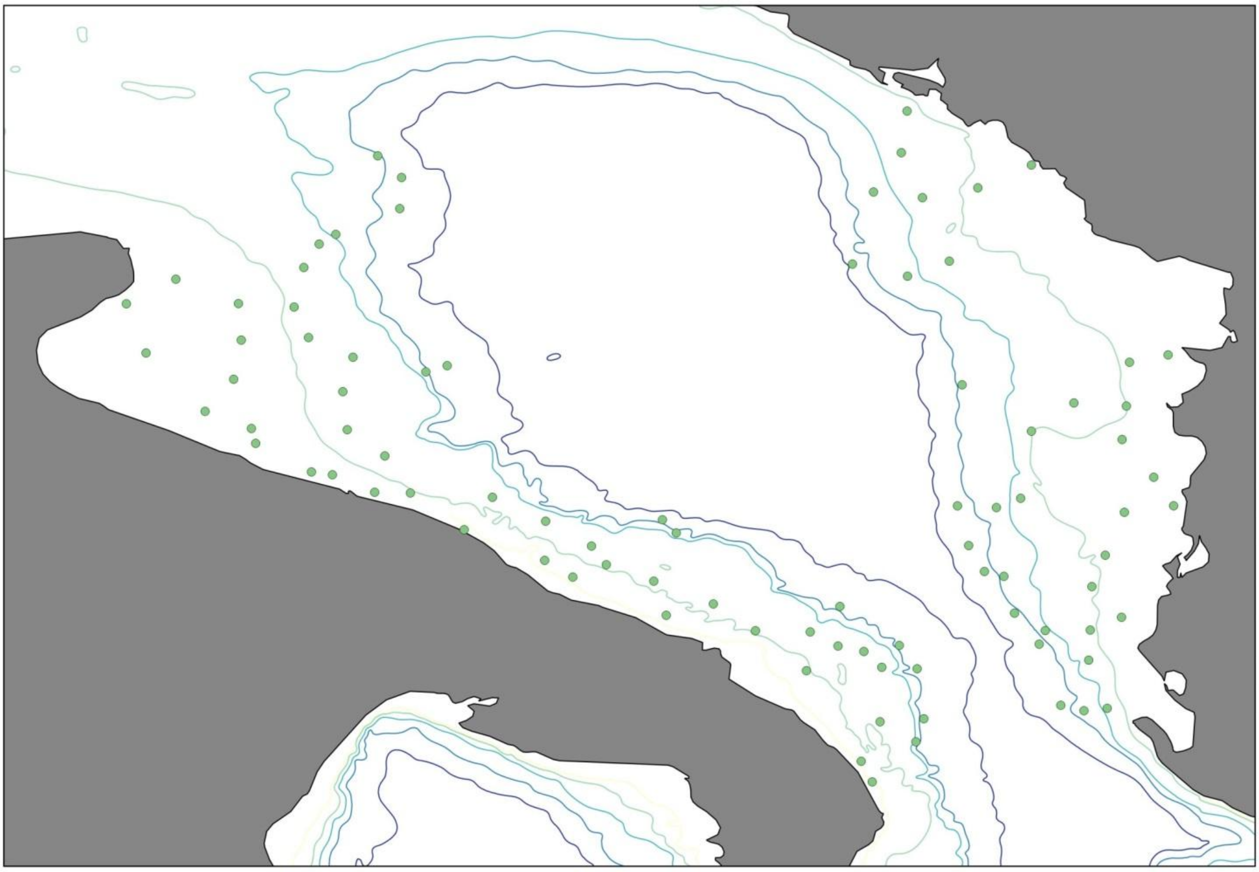


Fig. 18.1 – Hauls position in GSA18 - 2018

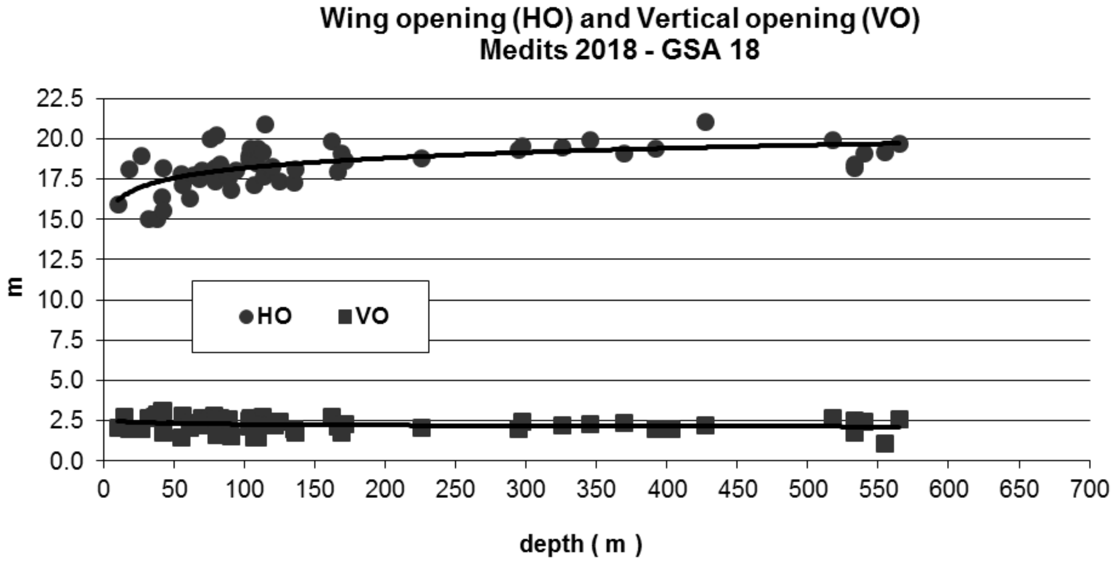


Fig. 18.2 - Wing Opening (HO) and Vertical Opening (VO) in GSA18 - 2018

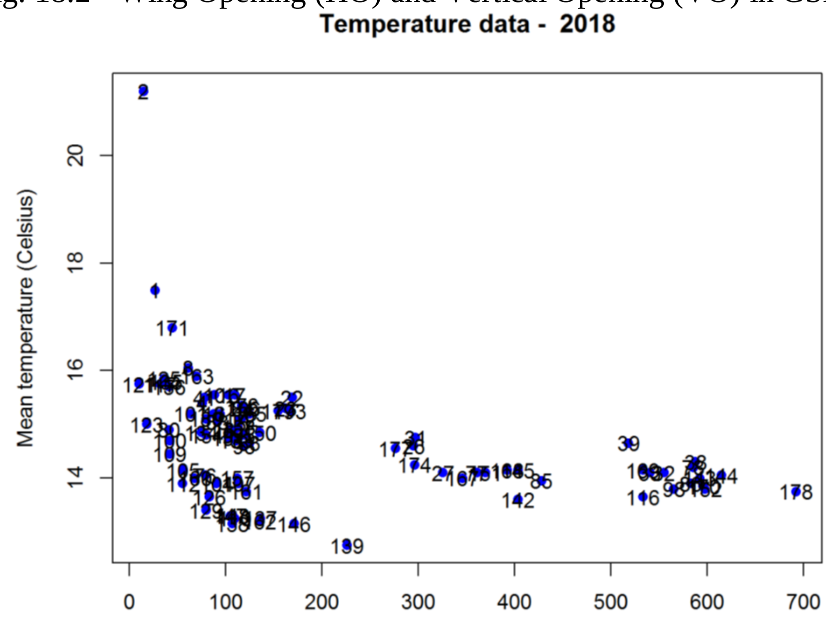
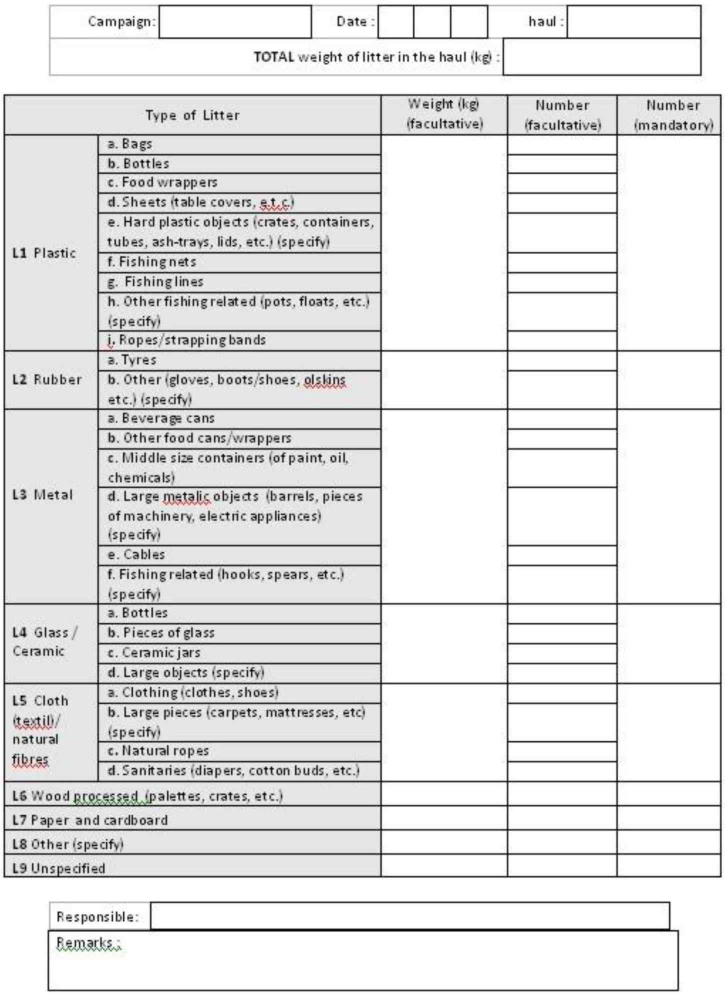


Fig. 18.3 – Bottom temperature GSA18 – 2018



Campaign:		Date :				haul :	
TOTAL weight of litter in the haul (kg) :							

Type of Litter		Weight (kg) (facultative)	Number (facultative)	Number (mandatory)
L1 Plastic	a. Bags			
	b. Bottles			
	c. Food wrappers			
	d. Sheets (table covers, e.t.c)			
	e. Hard plastic objects (crates, containers, tubes, ash-trays, lids, etc.) (specify)			
	f. Fishing nets			
	g. Fishing lines			
	h. Other fishing related (pots, floats, etc.) (specify)			
	i. Ropes/strapping bands			
L2 Rubber	a. Tyres			
	b. Other (gloves, boots/shoes, olskins etc.) (specify)			
L3 Metal	a. Beverage cans			
	b. Other food cans/wrappers			
	c. Middle size containers (of paint, oil, chemicals)			
	d. Large metalic objects (barrels, pieces of machinery, electric appliances) (specify)			
	e. Cables			
	f. Fishing related (hooks, spears, etc.) (specify)			
L4 Glass / Ceramic	a. Bottles			
	b. Pieces of glass			
	c. Ceramic jars			
	d. Large objects (specify)			
L5 Cloth (textil)/ natural fibres	a. Clothing (clothes, shoes)			
	b. Large pieces (carpets, mattresses, etc) (specify)			
	c. Natural ropes			
	d. Sanitaries (diapers, cotton buds, etc.)			
L6 Wood processed (palettes, crates, etc.)				
L7 Paper and cardboard				
L8 Other (specify)				
L9 Unspecified				

Responsible:	
Remarks :	

Fig. 18.4 - Litter protocol used in Medits Survey 2018

Table 18.1 – Sampled individuals for length distributions GSA18, 2018

FAUNISTIC CATEGORY	SPECIES	Specimens measured	Specimens caught	Percentage (%)
Bony fish	ASPI CUC	1390	1390	100%
	BOOP BOO	211	211	100%
	CITH MAC	66	66	100%
	DIPL ANN	90	90	100%
	DIPL VUL	3	3	100%
	ENGR ENC	16394	41119	40%
	EUTR GUR	35	35	100%
	HELI DAC	1022	1022	100%
	LEPM BOS	129	129	100%
	LOPH BUD	127	127	100%
	LOPH PIS	5	5	100%
	MERL MER	2482	2692	92%
	MICM POU	365	365	100%
	MULL BAR	9854	10987	90%
	MULL SUR	55	55	100%

	PAGE ACA	437	437	100%
	PAGE BOG	217	217	100%
	PAGE ERY	587	587	100%
	PHYI BLE	481	481	100%
	SARD PIL	9618	18836	51%
	SCOM PNE	726	726	100%
	SCOM SCO	220	220	100%
	SOLE VUL	2	2	100%
	SPIC FLE	2730	4200	65%
	SPIC SMA	343	343	100%
	TRAC MED	3032	3165	96%
	TRAC TRA	3787	3907	97%
	TRIG LUC	32	32	100%
	TRIP LAS	20	20	100%
	TRIS CAP	299	299	100%
	ZEUS FAB	35	35	100%
Elasmobranchs	CHIM MON	25	25	100%
	ETMO SPI	178	178	100%
	GALU MEL	518	518	100%
	MUST MUS	4	4	100%
	RAJA AST	12	12	100%
	RAJA CIR	2	2	100%
	RAJA CLA	46	46	100%
	RAJA MIR	40	40	100%
	RAJA OXY	2	2	100%
	RAJA POL	1	1	100%
	SCYM LIC	1	1	100%
	SCYO CAN	236	236	100%
	SCYO STE	5	5	100%
	SQUA BLA	16	16	100%
	TORP MAR	2	2	100%
	TORP TOR	1	1	100%
Crustaceans	ARIS FOL	837	837	100%
	ARIT ANT	1064	1064	100%
	NEPR NOR	87	87	100%
	PALI ELE	2	2	100%
	PAPE LON	14823	15470	96%
	PENA KER	1	1	100%
	SQUI MAN	140	140	100%
Cephalopods	ELED CIR	249	249	100%
	ELED MOS	34	34	100%
	ILLE COI	7012	8482	83%
	LOLI VUL	1185	1435	83%
	OCTO VUL	116	116	100%
	SEPI OFF	4	4	100%
	TODA SAG	23	23	100%

Table 18.2 – Number of specimens for sex and maturity GSA18, 2018

FAUNISTIC CATEGORY	SPECIES	N. of specimens for sex and maturity	Percentage (%)
Elasmobranchs	CHIM MON	25	100%
	ETMO SPI	178	100%
	GALU MEL	518	100%
	MUST MUS	4	100%
	RAJA AST	12	100%
	RAJA CIR	2	100%
	RAJA CLA	46	100%
	RAJA MIR*	40	100%
	RAJA OXY	2	100%
	RAJA POL	1	100%
	SCYM LIC	1	100%
	SCYO CAN	236	100%
	SCYO STE	5	100%
	SQUA BLA	16	100%
	TORP MAR	2	100%
	TORP TOR	1	100%
Bony fish	LOPH BUD	123	97%
	LOPH PIS	5	100%
	MERL MER	1097	44%
	MULL BAR	2182	22%
	MULL SUR	55	100%
	PAGE BOG	9	4%
	PAGE ERY	151	26%
	ZEUS FAB	13	37%
Crustaceans	ARIS FOL	823	98%
	ARIT ANT	1064	100%
	NEPR NOR	87	100%
	PALI ELE*	2	100%
	PAPE LON	13263	89%
	PENA KER	1	100%
	SQUI MAN*	138	99%
Cephalopods	ELED CIR	249	100%
	ELED MOS	34	100%
	ILLE COI	1853	26%
	LOLI VUL	48	4%
	OCTO VUL	116	100%
	SEPI OFF	3	75%
	TODA SAG	23	100%

*=in these species the number of specimens for sex not corresponds at that for maturity

2. Focus on historical trends

Crustaceans 1994-2018, GSA18

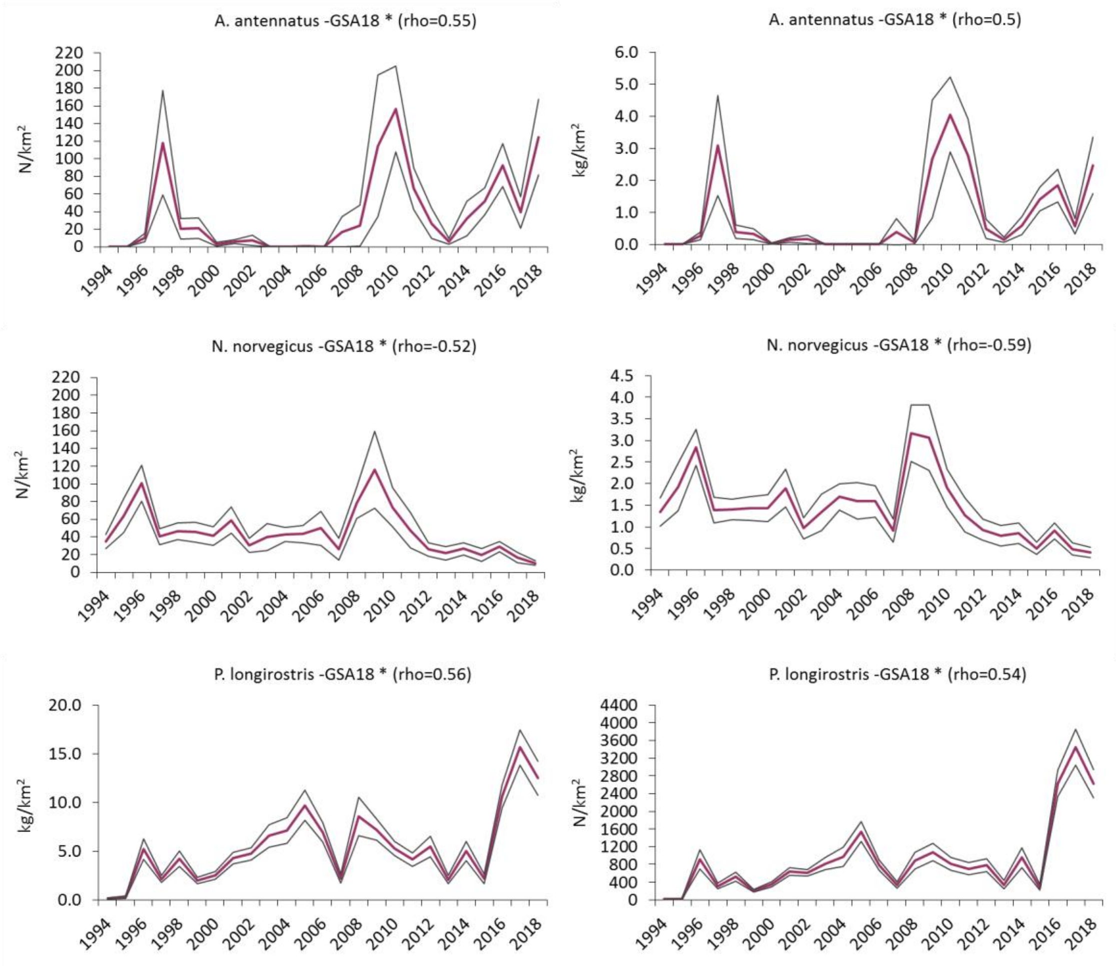


Fig. 18.5. Historical trends of abundance and biomass of target species of crustaceans

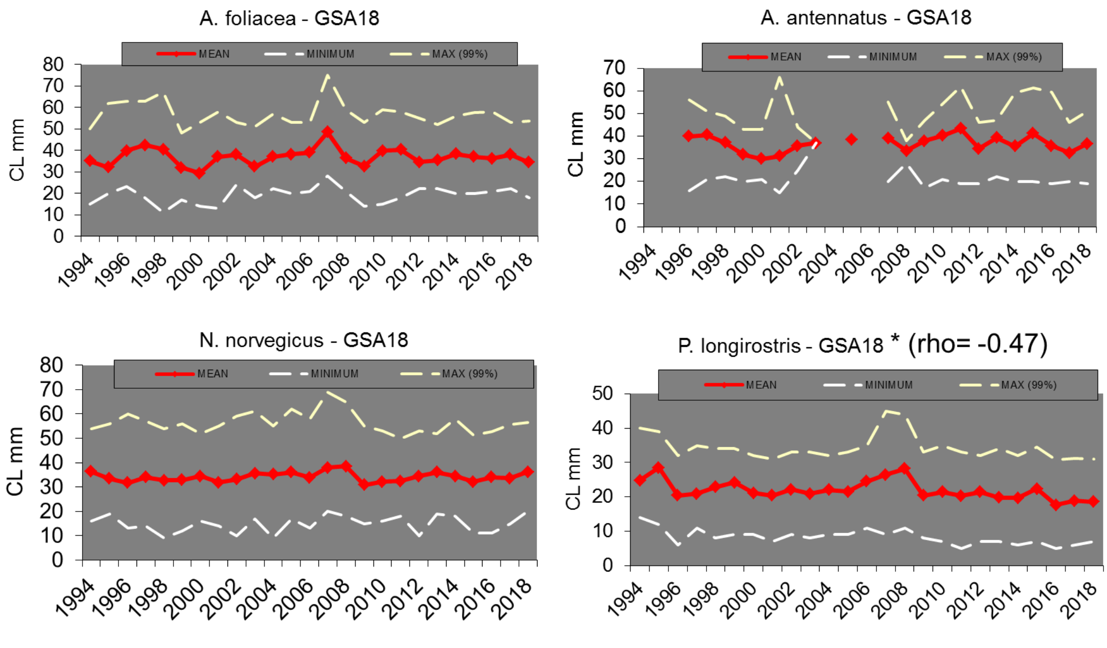


Fig. 18.6. Historical trends of length of target species of crustaceans

Bony fish 1994-2018, GSA18

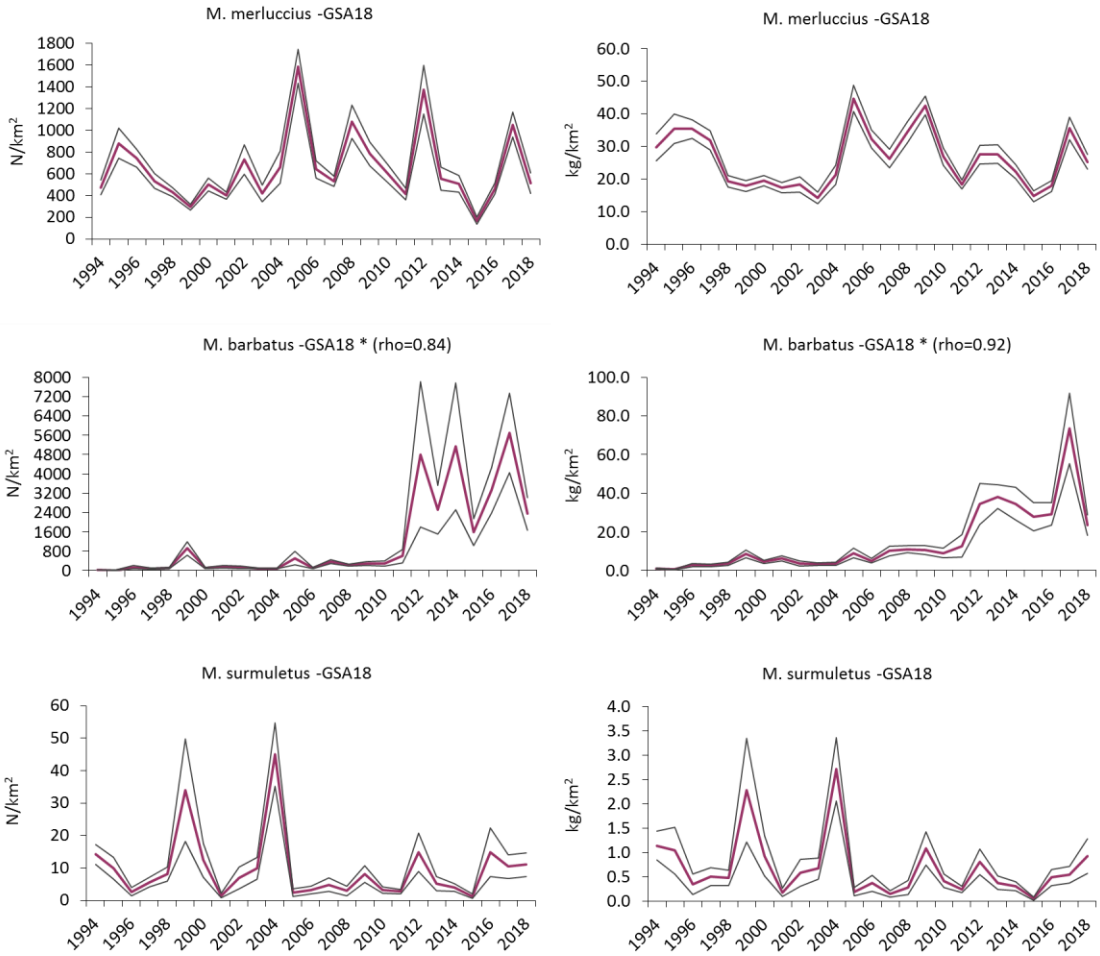


Fig. 18.7. Historical trends of abundance and biomass of target species of bony fish

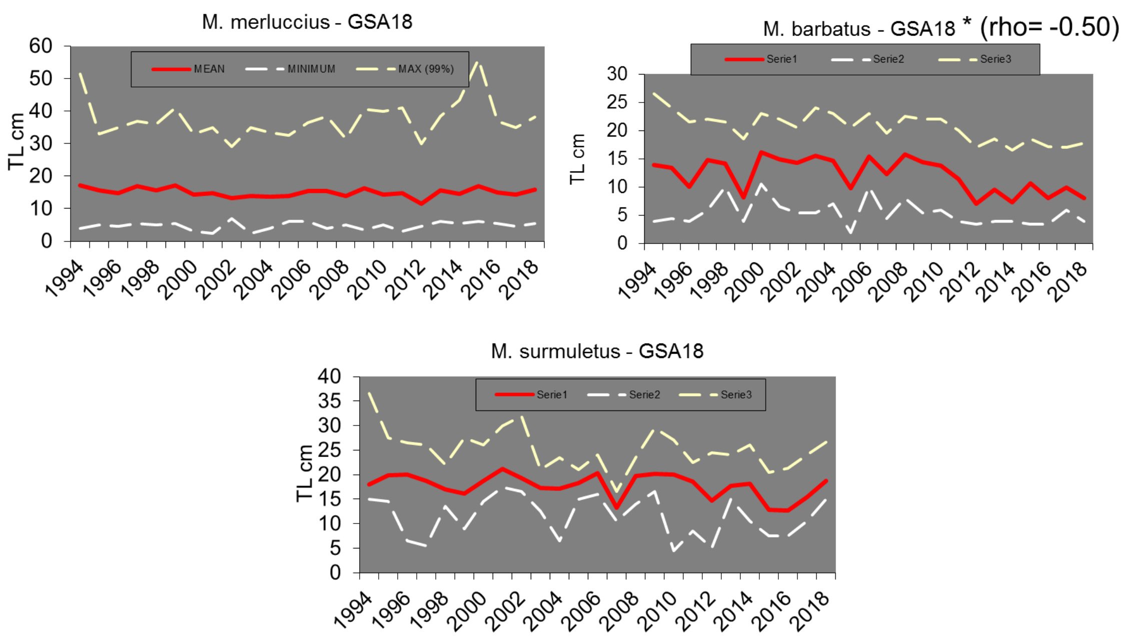


Fig. 18.8. Historical trends length of target species of bony fish

Cephalopods 1994-2018, GSA18

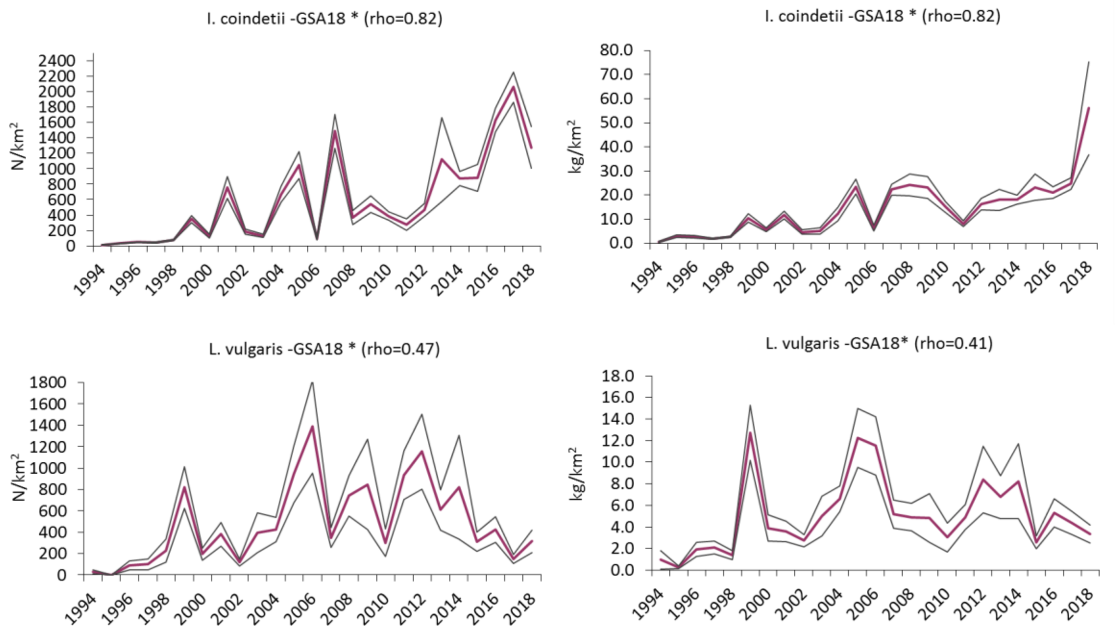


Fig. 18.9. Historical trends of abundance and biomass of target species of cephalopods

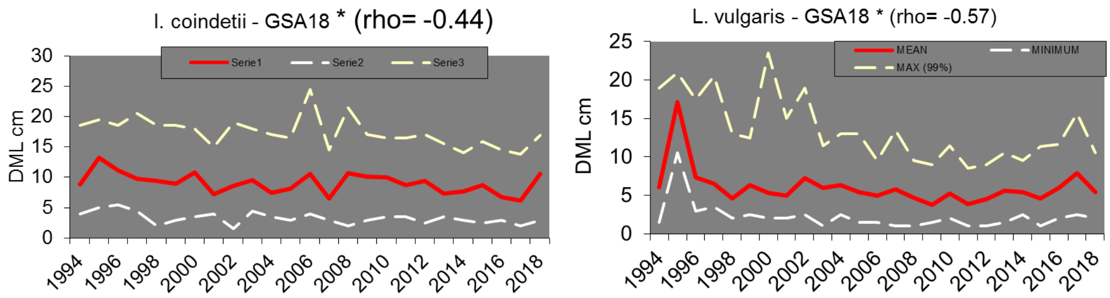


Fig. 18.10. Historical trends of length of target species of cephalopods

Total catches 1994-2018, GSA18

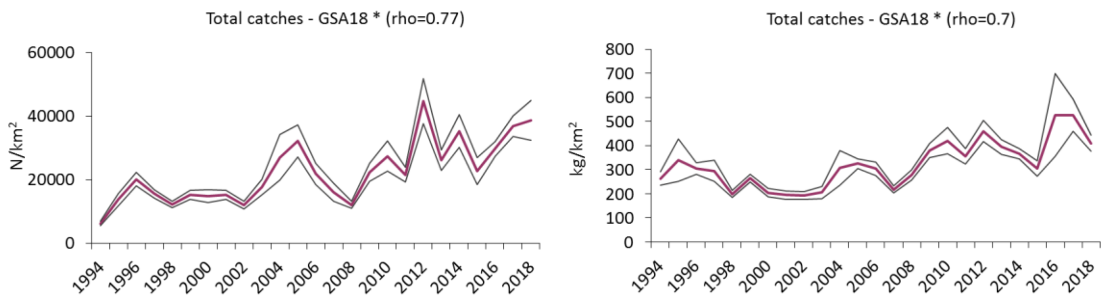


Fig. 18.11. Historical trends of abundance and biomass of total catches

Table 18.3. Spearman rho for the main species – Medits 2018 GSA18

	N/km^2	kg/km^2	Mean length
A. antennatus	**0.55**	**0.50**	0.03
A. foliacea	**0.56**	**0.56**	0.001

I. coindetii	**0.82**	**0.82**	-0.39
L. vulgaris	**0.47**	**0.41**	-0.37
M. barbatus	**0.84**	**0.92**	**-0.50**
M. merluccius	0.05	-0.07	-0.16
M. surmuletus	-0.06	-0.27	-0.34
N. norvegicus	**-0.52**	**-0.59**	0.14
P. longirostris	**0.56**	**0.54**	**-0.56**
Total catches	**0.77**	**0.70**	

3. <u>Planning for the next survey</u>

The next surveys is planned in July 2019.

Mediterranean International bottom Trawl Survey (MEDITS)

Greek Surveys 2018

Panagiota Peristeraki presented summary information for the 2018 Greek MEDITS Survey. The Greek MEDITS surveys in 2018 were accomplished in the GSAs 20, 22, 23 which cover the areas of E. Ionian, Aegean and Cretan Seas, respectively. Three scientific teams were involved in the surveys, two from HCMR and one from FRI.

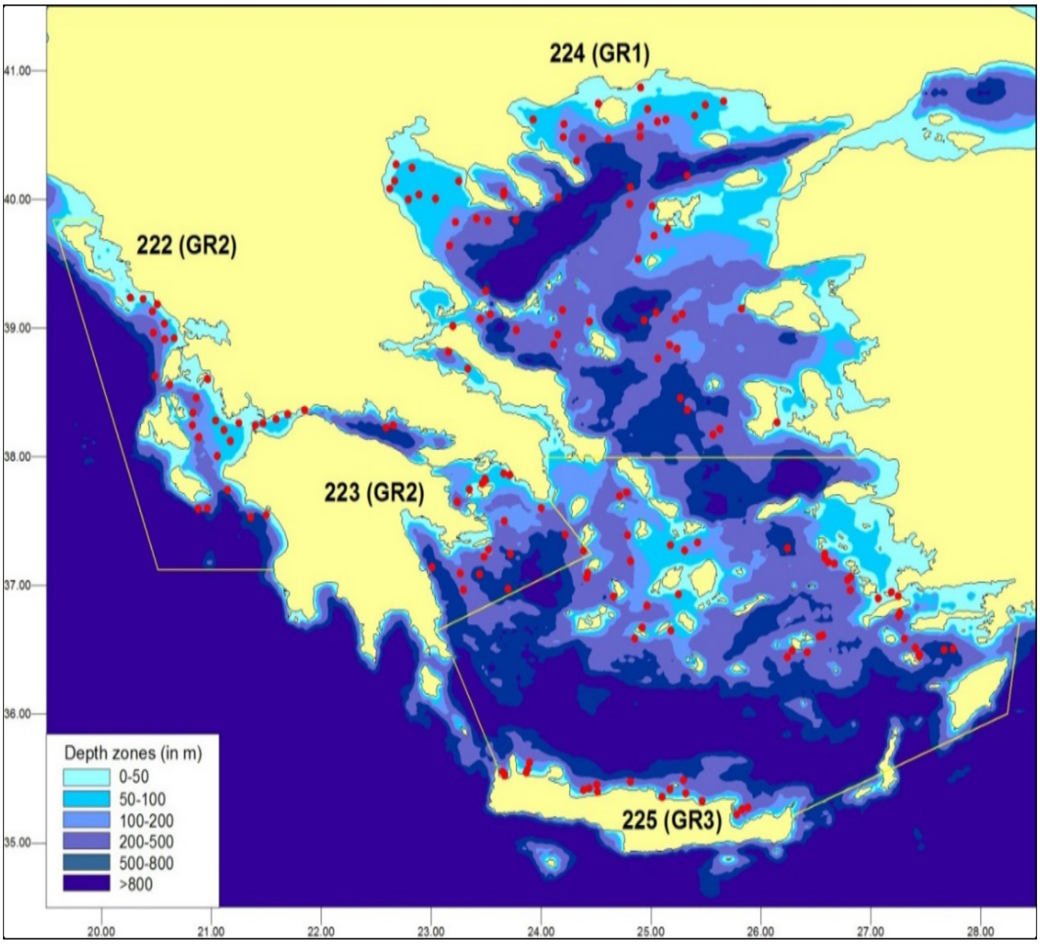


Figure1. MEDITS sampling stations in the Greek Seas

FRI team was responsible for the survey in the N. Aegean Sea (part of GSA 22). The survey was realized from 18/6/2018 to 16/7/2018, with the hired commercial vessel "MEGALOHARI N.Θ. 1031». Sixty five stations were sampled during the survey.

HCMR (Crete) team was responsible for the survey in the S. Aegean Sea (part of GSA 22) and Cretan Sea (GSA 23). In these areas the survey was realized from 22/6/2018 to 25/7/2018, with the hired commercial vessel "NAUTILOS N.X. 154». Sixty one stations were sampled during the surveys.

HCMR (Athens) team was responsible for the survey in the E. Ionian Sea (GSA 20) and Argosaronikos Gulf (part of GSA 22). In these areas the survey was realized from 30/7/2018 to 7/9/2018, with the hired commercial vessel "TAKIS-MIMIS N.X. 411». Fifty one (51) and Twenty eight (28 stations were sampled during the surveys in the eastern Ionian Sea and the Argosaronikos region respectively.

The surveys were accomplished without particular problems and data were collected in accordance with the foreseen design and procedures (Medits_Handbook_2017).

The locations of the sampling stations of the three surveys are presented in Figure 1.

Usefulness of MEDITS data from GSAs 20, 22, 23

MEDITS data from GSAs 20, 22, 23 have been used in 11 European and National scientific projects (MEDISEH, STOCKMED, MODIAS, PROTOMEDEA , MINOUW, SOCIOEC, MARISCA, STRING, MSFD, SOCIOEC) in the last decade and have supported at least 10 PhDs. Scientific teams have used Greek MEDITS data, e.g. GFCM assessment groups, COMEDA e.t.c. Since 2002, around forty five articles in peer reviewed journals, 5 book chapters and 35 publications in congress proceedings, have included such data.

GSA 20

The fishing vessel TAKIS-MIMIS was used, as in the surveys carried out since 2014. The survey in the eastern Ionian Sea (GSA 20), was carried out from 1 to 24 of August. A total of 51 valid hauls were performed, including the 43 hauls made at the same locations as in 2016 and 8 additional hauls at the southern part of the GSA. In most hauls, CTD and Minilog were used for depth, temperature and salinity recording, whereas through a SCANMAR system the trawl net openings were measured. A total of 271 taxa (15 chondrichthyes, 120 osteichthyes, 20 crustaceans, 24 cephalopods,6 bivalves, 9 gastropods, 23 echinoderms, 10 ascidians , 10 cnidarians, 20 porifera and 14 other invertebrates) were identified, counted and weighted. Considering sex and maturity 40 taxa were sampled, including 24 MEDITS G1 species, 14 MEDITS G2 species that are considered under the DCF sampling plan for biological data from commercial fisheries and *Todaropsis eblanae*, for which a further investigation on its size at maturity has been planned, as a decrease in ML50 has been observed from 2008 to 2014). Otoliths from 1223 fish specimens (374 *Merluccius merluccius*, 842 *Mullus barbatus*, 7 *Mullus surmuletus*) were collected. Tissue samples and calibrated pictures of *Centrophorus granulosus* specimens were collected for a study of GenoDREAM (Laboratory of Genetics & Genomics of Marine Resources and Environment, Interdepartmental Research Centre for Environmental Sciences, University of Bologna) aiming to clarify *Centrophorus specimens* taxonomic confusion between the two species *C. granulosus* and *C. uyato* occuring in the Mediterranean Sea. Litter items were collected, weighted and counted by sub-category.

GSA 22

North Aegean

The survey in this area took place from 18/6/2018 to 16/7/2018, totaling 29 sampling days. In this period, the 25 days were operational and the four non-operational due to bad weather conditions. 26 persons in total (scientific personnel and associates) were involved in the sampling procedure which was conducted by the vessel «MEGALOHARI». Samples were collected from 65 out of the 67 scheduled stations. Two stations were missed: #34 due to the expansion of the borders of the National Park of Sporades that included the specific station and #30 due to rough weather. 145 fish species were recorded (120 Osteichthyes and 25 Chondrichthyes), 685 otoliths were collected for the three species: 305 from Merluccius merluccius, 176 from *Mullus surmuletus* and 205 from *Mullus barbatus.* CTD and mini CTD were used for depth/temperature/salinity recording. Measures of the trawl-net used were taken. The rare coral species *Isidella elongate* was found in a specific sampling station, where hundreds of colony fragments are usually collected, proposing to bail out sampling in this station.

S. Aegean

In S. Aegean the survey was realized from 30/6/2018 to 22/7/2018, with the hired commercial vessel "NAUTILOS N.X. 154» and fourty stations were sampled in this area. However two of them resulted invalid due to obstacles, probably recently thrown by ships, or moved by commercial trawlers. A total of 755 otoliths were extracted from three fish species: 343 of *Merluccius merluccius*, 255 of *Mullus barbatus* and 157 of *Mullus surmuletus.*

In the S. Aegean Sea, decrease in the abundance of *Spicara smaris* was observed in 2018 in comparison to recent years (since 2014), while increases of abundance were observed for several species, such *R. clavata, I. coindetii, P. erythrinus, M. meluccius.*

The 2018 MEDITS Survey in the region of Argosaronikos was carried out by the fishing vessel TAKIS-MIMIS from 25/8/2018 to 5/9/2018. In a total of 28 valid hauls were identified 234 taxa (12 chondrichthyes, 105 osteichthyes, 16 crustaceans, 19 cephalopods and 82 other benthic invertebrates). Considering sex and maturity 34 taxa were sampled, including 20 MEDITS G1 species and 14 MEDITS G2 species that are considered under the DCF sampling plan for biological data from commercial fisheries. Otoliths from 884 specimens were collected (185 *Merluccius merluccius*, 286 *Mullus surmuletus*, 413 *Mullus barbatus*). Litter items were collected, weighted and counted by sub-category.

GSA 23

The survey was realized in the Cretan Sea between 22-30/6/2018 and 22-25/7/2018, with the hired commercial vessel "NAUTILOS N.X. 154». Twenty one stations were sampled in the Cretan Sea. One more station was added in the sampling scheme, to cover depths over 700 m, as previously only one sampling station was included in the sampling scheme for the 500-800 m depth zone and this was in depths around 600 m.

A total of 914 otolith was extracted from three fish species: 223 of *Merluccius merluccius*, 508 of *Mullus barbatus* and 183 of *Mullus surmuletus*.

In comparison with previous recent years (since 2014), important reduction in the overall abundance of some species, such *Mullus barbatus, Squallus blainvilei, Boops boops, Pagellus erythrinus* and *Illex coindetii*, were observed in the 2018 survey in GSA 23 (Cretan Sea). In fact, this reduction in the abundance of the aforementioned commercial species has been also observed in commercial fisheries in the Cretan Sea during the 2018-2019 fishing season. However, substantial increase of abundance was observed for other species, such *Raja clavata, Parapenaeus longirostris, Merluccius merluccius* and *Mullus surmuletus*. As the exploitation pattern has not been changed in the area the recent years, these changes may be related to the previous years' high sea temperatures observed in winter time, preventing the mixing of sea-water layers in the area (personal communication). They may be also related to the expansion of alien and invasive species in the shallow areas of Crete, which possibly compete with some of these species.

Demersal Surveys at the Romanian Black Sea Coast

phd. eng Valodia **MAXIMOV** and phd. eng George **TIGANOV**,

Description of the Romanian Fisheries

The Romanian fishing fleet is operating in the area of competence of the Regional Fisheries Management Organisations - G.F.C.M., Area 37 - Mediterranean and Black Sea, Sub-area 37.4., Division 37.4.2, GSA 29. The Romanian fishing area is comprised between Sulina and Vama Veche; the coastline extends for over 240 km, which can be divided into two main geographical and geomorphologic sectors:

♦ the northern sector (about 158 km in length) lies between the secondary delta of the Chilia branch and Constanta, and is constituted of alluvial sediments;

♦ the southern sector (about 85 km in length) lies between Constanta and Vama Veche and is characterised by promontories with active, high cliffs, separated by large zones with accumulative beaches often protecting littoral lakes.

In the coastal zone of the Romanian marine sector with small depth, fishing with fixed gear is characterized by the concentration of activity mainly in the first six-seven months of the season (March-September), when usually the species migrates to the coastal area for reproduction and other species migrate for feeding. In generally, total fishing season being of about eight months. The capture level and the level of fishing productivity differs from one year to another, depending on the fishing effort (number of pound nets and effective fishing days), and also depends on the evolution of hydro climatic conditions and at last but not least, the state of fish stocks. The structure of species in the catches mirrored only partly the composition of Black Sea ichtyofauna from the Romanian sector, because of the type of gear used, hydroclimatic conditions and the ratio between the different fish species. As a general rule, the pelagic species, small-sized and short life cicle keep continue to be dominant in catches.

Offing fishing

- 4 trawlers (> 24 m), equipped with installations for demersal fishing
- 18 trawlers (12-18 m)
- 60 beam trawls
- 2,010 turbot gillnets
- 104 professional staff members

Coastal fishing

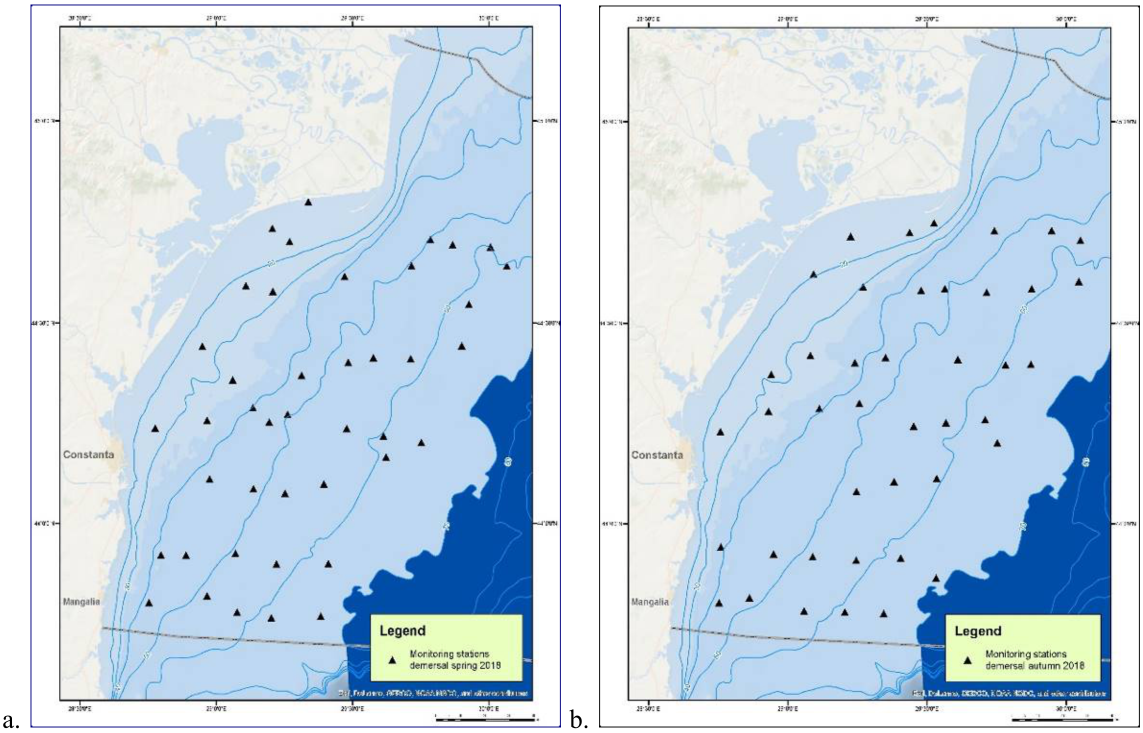
- 12 fishing points
- 103 boats
- 28 trap nets
- 1,366 turbot gillnets
- 871 others gill nets
- 3 beach seines
- 300 professional and 547 amateur fishermen

Efort of the turbot fishing

Gear	No. vessels	Landings (kg)	No. gillnets	Days fishing	CPUE / gear	CPUE / day
LOA => 0 < 6	1	1,874	60	6	31.233 kg	312.333 kg
LOA => 6 < 12	28	33,457	1,266	182	26.427 kg	183.830 kg
LOA => 12 < 18	10	21,447	1,890	69	11.348 kg	310.826 kg
LOA => 18 < 24	0	0	0	0	0.000	0.000
LOA => 24 < 40	1	738	120	3	6.150 kg	246.000 kg
TOTAL	40	57,516	3336	260	17.241 kg	221.215 kg

Demersal survey 2018:

♦ *period*: 17–26 may 2018 and 17 octomber - 02 november 2018 (Fig. 1).



a. b.

Fig. 1 The distribution points trawling in spring (a) and autumn (b) season, in the Romanian area

♦ *type of fishing vessel*: B-410 (***STEAUA DE MARE 1***);

♦ *methodology*: evaluation of part of the stock of turbot and other demersal species (agglomerations fishing) was made by the method holistic trawl survey (method surface), that can be applied to restricted areas, without regard of the distribution of the entire stock and used as parameters: vessel speed, and the horizontal opening of the trawl during trawling;

♦ *characteristics*: demersal trawls: 22/27-34 m; horizontal trawl opening - 13 m; vertical trawl opening - 2 m; no trawls: 81; drepth: 13.3-80.5 m; trawl speed: 1.7–2.2 knots; time trawling: 60 min; catch: 10 - 580 kg.

In demersal fishing conducted with pelagic trawl in the Romanian Black Sea waters, other complementary fish species beside sprat have occurred (the total number of identified species was 18): turbot (*Psetta maxima maeotica*); whiting (*Merlangius merlangus ponticus* N.); picked dogfish (*Squalus acanthias* L.); red mullet (*Mullus barbatus ponticus*); common sole (*Solea vulgaris Q.*); European flounder (*Platichthys flesus*); thornback ray (*Raja clavata* L.); stingray (*Dasyatis pastinaca* L.); knout goby (*Mesogobius batrachocephalus* L.); sprat (*Sprattus sprattus*); shore rockling (*Gaidropsarus mediterraneus* L); rapa whelk (*Rapana venosa*); common shrimp (*Cragon crangon L.*); other species.

Estimated total biomass:

a. ***Psetta maxima maeotica*** (turbot):

Spring - In the 42 sample trawlings made with the demersal trawl, on a surface of 2762.5 Nm^2, the average values of the catches were of about 0.259 - 0.446 t/Nm^2. The maximum value was recorded in the Sf. Gheorghe - Constanta (30-50 and 50-70 m) and Eforie - Mangalia (30-70 m) sectors (Fig. 2a). The estimated biomass for turbot crowds, in the research a area, was of about **2,090** tons.

Assessment of turbot agglomerations (tons), in May 2018, in the Romanian area

Depth range (m)	***0 - 30 m***	***30 - 50 m***	***50 - 70 m***	***Total***
Investigated area (Nm^2)	**575**	**1000**	**1187.5**	**2762.5**
Variation of the catches (t/ Nm^2)	0-1.117	0-1.568	0-1.367	0-1.568
Average catch (t/ Nm^2)	0.259	0.431	0.446	0.419

Biomass of the fishing agglomerations (t)	149	431	529	1158
Biomass extrapolated for the Romanian shelf (t)				**2,090**

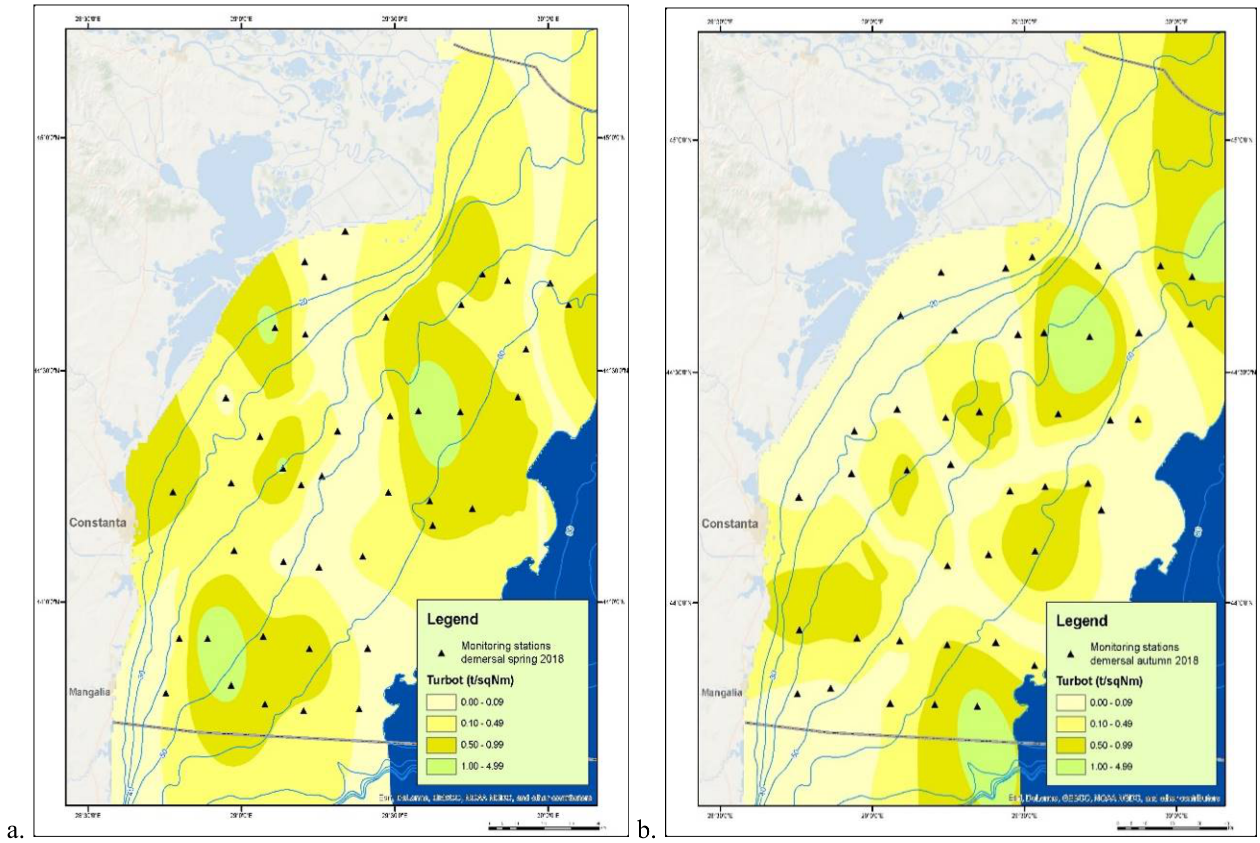


Fig. 2 The distribution of the turbot agglomerations in spring (a) and autumn (b), in the Romanian area

Structure of biomass and abundance by length distribution (Fig. 3)

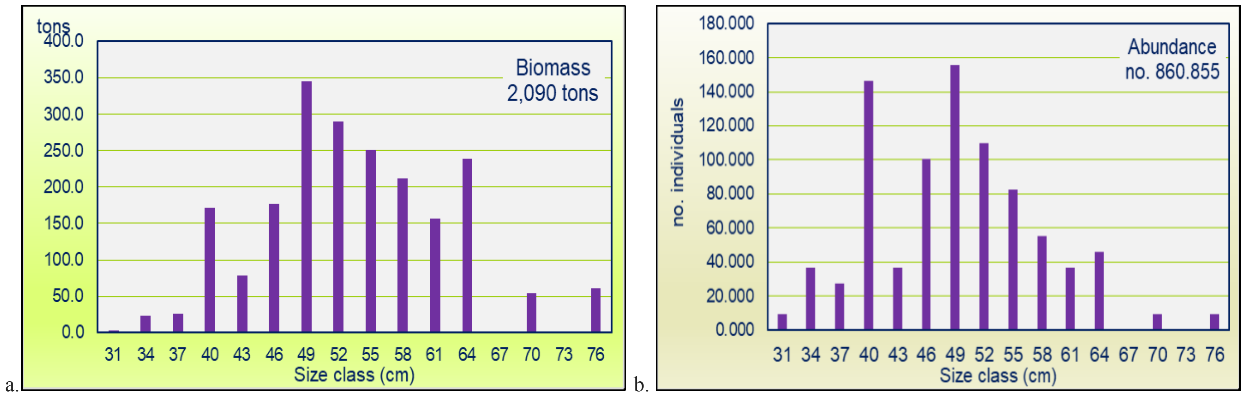


Fig. 3 Structure by lengths of biomass (a) and abundance (b) of turbot during spring survey

by age distribution (Fig. 4)

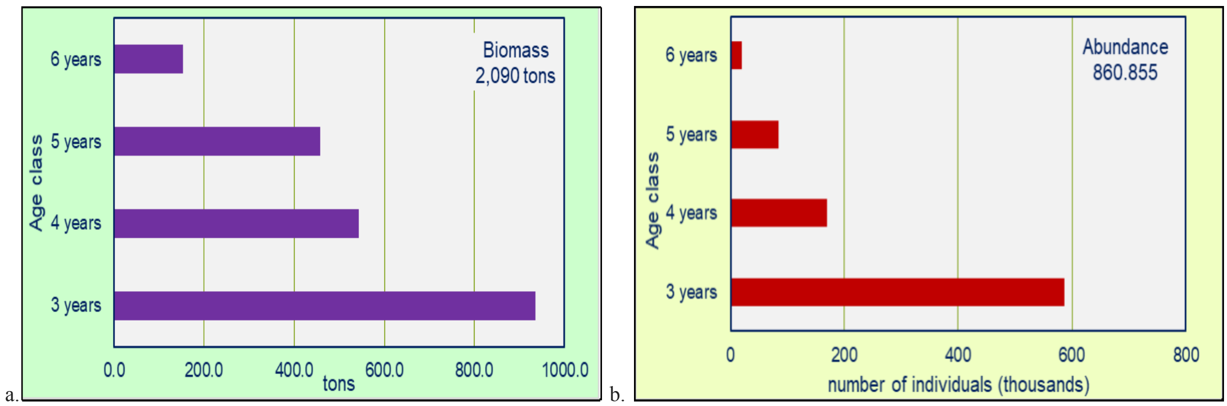


Fig. 4 Structure by ages of biomass (a) and abundance (b) of turbot during spring survey

The analysis of the structure by lengths and weights of turbot shoals during the survey highlighted the presence of mature specimens and a high homogeneity of fish shoals. The lengths of turbot individuals were within the limits of classes of length 31.0 - 76.0 cm / 400.0 – 6,700 g. The dominant classes were 40.0 - 55.0 cm / 1,168.1 – 3,038.9 g (Fig. 5). Males were dominant – 50.0 %, compared to females (42.71 %) and juveniles (7.3%). The average body length was 50.38 cm and the average weight 2,377.24 g.

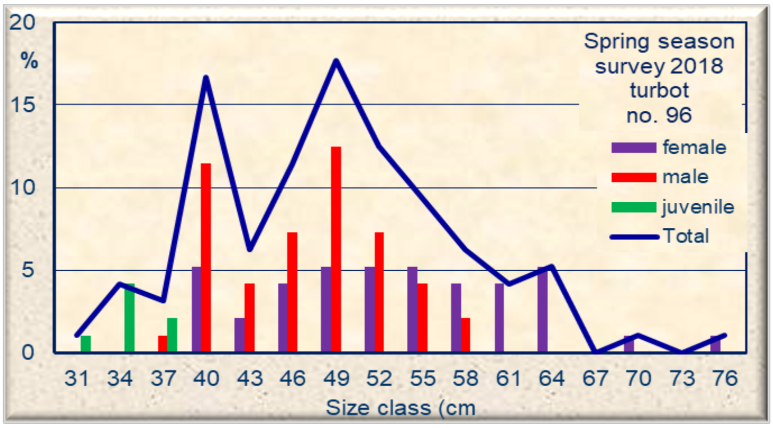


Fig. 5 Structure by lengths of turbot, during the spring survey

The age composition of turbot catches indicates the presence of individuals from 3 to 6 years old. Most of the individuals caught are 3 year old (44.79% of all specimens analyzed), followed closely by those 4 years old (26.09 %), 5 years old (21.88 %) and 6 years (7.29%)(Fig. 6).

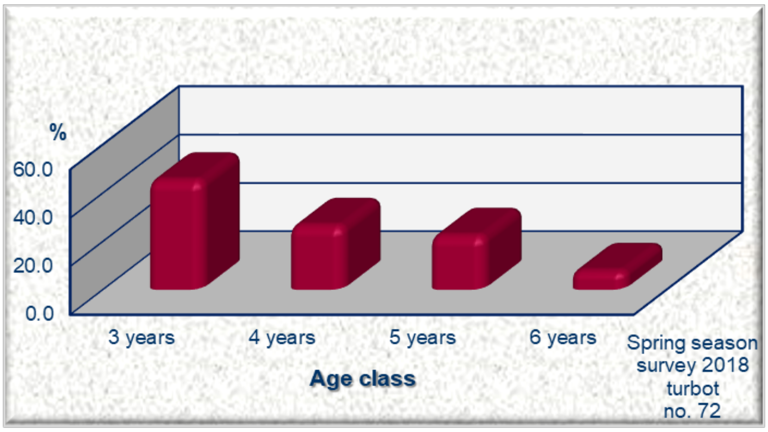


Fig. 6 Structure by age composition of turbot, during the spring survey

Autumn - In the 40 sample trawlings made with the demersal trawl, on a surface of 2962.5 Nm^2, the average values of the catches were of about 0.081 - 0.508 t / Nm^2. The maximum value was ecorded in the Sf. Gheorghe - Periboina sector (30 - 50 m) (0.508 t/N m^2)(Fig. 2b). The estimated biomass for turbot crowds, in the research a area, was of about 1,991 tons.

Assessment of turbot agglomerations (tons), in Octomber/November 2018

Depth range (m)	***0 – 30 m***	***30 – 50 m***	***50 - 70 m***	***Total***
Investigated area (Nm^2)	**612.5**	**1125**	**1225**	**2962.5**
Variation of the catches (t/ Nm^2)	0-0.333	0-0.843	0-2.079	0-2.079
Average catch (t/ Nm^2)	0.081	0.340	0.508	0.398
Biomass of the fishing agglomerations (t)	50	383	623	488
Biomass extrapolated for the Romanian shelf (t)				**1,991.0**

Structure of biomass and abundance

by length distribution (Fig. 7)

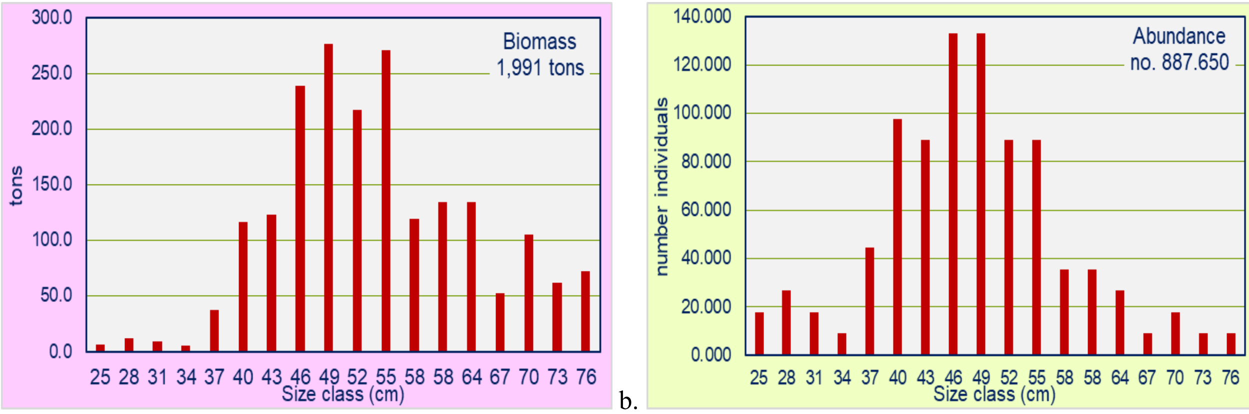


Fig. 7 Structure by lengths of biomass (a) and abundance (b) of turbot during autumn survey

by age distribution (Fig. 8)

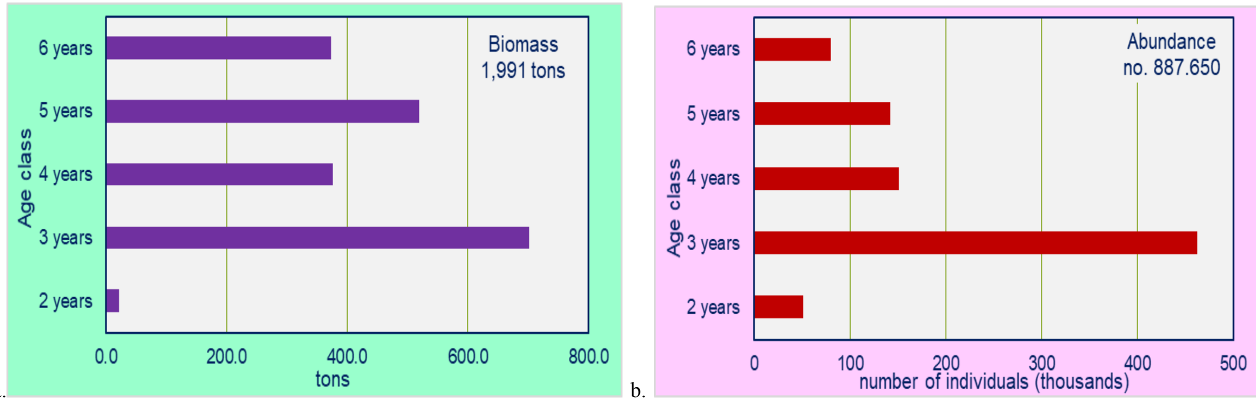


Fig. 8 Structure by ages of biomass (a) and abundance (b) of turbot during autumn survey

The lengths of turbot individuals were within the limits of classes of length 25.0 - 76.0 cm / 350.0 – 8,100 g. The dominant classes were 40.0 - 55.0 cm / 1,190.9 - 3,050 g (Fig. 9). Males were dominant – 50.0 %, compared to females (35.0 %) and juvenil (15.0 %). The average body length was 49.54 cm and the average weight 2,243.0 g.

Age composition of turbot catches indicates the presence of individuals from 2 to 6 years old. Most of the individuals caught are 3 year old (44.79% of all specimens analyzed) and 4 years old (26.04%), followed closely by those 5 years old (21.88%) and 6 years old (7.29 %) (Fig. 10).

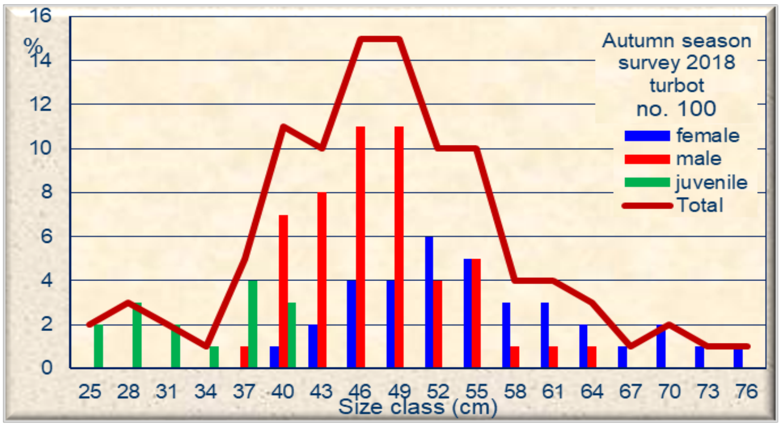


Fig. 9 Structure by lengths of turbot, during the autumn survey

b. ***Merlangius merlangus*** (whiting):

Spring - sweeping area procedures were conducted on an area of 2762.5 Nm^2. The average values of 0.008 - 1.067 t / Nm^2 revealed that whiting had a flat distribution in large area between Cape Midia - Costinesti (0.407 t / Nm^2 / depth 30-50 m, and 1.067 t/Nm^2 / depth 50-70 m respectively)

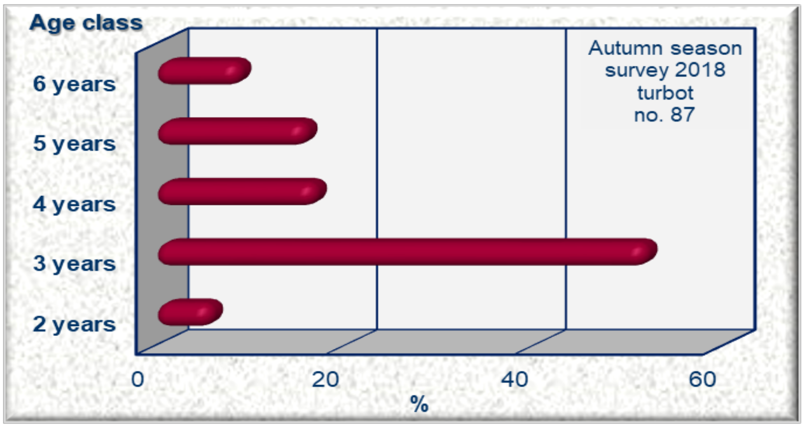


Fig. 10 Structure by age composition of turbot, during the autumn survey

and Mangalia - 2 May sector (30-70 m)(Fig. 11). The estimated biomass for the Romanian shelf was about 3,606 tons.

Assessment of whiting agglomerations (tons), in May 2018, in the Romanian area

Depth range (m)	***0 – 30 m***	***30 – 50 m***	***50 - 70 m***	***Total***
Investigated area (Nm^2)	**575**	**1000**	**1187.5**	**2762.5**
Variation of the catches (t/Nm^2)	0-0.04	0-2.376	0-3.960	0-3.96
Average catch (t/ Nm^2)	0.008	0.407	1.067	0.721
Biomass of the fishing agglomerations (t)	5	407	1268	1992
Biomass extrapolated for the Romanian shelf (t)				**3,606**

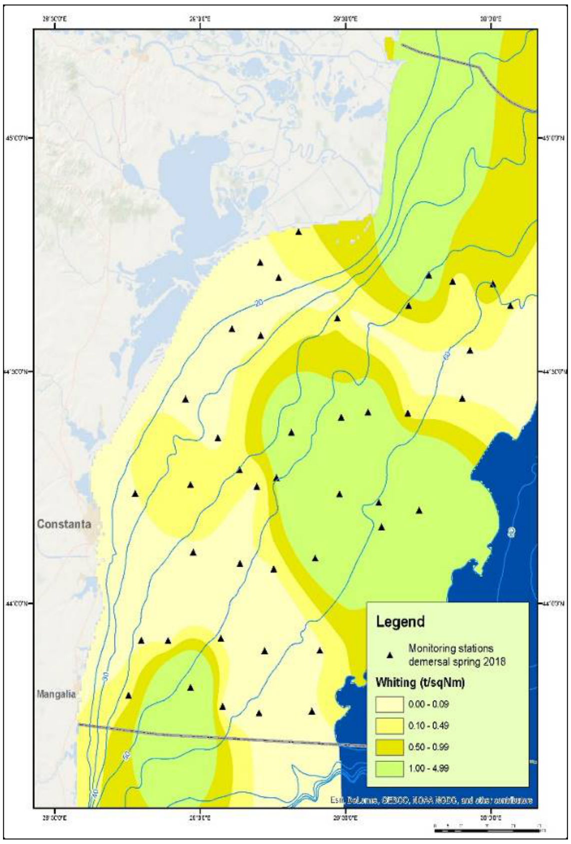


Fig. 11 The distribution of the whiting agglomerations in spring, in Romanian area

The analysis of structure by lengths and weights of whiting caught during the survey showed that the lengths of whiting individuals are within the limits of classes of length 80.0-180.0 mm / 5.72 – 40.03 g. The dominant classes are those of 90.0-140.0 mm / 6,59 - 19.15 g (Fig. 12). Females were dominant – 62.28%, compated to males (36.72 %). The verage body length was 122.2 mm and the average weight 13.55 g.

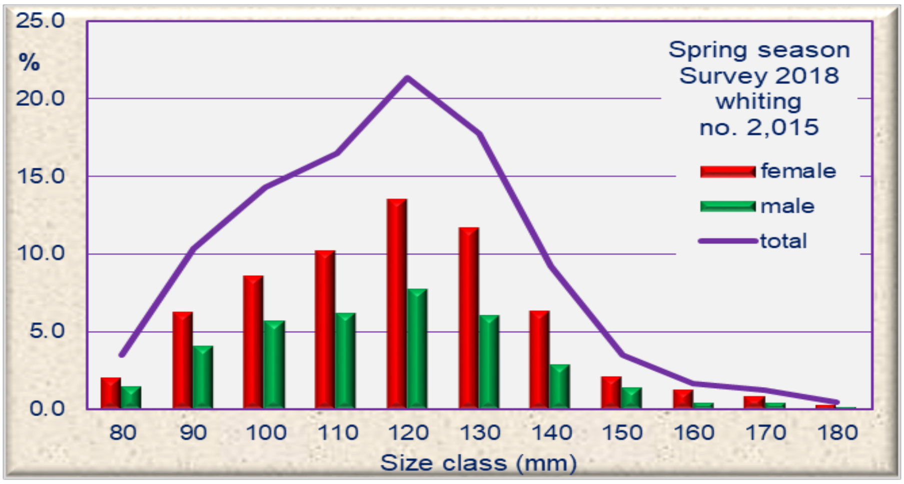


Fig. 12 Structure by lengths of whiting, during the spring survey

Age composition of withing catches indicates the presence of individuals from 1 to 5 years old. Most of the individuals caught are 2 years old (38.11% of all specimens analyzed) and 1 year (27.29%), followed by those 3 years old (24.11%), 4 years old (6.9%) and 5 years (3.5%)(Fig. 13).

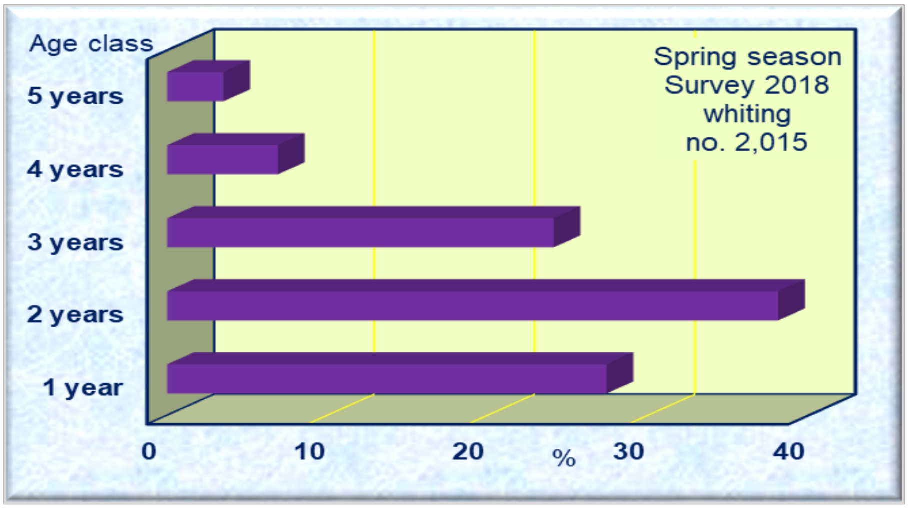


Fig. 13 Structure by age composition of whiting, during the autumn survey

c. ***Squalus achanthias*** (piked dogfish)

Spring - in the 42 sample trawlings made with the pelagic trawl, on a surface of 2762.5 Nm², the average values of the catches were of about 0.209 - 0.624 t/Nm². The maximum value was recorded in the Cape Tuzla - Cape Mangalia sector (0.624 t/Nm² / 50-70 m)(Fig. 14a). The estimated biomass in the research area was of about **2,065** tons.

Assessment of piked dogfish agglomerations (tons), in May 2018, Romanian area

Depth range (m)	*0 – 30 m*	*30 – 50 m*	*50 - 70 m*	*Total*
Investigated area (Nm^2)	475	950	800	2225
Variation of the catches (t/ Nm^2)	0-0.704	0-1.597	0-0.727	0-1.597
Average catch (t/ Nm^2)	0.170	0.259	0.126	0.186
Biomass of the fishing agglomerations (t)	80.848	246.319	101.151	413.951
Biomass extrapolated for the Romanian shelf (t)				930.239

The lengths of piked dogfish individuals were within the limits of classes of length 84.0 -123 cm / 2,043 – 7,394 g. The dominant classes were 108.0 - 120.0 cm / 5,500 – 6,658 g (Fig. 15). Only males were identified (100.0%). The average body length was 112.53 cm and the average weight 5,780.6 g.

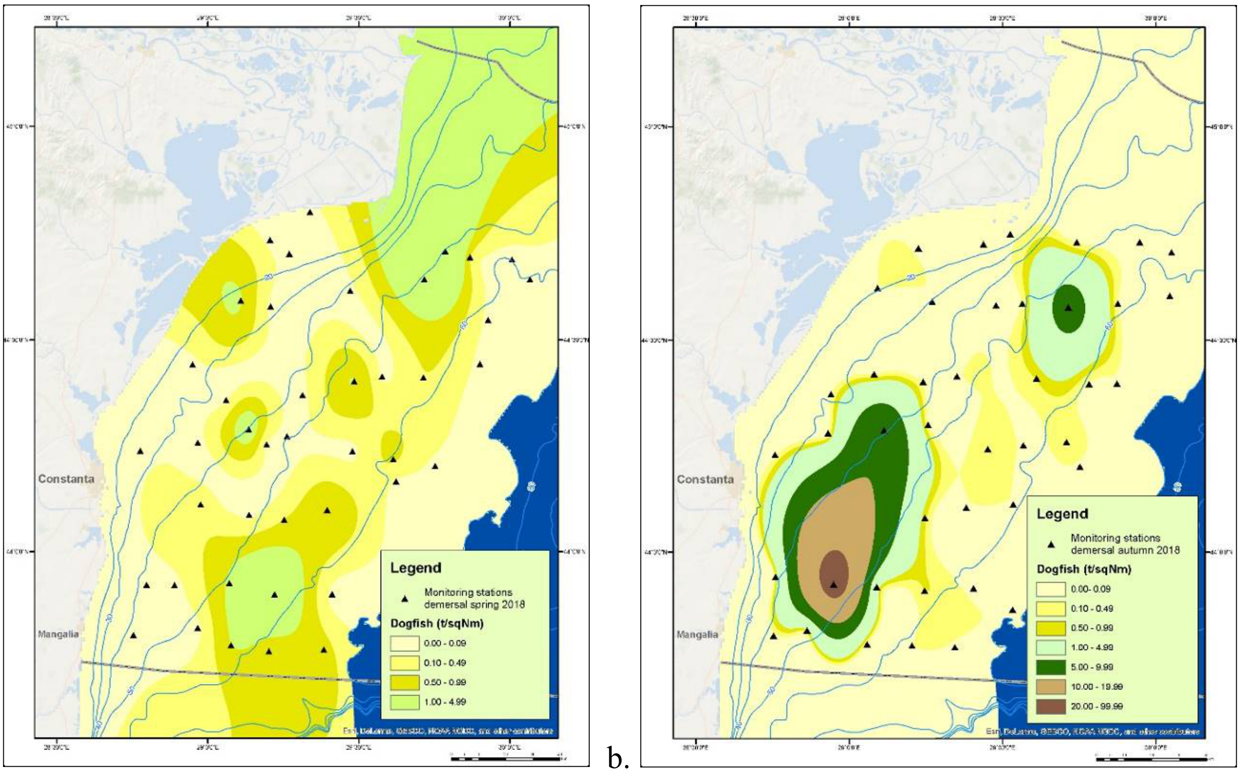
a. b.


Fig. 14 The distribution of the piked dogfish agglomerations in spring (a) and autumn season (b), demersal trawl survey, in Romanian area

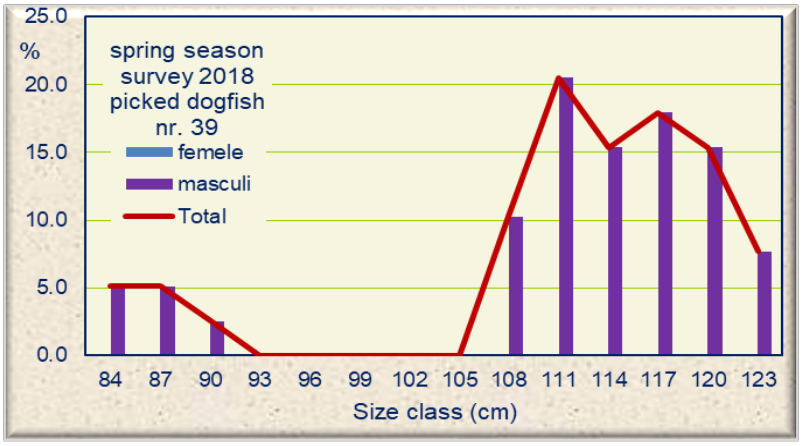


Fig. 15 Structure by lengths of piked dogfish, during the spring survey

Age composition of piked dogfish catches indicates the presence of individuals from 11 to 16 years old. Most of the individuals caught were 15 years old (33.33% of all specimens analyzed) and 14 years old old (30.77%), followed closely by those of 13 years (12.8%), 11 years (12.8%) and 16 years (10.26%)(Fig. 16).

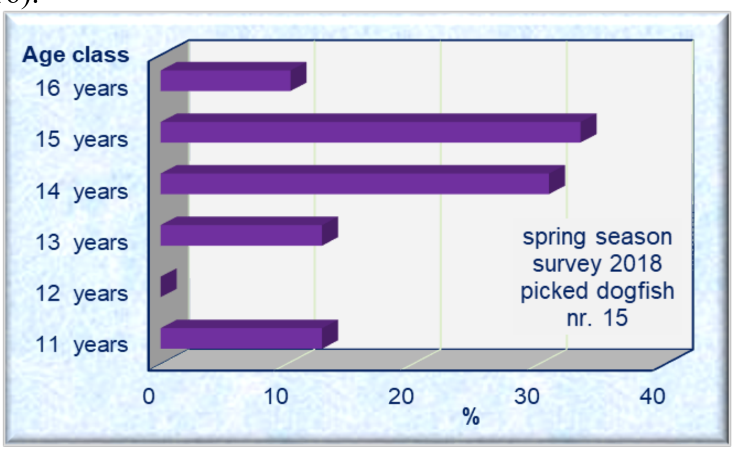


Fig. 16 Structure by age composition of piked dogfish, during spring survey

Autumn - in the 40 sample trawlings made with the pelagic trawl, on a surface of 2,962.5 Nm², the average values of the catches were of about 0.429 - 3.143 t/Nm². The maximum value was recorded in the Chituc - Mangalia sector (3.143 t/Nm² / 30 - 50 m) (Fig. 14 b). The estimated biomass in the research area, was of about **5,556.0 to**.

Assessment of dogfish agglomerations (tons), in October/November 2018, in the Romanian area

Depth range (m)	***0 – 30 m***	***30 – 50 m***	***50 - 70 m***	***Total***
Investigated area (Nm^2)	**612.5**	**1125**	**1225**	**2962.5**
Variation of the catches (t/ Nm^2)	0	0-25.148	0-7.076	0-25.148
Average catch (t/ Nm^2)	0	3.143	0.429	1.111
Biomass of the fishing agglomerations (t)	0	3536	526	1361
Biomass extrapolated for the Romanian shelf (t)				5,556

The lengths of piked dogfish individuals were within the limits of classes of length 108.0-126.0 cm / 5,511,5 – 8,050.0 g. The dominant classes were 111.0 - 120.0 cm / 5,993 – 6,950 g (Fig. 17). Only males were identified (100.0%). The average body length was 117.0 cm and the average weight 6.460 g.

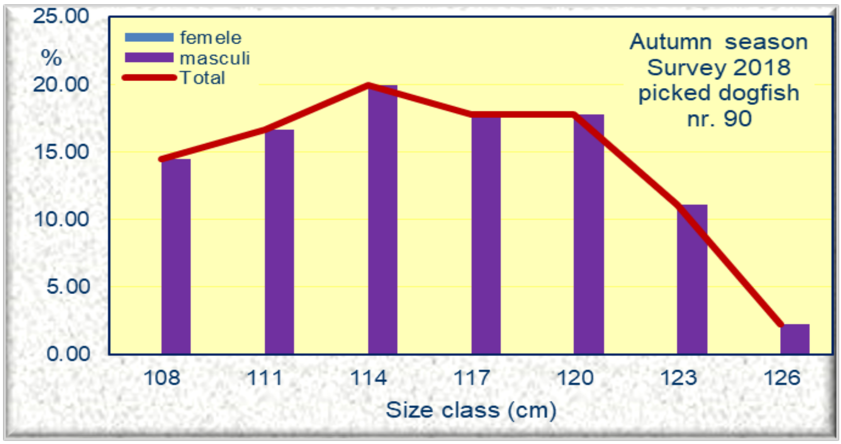


Fig. 17 Structure by lengths of piked dogfish, during the autumn survey

Age composition of piked dogfish catches indicates the presence of individuals from 12 to 17 years old. Most of the individuals caught were 14 years old (33.3%, of all specimens analyzed), 15 years old (33.0%), and 13 years old (15.0%, followed closely by those of 16 years (11.0%) and 12 years (8.0% / Fig. 18).

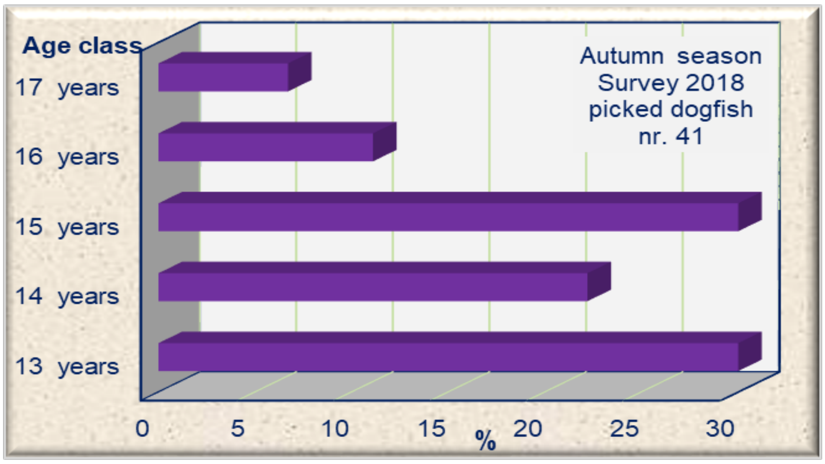


Fig. 18 Structure by age composition of piked dogfish, during autumn survey

The biomass of the main species' agglomerations from the Romanian coast

The swept area method is used for the assessment of the biomass of fishing agglomerations of turbot, whiting and dogfish, based on the statistical processing of productivity data obtained in sampling trawling and industrial trawling. The calculated biomasses by the swept area method for the main species at the Romanian littoral ranged between: turbot (300 tons and 2,356 tons); whiting (5,650 t and 21,000 t) dogfish (1,450 t and 13,051 t), rapa whelk (13,000 - 17,500 t) and gobies (300-500 t)(Fig. 19).

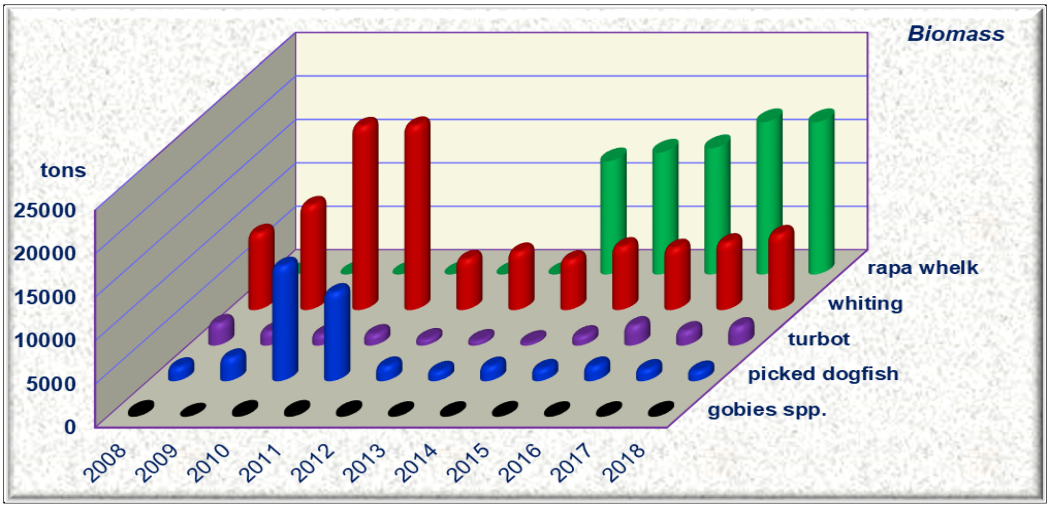


Fig. 19 The biomass of the main species' agglomerations from the Romanian coast

phd. eng Valodia MAXIMOV
phd. eng George TIGANOV

Valentina Lauria

IRBIM Istituto per le Risorse Biologiche e le Biotecnologie Marine – CNR, Mazara del Vallo, Italy

Spatial distribution of VMEs to support fishery management in the Mediterranean Sea

The animal forest includes all benthic organisms that have a three-dimensional structure such as sponges, cnidarians, bryozoans, ascidians. Among these deep-sea corals are key components of marine ecosystems that generate habitats for fish and invertebrate communities and act as marine biodiversity hot spots. Because of their life history traits are highly vulnerable to human impacts such as fishing. They are an indicator of vulnerable marine ecosystems (VMEs), therefore their conservation is essential to preserve marine biodiversity. In the Mediterranean Sea deep-sea coral habitats are associated with commercially important crustaceans, consequently their abundance has dramatically declined because of trawling. Marine spatial planning is required to ensure that the conservation of these habitats is achieved.

Species distribution models were used to investigate the distribution of two critically endangered octocorals (*Funiculina quadrangularis* and *Isidella elongata*) and other benthic species that are indicators of VMEs (i.e. *Pennatula phosphorea*, *Pennatula rubra*, *Pteroeides spinosum* and *Leptometra phalangium*) in the central Mediterranean as a function of environmental and fisheries variables. Results show that all species exhibit species-specific habitat preferences and spatial patterns in response to environmental variables, but the impact of trawling on their distribution differed. In particular, *F. quadrangularis* and *L. phalangium* can overlap with fishing activities, whereas *I. elongata* occurs exclusively where fishing is low or absent. Similarly, the other pennatulacean showed a negative relationship between their probability of abundance and fishing effort. These results evidenced that different management plans are necessary to ensure the conservation of such important habitats at Mediterranean scale.

TOWARDS A STANDARDIZATION OF MEDITS BENTHOS PROCESSING: SOME PROPOSALS FOR A COMMON PROTOCOL

Daniela Massi, Antonino Titone, Cinzia Badalucco, Danilo Scannella, Fabio Falsone, Michele Geraci, Federico Di Maio

Institute of Marine Biological Resources and Biotechnology (IRBIM) National Research Council (CNR), Mazara del Vallo, Italy
daniela.massi@cnr.it

The presentation summarizes experiences gathered, since 2008, in sampling and processing procedures developed at CNR of Mazara del Vallo Laboratory for benthos studies in the Strait of Sicily including MEDITS program. Some critical issues faced during on-board sampling and laboratory processing are also discussed.
According to the general approach of MEDITS survey the organisms are classified at the most detailed taxonomic level possible, the species, and are included into the categories already present in the current MEDITS Protocol.
However since the current MEDITS categories are not enough to describe all benthic items collected during the trawl surveys, new sub-categories are proposed to classify everything that is collected by the gear during the hauls for a future better use of the MEDITS data in the perspective of the Ecosystem Approach to Fishery Management.
Fishes, Cephalopods and target species of Crustaceans are excluded from the analyses.
Main critical issues and the procedures adopted for the collection of the data are reported. In particular, the following cases are described: i) the damaged organisms, lacking large parts of the body, as “Broken non identifiable organisms” and “Broken identifiable organisms”, ii) the organisms with an intact shell but without mollusk as “Empty shells”, iii) the "aggregation" of organisms belonging to different taxa and/or parts of these closely linked as “Separable and identifiable aggregations”, “Identifiable Taxa but not separable” and “Non-identifiable and non-separable calcareous Taxa” (Bioconstruction), iv) the eggs belonging to Elasmobranchs, Gastropods and Cephalopods as “Eggs Capsules” v) the taxa retaining water (as Porifera, Tunicata) and/or sediment (as *Actinauge richardi*) in their tissues and vi) the other kind of debris as “Terrestrial organic debris”, “Inorganic debris” and “Anthropic waste”.
The experiences presented would like to be a contribution to reach agreed procedures for a new version of the MEDITS Manual that takes into account, in an exhaustive way, all those benthic components collected during the trawl surveys not yet considered.

BENTHOS QUESTIONNAIRE

GSA (insert GSA number)	Do you collect Benthos data? (Y/N)	Since when? (mention the starting year or put "infrequently" in case of scattered collection)	Over all survey hauls? (Y/N)	Presence data? (Y/N)	Numbers? (Y/N)	Biomass? (Y/N)
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APPENDIX 4 - Presentations

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Workshop on sampling, processing and analysing the stomach contents (WKSTCON)
Palma (Spain), 24-27 April 2018

Beatriz Guijarro and Maria Valls

IEO – Centre Oceanogràfic de les Balears

MEDITS coordination meeting
Sète (France), 16-17 April 2018

Background

EUROPEAN UNION
European Maritime
and Fisheries Fund

- **EU Data Collection Framework:**
  - Official framework of the European Commission dedicated to **data collection** on economic, biological and transversal aspects in the fisheries sector of different Member States (MS).
  - Basic data for the evaluation of the **status of fishery resources**, fisheries, aquaculture, and processing sector in the EU countries, as well as the support of management and use of data in fisheries sector for **scientific advice** for the Common Fisheries Policy.

In the new period 2017-2019 Member States have to estimate the **impact of fishing activities** on marine biological **resources** and on marine **ecosystems**, such as effects on non-commercial species, predator-prey relationships and natural mortality of fish species in each marine region.

Background

EUROPEAN UNION
European Maritime
and Fisheries Fund

Regional Coordination Group for the Mediterranean
and Black Sea (RCG-Med&BS)
Larnaka (Cyprus), 18-22 September 2017

The aim of this proposal is to **standardize the methodology** of the study of the stomach contents in order to start a **coordinating sampling** in the region in 2019.

- **MARE/2014/19 Med&BS project** (WP3 - Regional Sampling program for the collection of data on fisheries impacts on the ecosystem):
  - Different methods for analyzing fish stomach contents were reviewed
  - Guidelines on sampling methodologies, including the collection of samples from both scientific surveys and commercial fisheries, are included
  - Sampling protocol and dietary indices
- **MARE/2016/22 STREAM** (WP4 - Regional Sampling Program for the collection of data on fisheries impacts on the ecosystem)

Workshop on sampling, processing and analysing the stomach contents (WKSTCON)

WKSTCON, 24-27 April 2018, Palma (Balearic Islands, Spain)

Chairs: Beatriz Guijarro and Maria Valls (IEO Spain)

Terms of Reference:

- Review of methodologies used in the stomach content analysis, with special relevance to the volumetric method
- Dietary indices and their interpretation
- Data analysis at species, multispecies and ecosystem levels
- Complementary methodologies: stable isotopes, condition index, fatty acids
- Proposal of a common sampling methodology at Mediterranean level

24 participants from 8 countries: Bulgaria, Croatia, France, Greece, Italy, Slovenia, Spain and United Kingdom

Workshop on sampling, processing and analysing the stomach contents (WKSTCON)

Review of methodologies

- ➢Volumetric method
- ➢ Gravimetric method
- ➢ Numerical method
- ➢ ICES methodology
- ➢ Stable isotopes
- ➢ Fatty acids and lipids

Case studies (7)

- ➢ Demersal chondrichthyes and osteichthyes, small pelagics, crustaceans
- ➢ Mediterranean, Black Sea

Data analysis at species, multispecies and ecosystem levels

- ➢ How to measure and compare diets
- ➢ Trophic level
- ➢ Stable isotopes
- ➢ Condition factors
- ➢ Fatty acids and lipids
- ➢ Trophodynamic models: ISOWEB, ATLANTIS, NICHEOVER, Ecopath
- ➢ Ecosystem Network Analysis (ENA)

Outcomes

- Stomach contents: summary table with pros and cons on different methods
- Comparison with other methods: stable isotopes and fatty acid analysis
- Pilot study for *Merluccius merluccius* (Med) and *Psetta maxima* (BS)
- Common sampling methodology: updated from MARE/2014/19 Med&BS

Recommendations

- Establish permanent WKSTCON (report to WKBIOP, ACCOM, GFCM,…) to meet biyearly → The next is being planned during late 2019 or early 2020
- Pilot study based on samples from surveys
- Create a reference collection (tool or database)
- Need of human resources to carry out the sampling and data analysis
- Mailing list of experts

Proposal to MEDITS group

➢ Pilot study for *Merluccius merluccius* during MEDITS 2018, based on methodology agreed during WKSTCON 2018:

- 20 individuals by 10 cm
- Minimum 100 individuals by GSA, by adjusting the number of individuals for each size class depending on the size range
- The individuals with stomach reverted will be excluded

This pilot study was made in GSAs 1, 5, 6, 20 and 22

➢ The results of the pilot study would be discussed in the WKSTCON2 and reported to the MEDITS Coordination Meeting

➢To be part of mailing list, contact Maria Valls (maria.valls@ieo.es):

➢ **Contact MEDITS persons? National and Regional MEDITS Coordinators?**

MEDITS-ES 2018

26th April - 24th June 2018

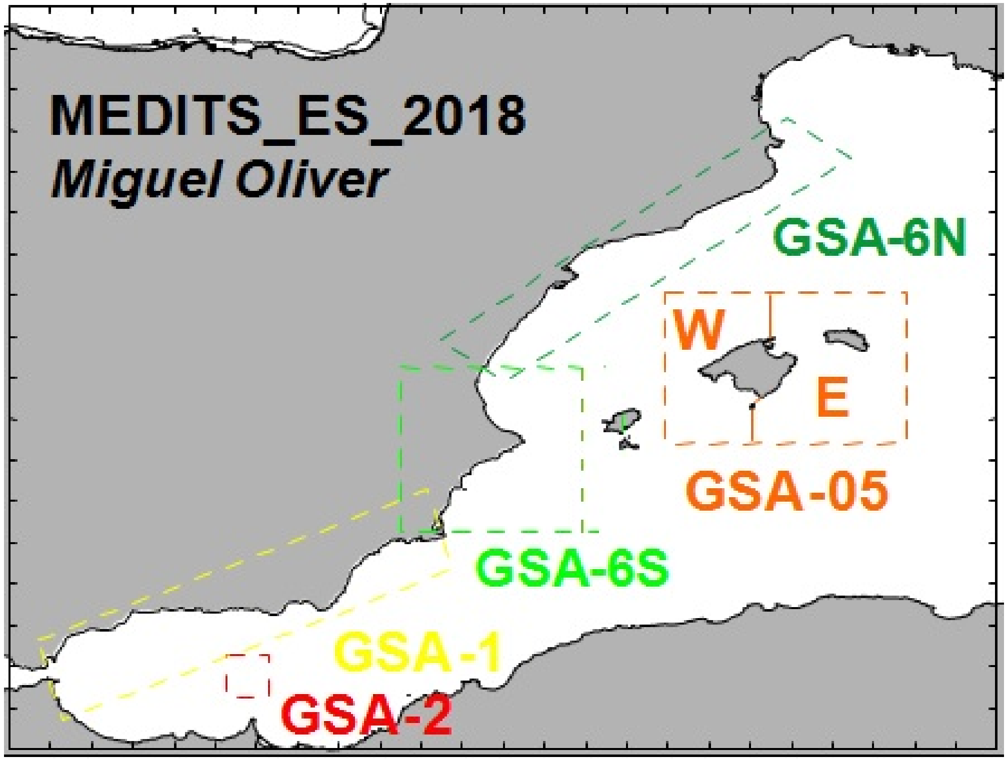
GOBIERNO DE ESPAÑA MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES

INSTITUTO ESPAÑOL DE OCEANOGRAFÍA

Unión Europea

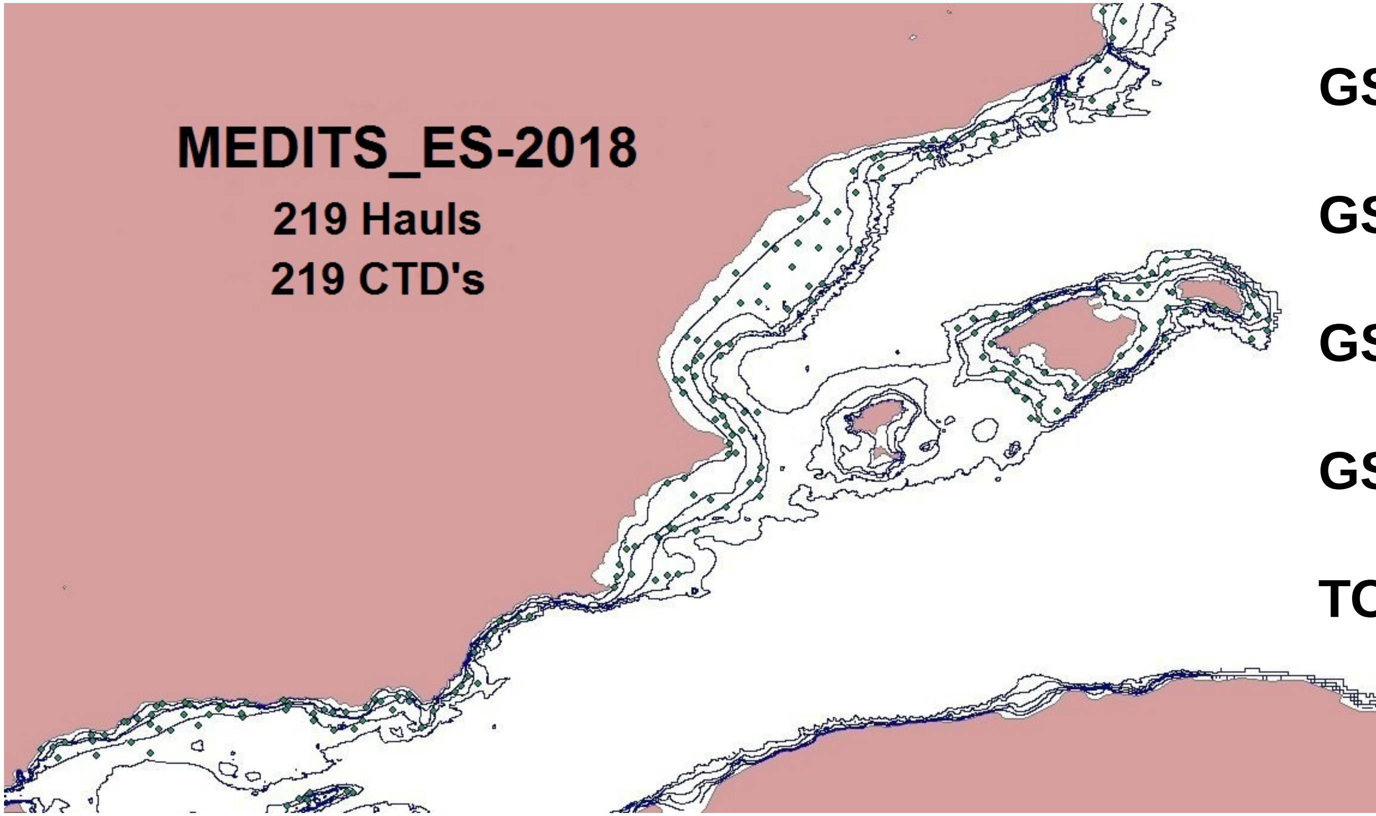
Fondo Europeo Marítimo y de Pesca (FEMP)

SPANISH GSAs



- GSA-1 (Northern Alboran)
- GSA-2 (Alboran Island)
- GSA-5 (Balearic Islands)
  - West (GSA-5W)
  - East (GSA-5E)
- GSA-6 (Northern Spain)
  - South (GSA-6S)
  - North (GSA-6N)

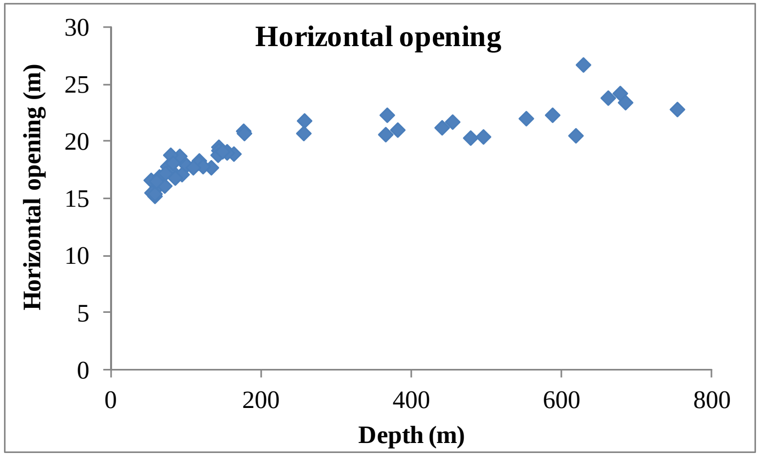
Days/Hauls

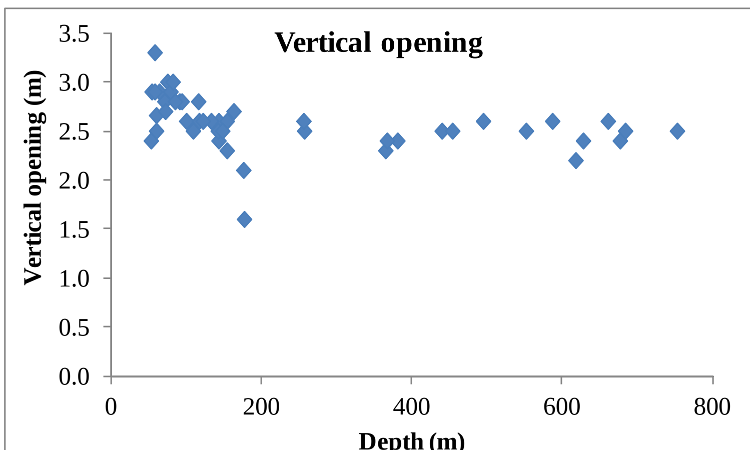


	Days	Hauls
GSA 1	15	59
GSA 2	2	7
GSA 5	13	51
GSA 6	25	102
TOTAL	55	219

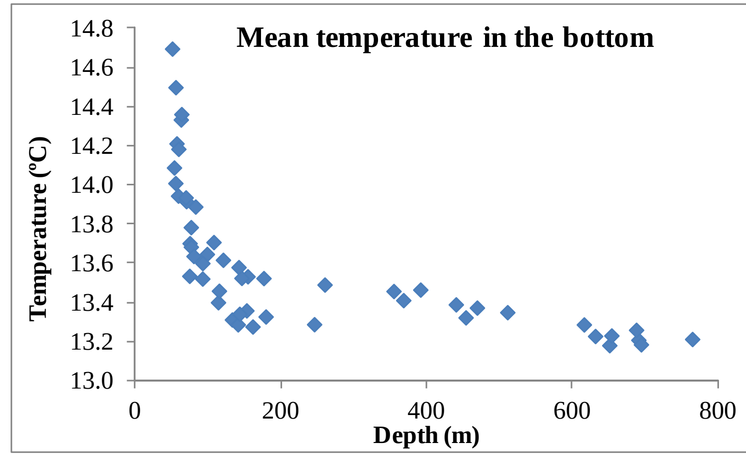
- ✓ CTD SBE-37
- ✓ MARPORT

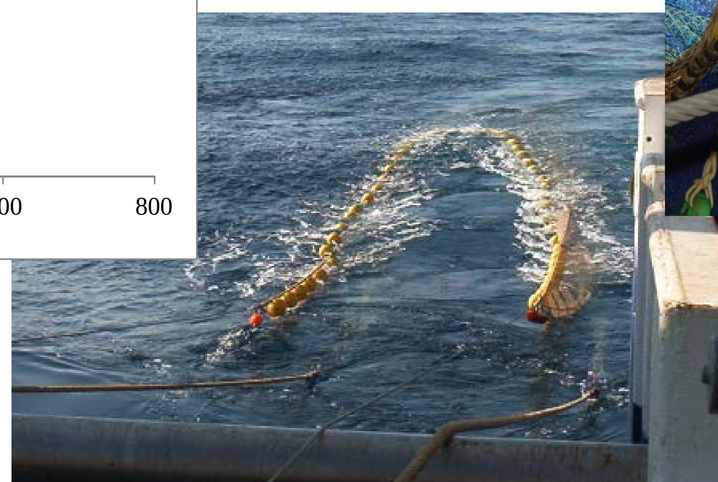
OPENING OF THE NET (MARPORT)





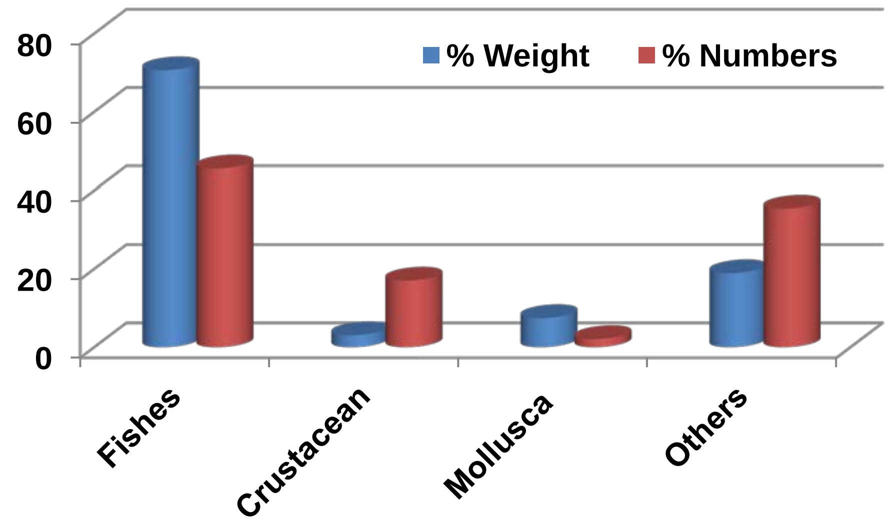
WATER CHARACTERISTICS (CTD



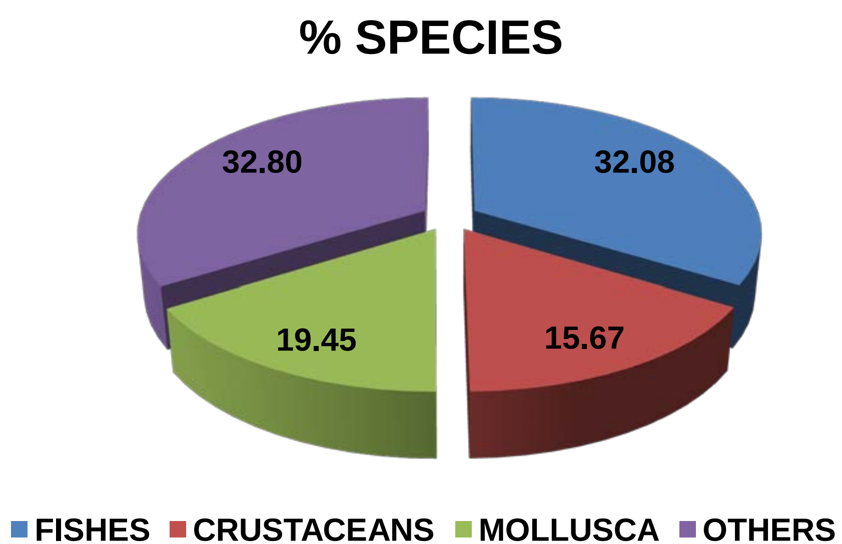


Results: Catches

Taxa	Weight (kg)	Number
Fishes	13334	755845
Crustaceans	576	282411
Mollusca	1402	34322
Others	3571	587502

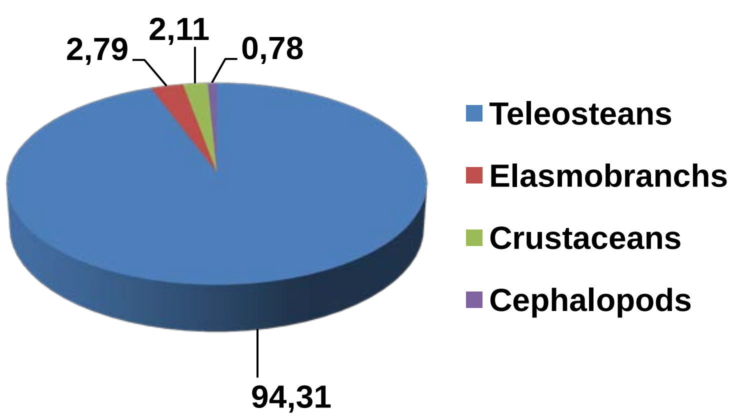


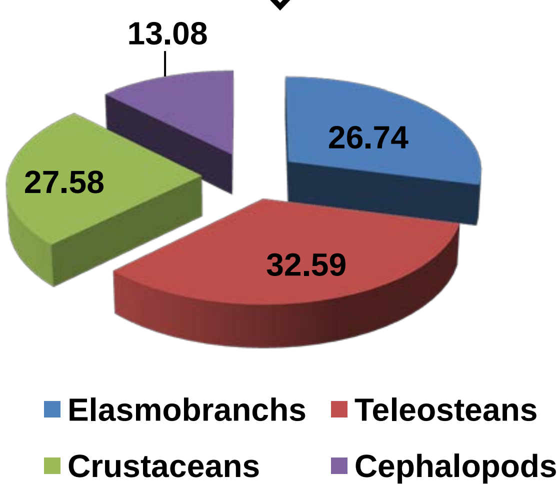
	Species
Fishes	221
Crustaceans	108
Mollusca	134
Others	226



Sampling

Lengh frequency	282411
Biological sampling	34322
Otoliths & Illicia	587502

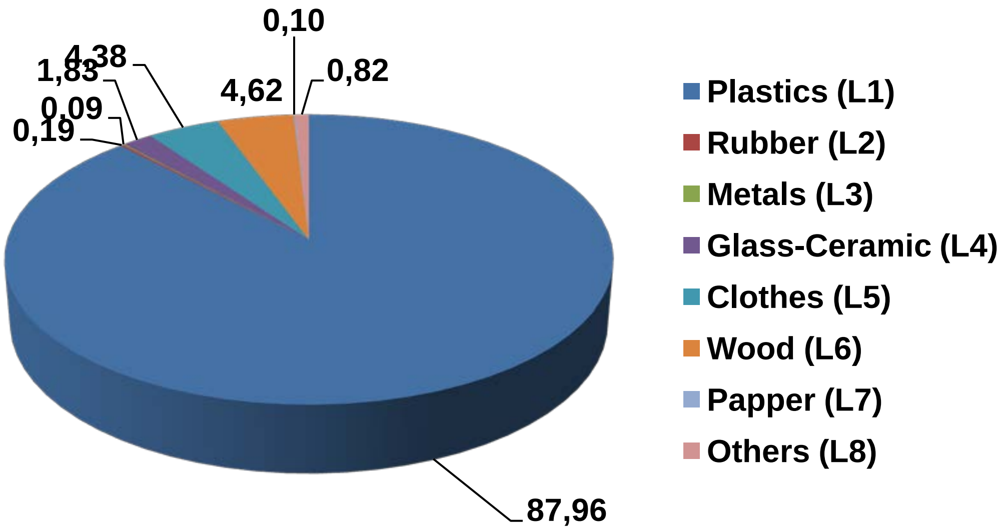




Species	Number
Merluccius merluccius	693
Mullus barbatus	609
Mullus surmuletus	531
Lophius budegassa	313
Lophius piscatorius	27

INSTITUTO ESPAÑOL DE OCEANOGRAFÍA

Litter record



MEDITS-ES 2019

R/V *Miguel Oliver*

April 23th to June 21th

The MEDITS Protocol will be applied

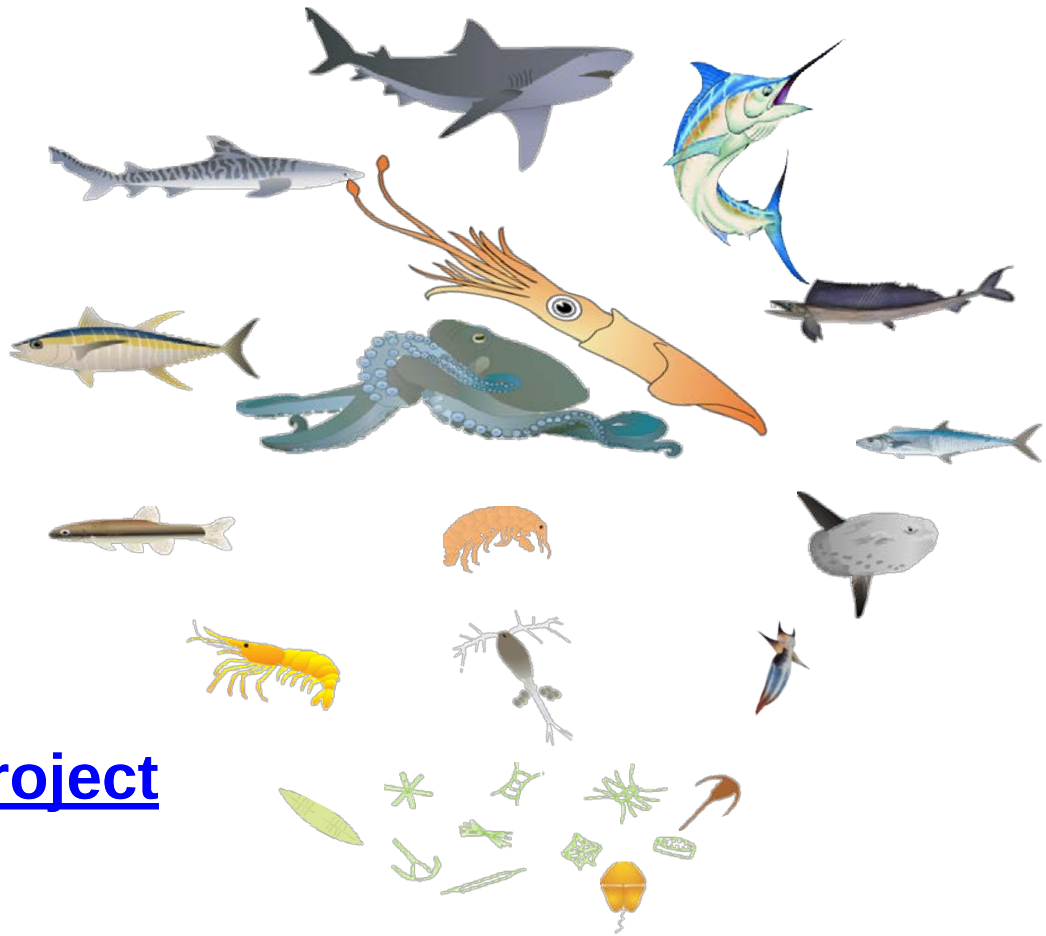
Summary and Reports

MEDITS_Spain_Summary_2018.doc

During 2018, the Spanish MEDITS survey was carried out from April 26th to June 24th (60 days), on board the R/V *Miguel Oliver*. Four geographic sub-areas (GSAs) were covered: 1 (Northern Alboran), 2 (Alboran Island), 5 (Balearic Islands) and 6 (Northern Spain). A total of 219 hauls were performed and sampled by several teams of the Spanish Institute of Oceanography: 59, 7, 51 and 102 hauls in GSAs 1, 2, 5 and 6, respectively. Up to 689 species or taxa (221 fishes, 108 crustaceans, 134 molluscs and 226 other invertebrates and algae) were identified, counted and weighted. SCANMAR was used in all hauls. A CTD SBE 37 was used attached to the flotsam of the net in all these hauls. The total number of individuals captured was 1660080. The number of length distribution made were 153908 individuals. The number of biological sampling made were 28358 individuals and 2713 samples of hard tissues for age estimations were taken in *Merluccius merluccius*, *Mullus barbatus*, *M. surmuletus*, *Lophius budegassa* and *L. piscatorius* were taken. In 2018, the Spanish MEDITS survey was carried out applying the MEDITS protocol, without major problems to mention and. In 2019, this survey is planned from April 23th to June 21th on board the R/V *Miguel Oliver*.

- ✓ Outline Report GSAs 1-2
- ✓ Outline Report GSA 5
- ✓ Outline Report GSA 6

- [Workshop on sampling, processing and analysing the stomach contents (WKSTCON)]

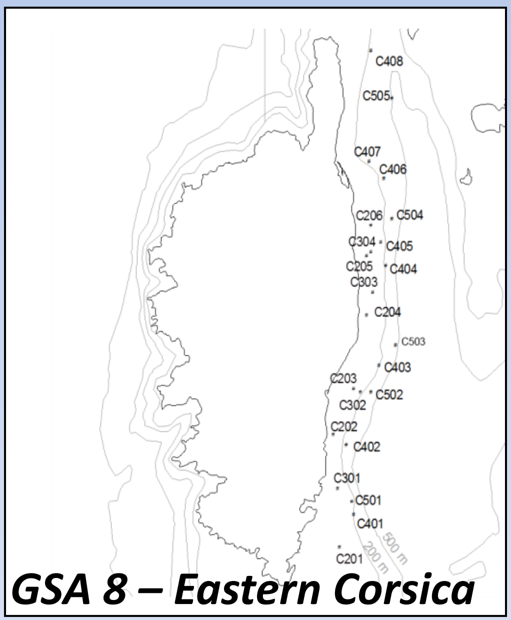


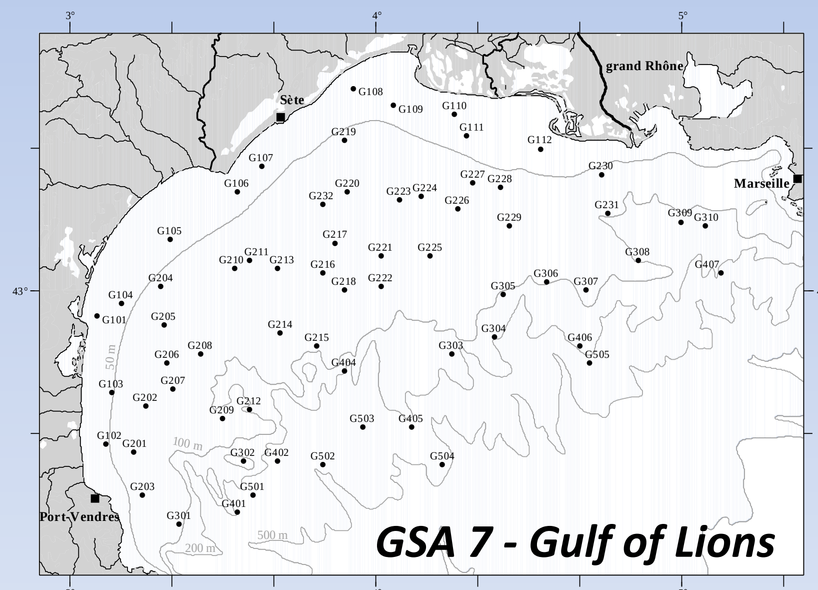
- [STREAM Project]


MERCI POUR VOTRE ATTENTION

MEDITS FRANCE 2018

23rd may – 26th June 2018

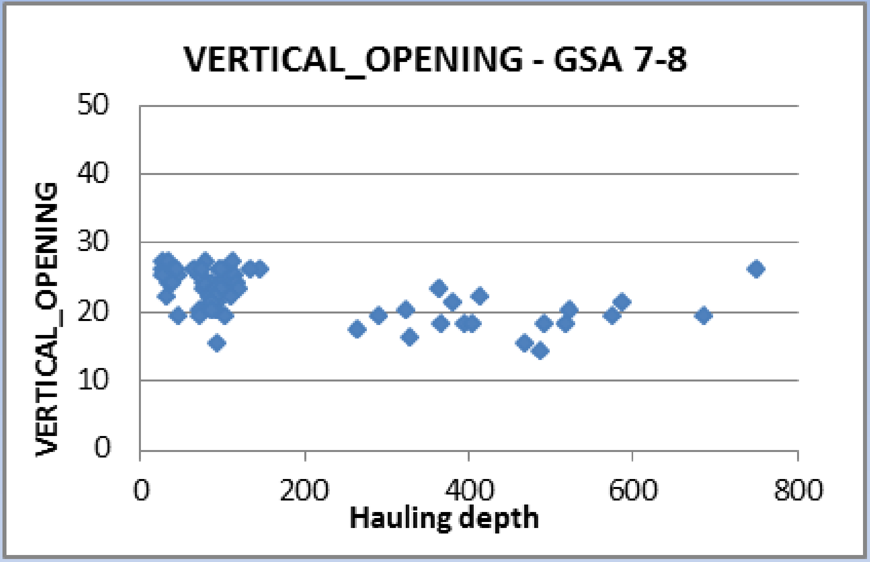




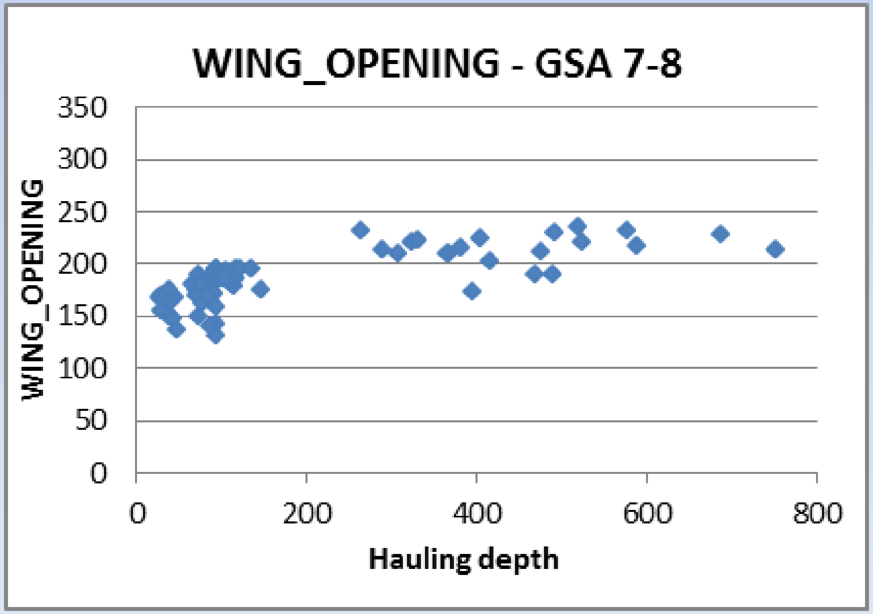
24th may –31th may: 23/23 hauls

1th june – 27th June: 65/65 hauls

All the hauls of GSA 7 and 8 performed with MARPORT *(equivalent to SCANMAR)*



Vertical opening
between 1.5 and 3 m

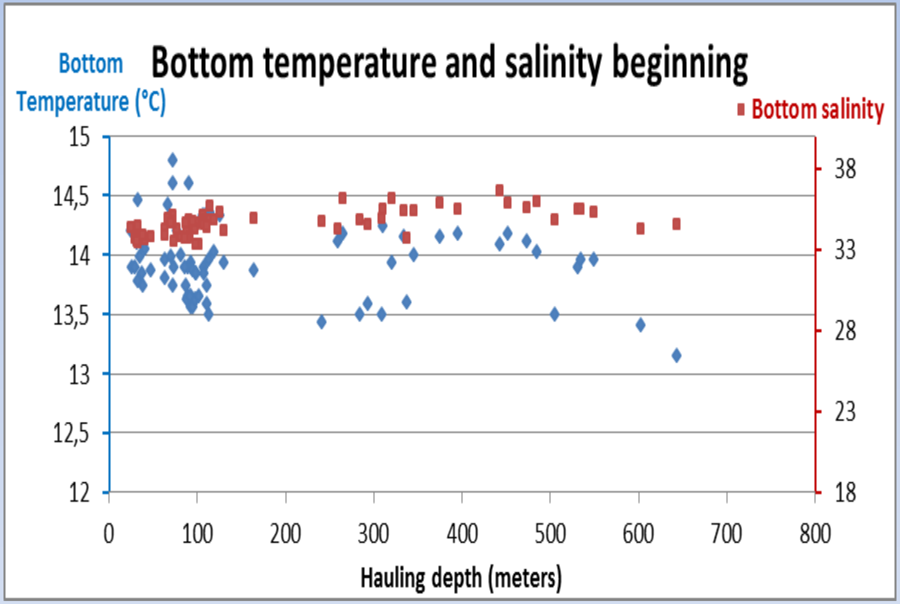


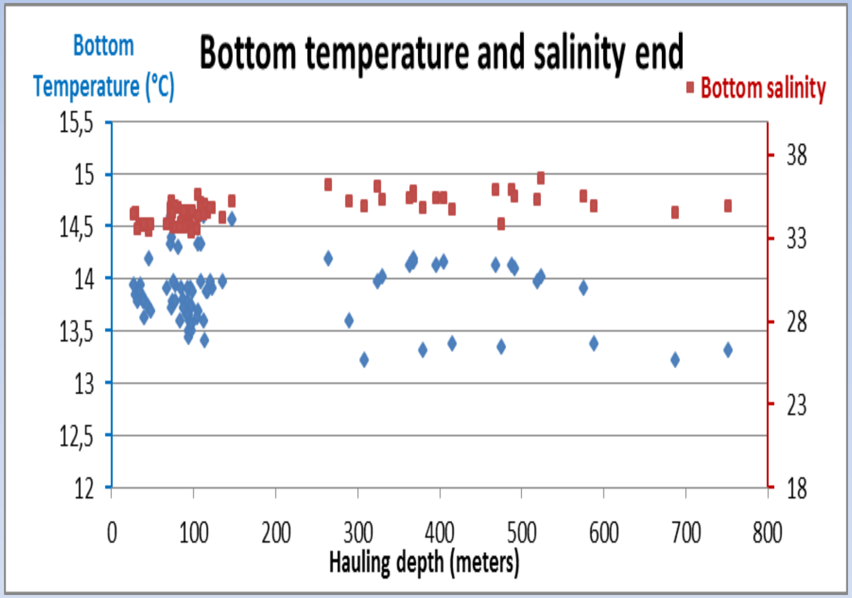
Wing opening
between 13 and 25 m

Bottom Temperature and Salinity

- 1994-2012: **minilog, Temperature/depth**
- 2013: **oddi-star DST centi, Temperature/depth**
- 2014-2018: **oddi-star CTD**, **Temperature/depth and salinity**

➢ **2018 : All the hauls with oddi-star CTD**

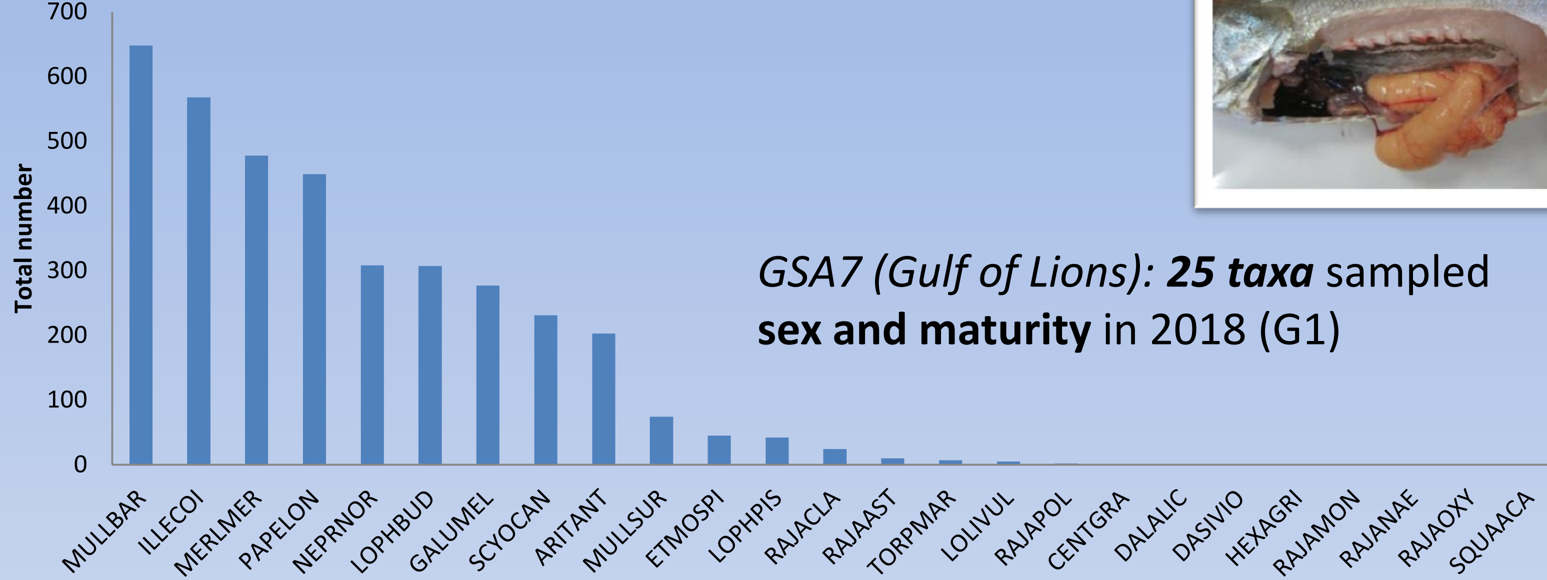




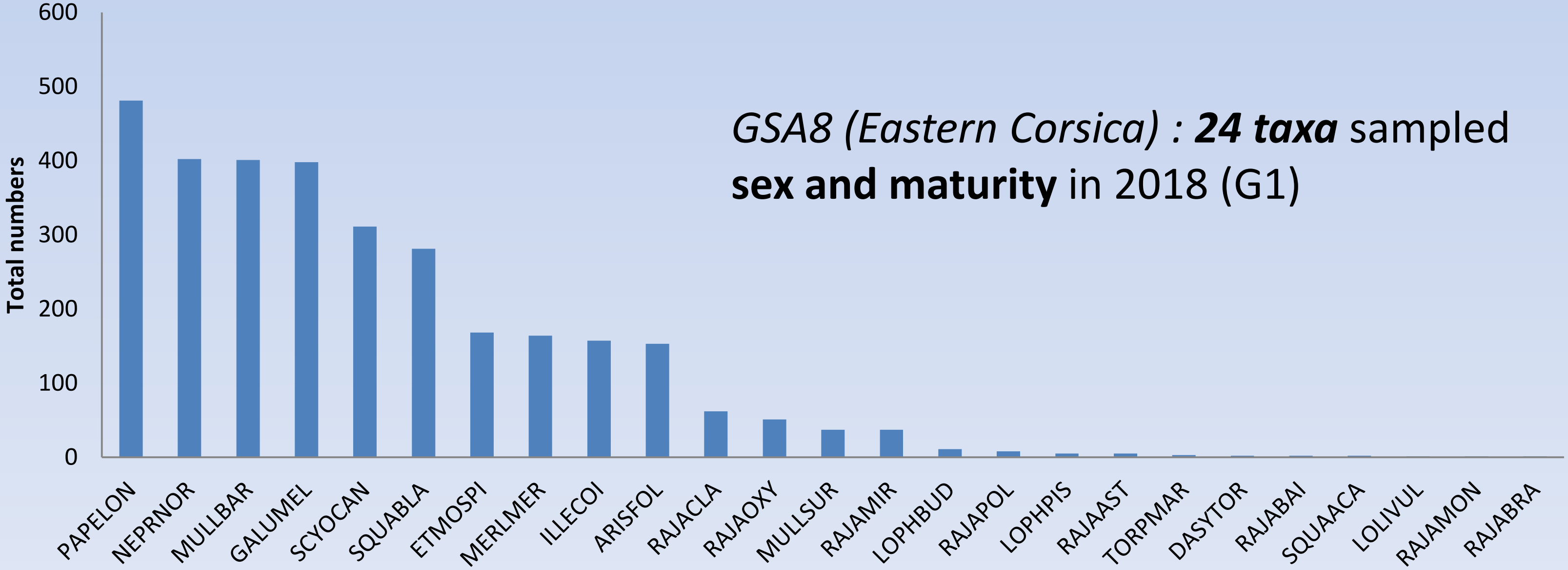
Temperature : Between 13 and 15°C ; 0-200m : 13.5-15°C and up to 200m : 13-14.2° C

Salinity : Between 33 and 37 (psu)

Species : *Total number of sampled individuals for* ***sex and maturity***



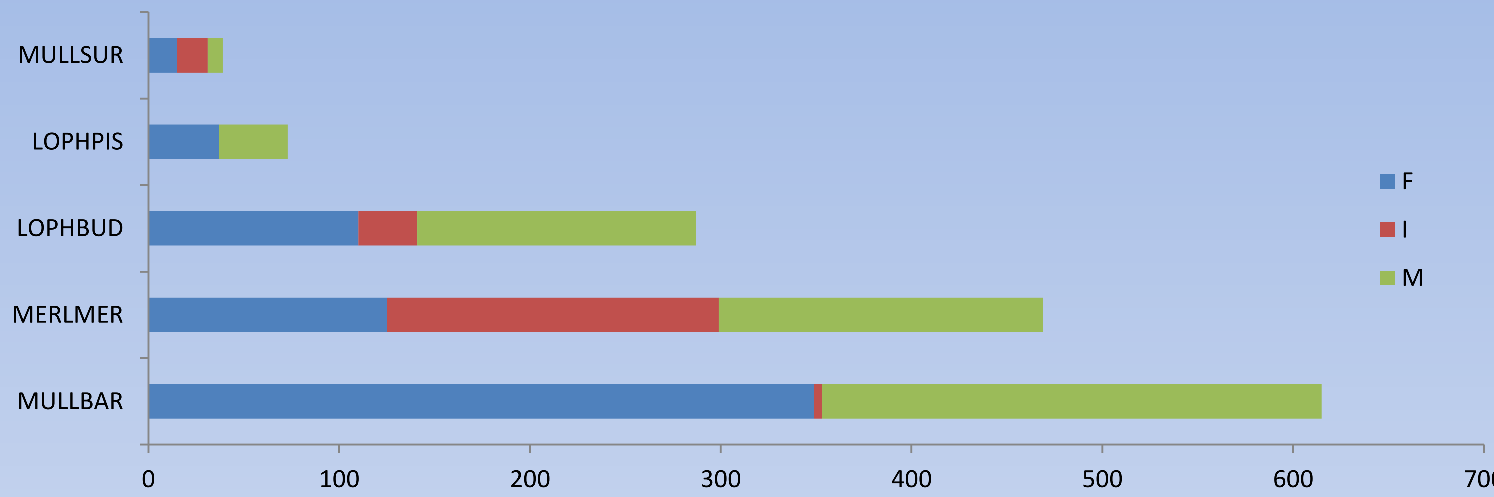
GSA7 (Gulf of Lions): ***25 taxa*** sampled **sex and maturity** in 2018 (G1)



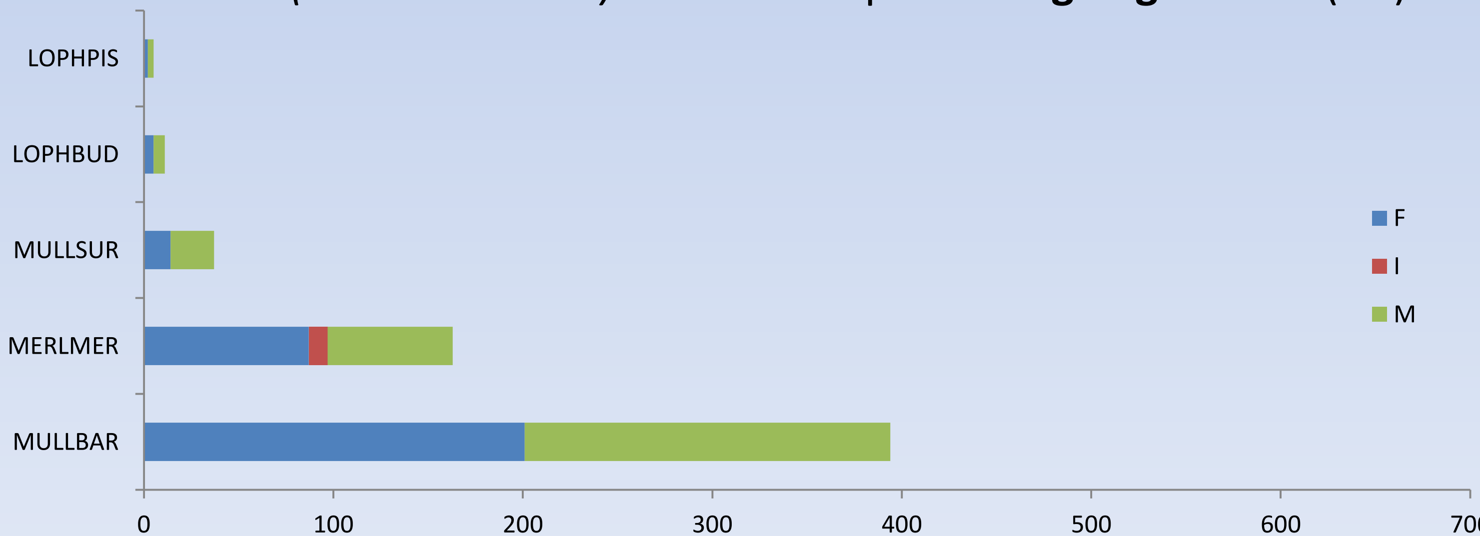
GSA8 (Eastern Corsica) : ***24 taxa*** sampled **sex and maturity** in 2018 (G1)

Species : *Total numbers of hard tissues collected for ageing*

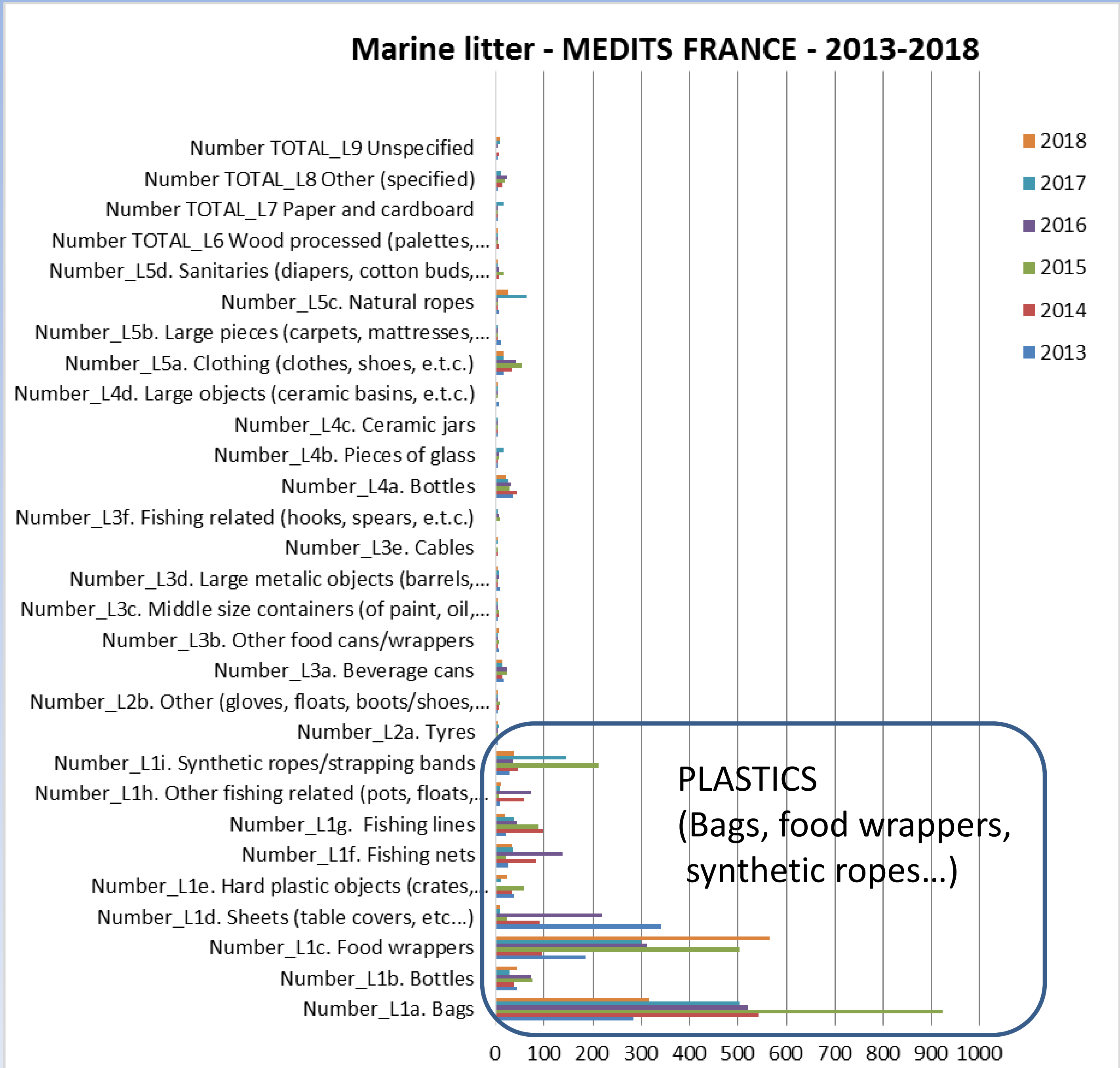
GSA7 (Gulf of Lions) : ***5 taxa*** sampled for **ageing** in 2018 (G1)



GSA8 (Eastern Corsica) : ***5 taxa*** sampled for **ageing** in 2018 (G1)

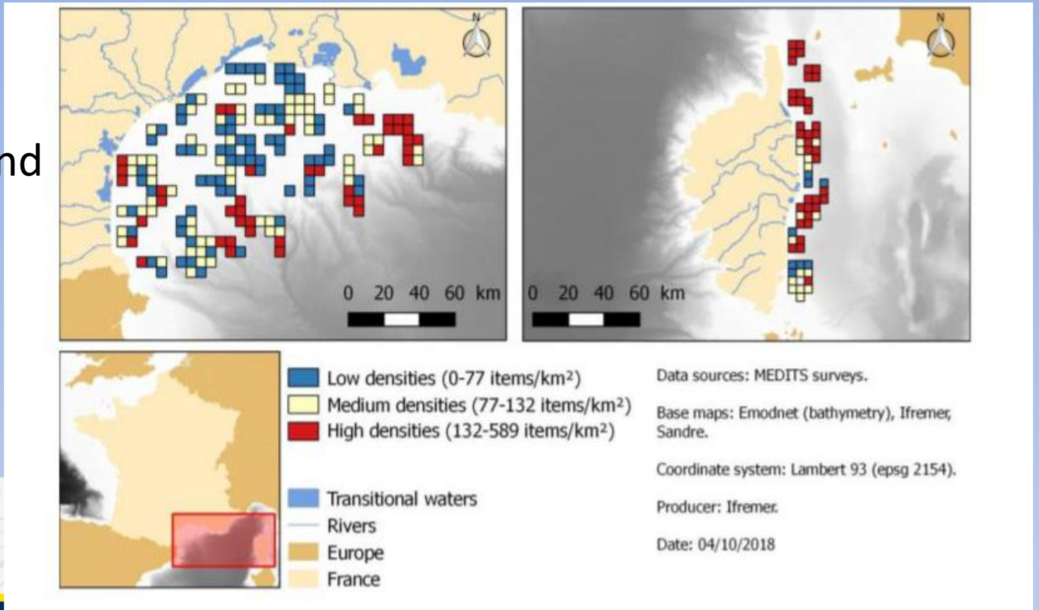


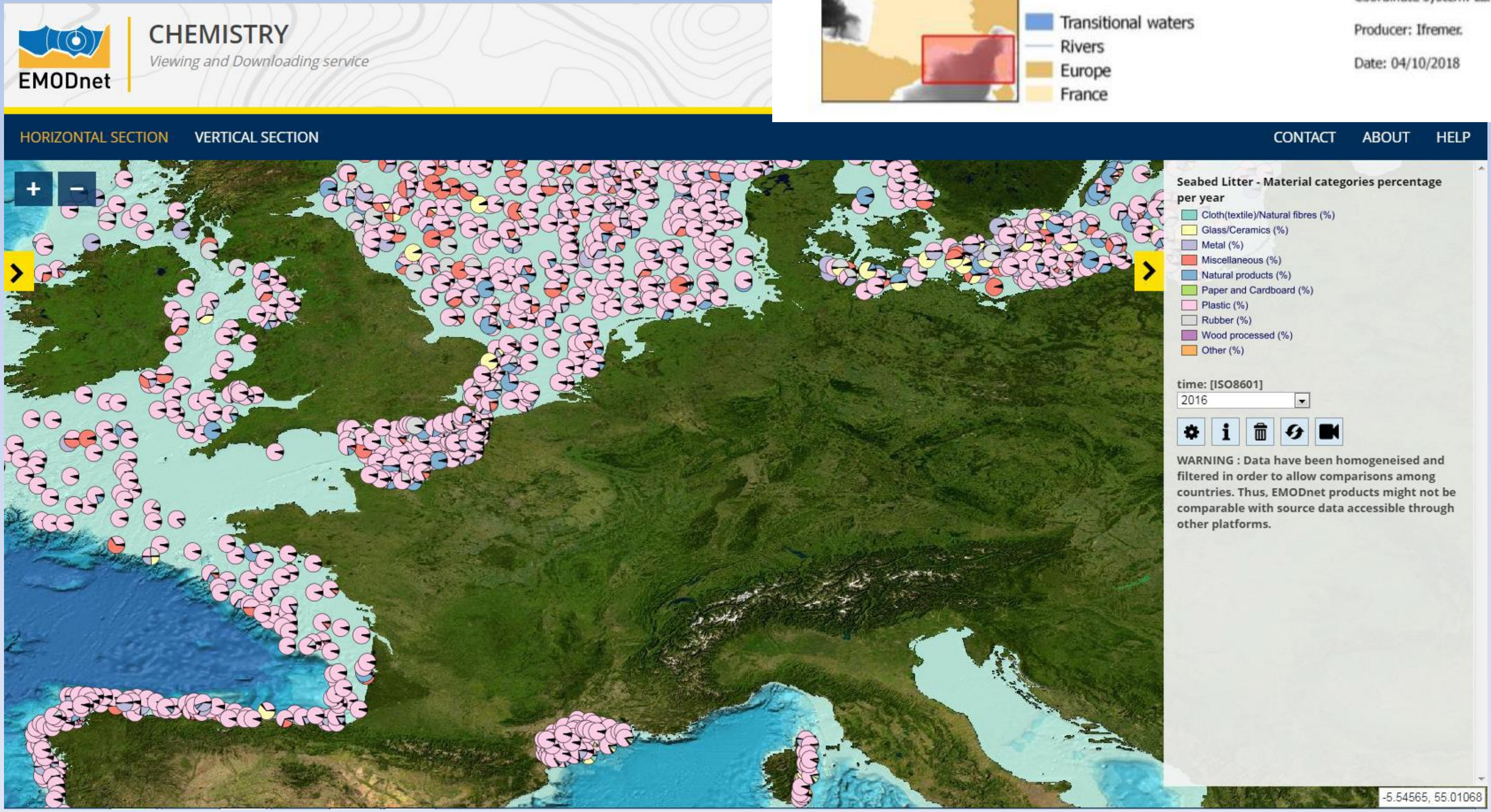
Marine litter:



Marine litters

EMODNet (European Marine Observation and Data Network) consortium of organisations within Europe that assembles marine data, data products and metadata from diverse sources in a uniform way





Source Galgani F. and Gerigny O.

Other measures of environmental variables

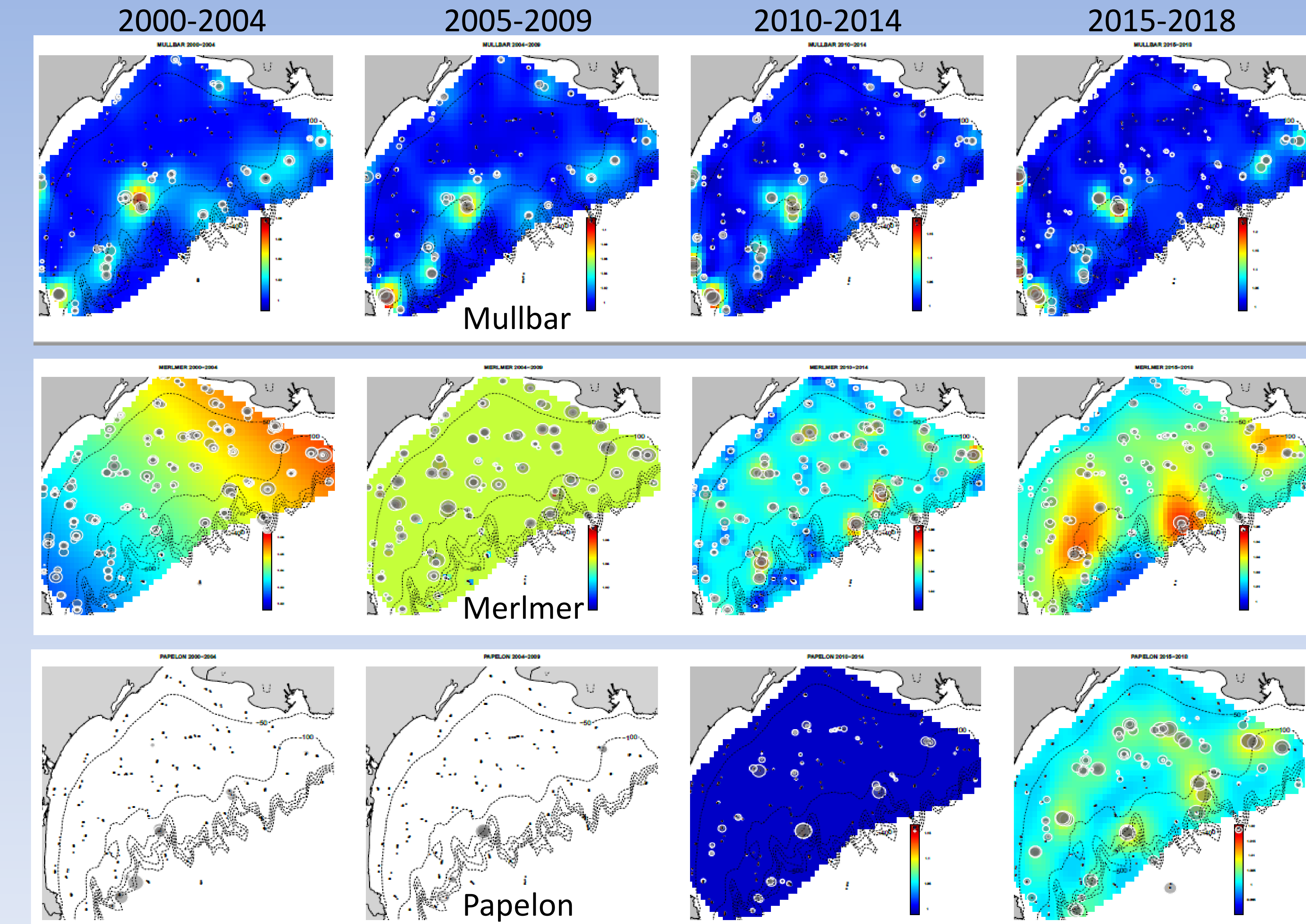
Marine Strategy Framework Directive:

- Determination of **jelly fish**

- Characterization of **abundance of zooplankton taxa**
  - ✓ Use of WP2 for 8 stations in the Eastern Corsica (1 point in each depth strata)
  - ✓ Samples stored in formol

- CTD: 8 stations in the Eastern Corsica (1 point in each depth strata)

Spatial distributions ***(square root of biomass in tons/Km2)***

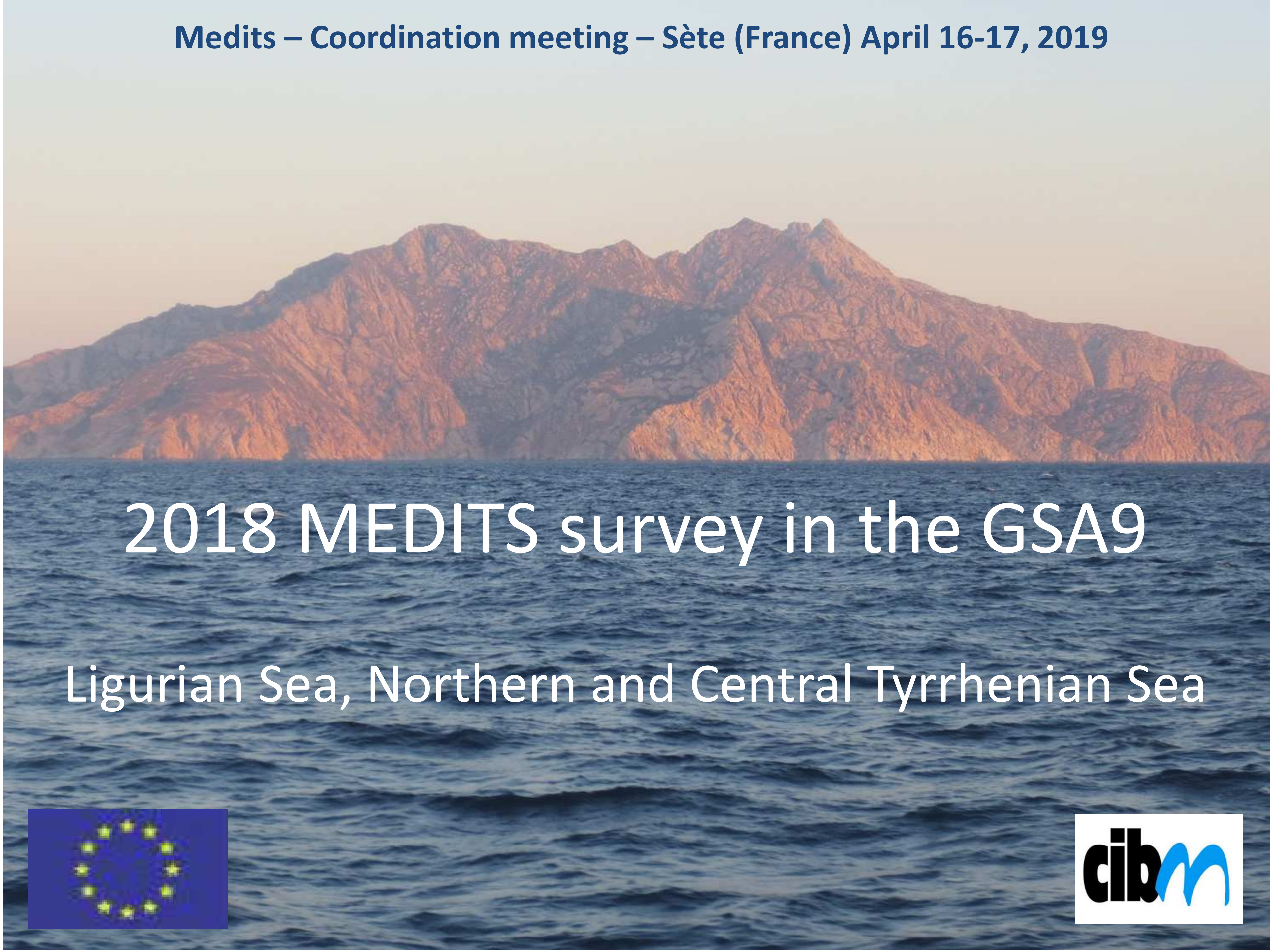


Planning for the 2019 survey

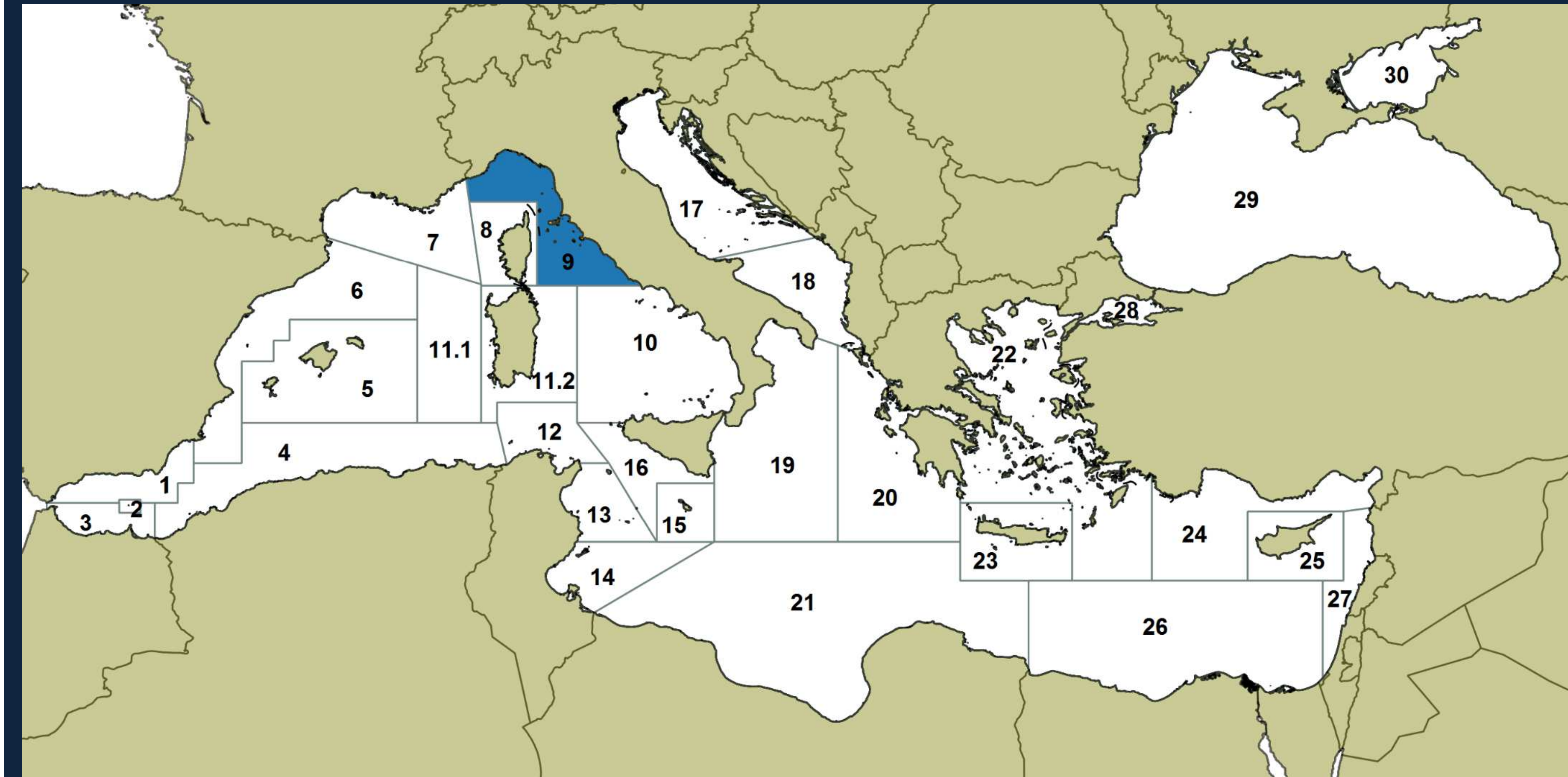
22nd may – 25th June

…first Eastern Corsica

then Gulf of Lions…


Medits – Coordination meeting – Sète (France) April 16-17, 2019
2018 MEDITS survey in the GSA9
Ligurian Sea, Northern and Central Tyrrhenian Sea

GSA 9



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Medits 2018 – Period in which the survey was carried out

Date	N° progressive days	Valid Hauls	Notes
13/06/2018	1	2	Sampling activities
14/06/2018	2	5	Sampling activities
15/06/2018	3	5	Sampling activities
16/06/2018	4	5	Sampling activities
17/06/2018	5	5	Sampling activities
18/06/2018	6	6	Sampling activities
19/06/2018	7	5	Sampling activities
20/06/2018	8	5	Sampling activities
21/06/2018	9	6	Sampling activities
22/06/2018	10	5	Sampling activities
23/06/2018	11	5	Sampling activities
24/06/2018	12	3	Sampling activities

Date	N° progressive days	Valid Hauls	Notes
25/06/2018	13	6	Sampling activities
26/06/2018	14	7	Sampling activities
27/06/2018	15	5	Sampling activities
28/06/2018	16	4	Sampling activities
29/06/2018	17	6	Sampling activities
30/06/2018	18	5	Sampling activities
01/07/2018	19	6	Sampling activities
02/07/2018	20	3	Sampling activities
03/07/2018	21	8	Sampling activities
04/07/2018	22	6	Sampling activities
05/07/2018	23	7	Sampling activities
Total	**23**	**120**	

Medits – Coordination meeting – Sète (France) April 16-17, 2019

Vessel characteristics

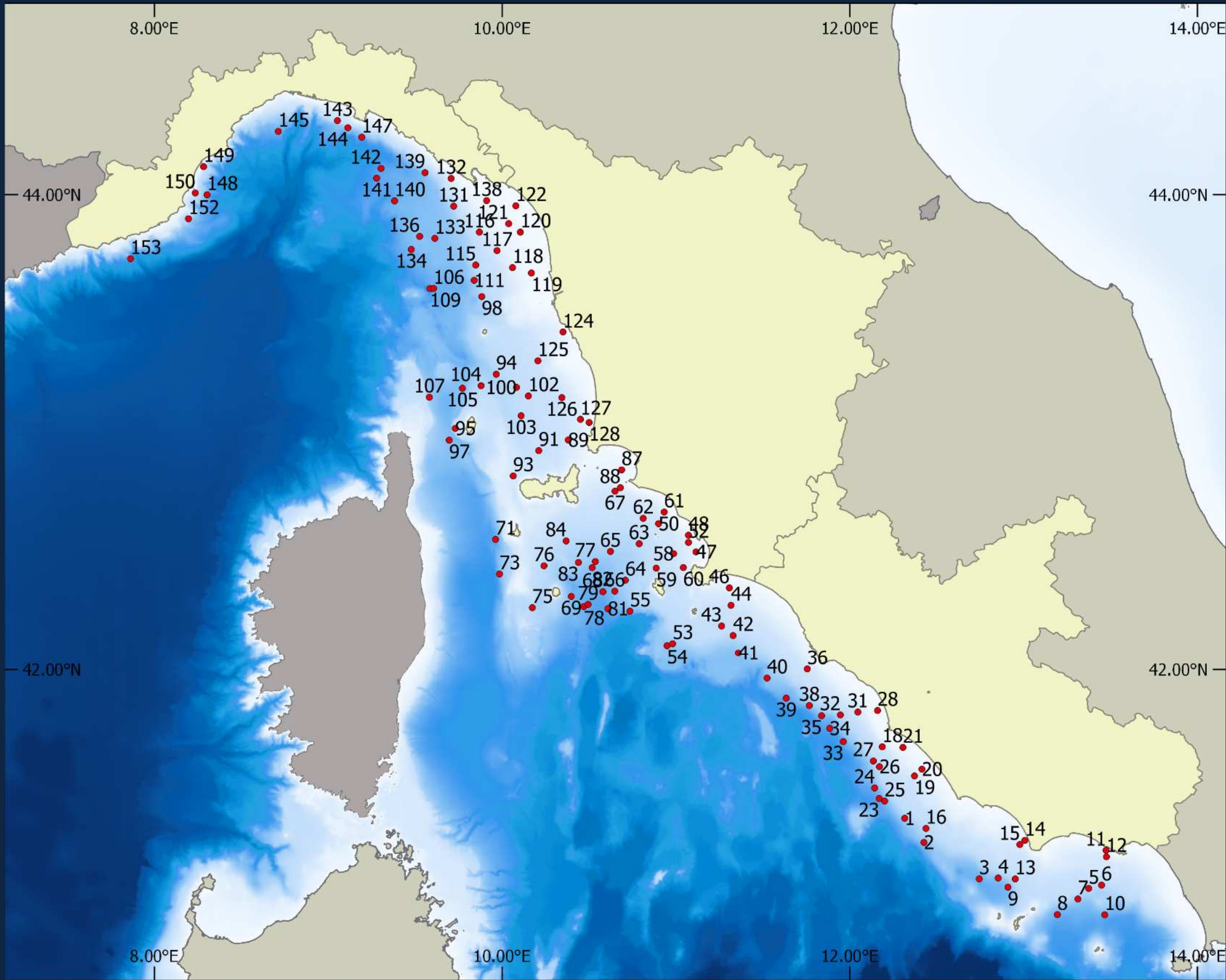
Period: 2016-2017

Name of the vessel	**S. Anna**
Mooring port	Mazara del Vallo (TP)
Registration number	MV 292
Year of construction	1981
Length (LOA)	32.2
Tonnage (GT)	197 t
Engine brand	M.A.K.
Engine power (kW)	744
Maximum number of engine revolution	1800 (min)
Maximum capacity of warps	3100 m

Period: 2018

Name of the vessel	**Pegaso SB**
Mooring port	Mazara del Vallo (TP)
Registration number	MV 299
Year of construction	1975
Length (LOA)	33.3
Tonnage (GT)	193 t
Engine brand	BADOUIN
Engine power (kW)	746
Maximum number of engine revolution	1800 (min)
Maximum capacity of warps	2500 m

Geographical position of the hauls



Number of hauls and allocation in the bathymetric strata

Survey MEDITS 2018		
Bathymetric strata	**GSA9 n. of hauls**	**GSA9 Area (km^2)**
Stratum A (10-50 m)	14	5762
Stratum B (51-100 m)	18	5992
Stratum C (101-200 m)	31	10878
Stratum D (201-500 m)	37	10587
Stratum E (501-800 m)	20	9191
Total	**120**	**42410**
Macro-stratum 10-200 m	**63**	**22632**
Macro-stratum 201-800 m	**57**	**19778**

Medits – Coordination meeting – Sète (France) April 16-17, 2019

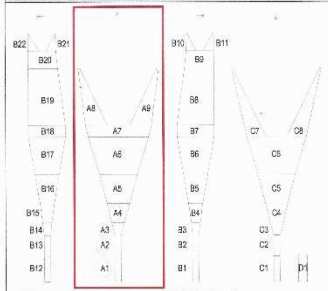
Quality check of the MEDITS gear

Centro Interuniversitario di Biologia Marina ed Ecologia Applicata "G.Bacci"

MEDITS ANNUAL CHECK

NOME RETE	OPERATORI	DATA	LUOGO
GOC73_UO009_2015_01	FDC CV	6 05 2018	MDV

TOP PANEL



Top panel

ID Netting	Mesh size [mm] Nom	Mesh size [mm] Eff	Netting Height [m] Nom	Netting Height [m] Eff
A1	20		5.00	5.25
A2	40		4.00	3,85
A3	40		2.40	2.35
A4	60		3.72	3.50
A5	80		5.44	5.20
A6	120		7.20	4.30
A7	140		2.24	2.20
A8	140		10.64	10.17
A9	140		10.64	10.40

→ sopra → fianco sx → sotto } Fianco DX

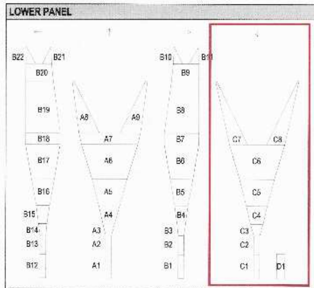
DATA_________ FIRMA_________

Pagina 1 di 1

Centro Interuniversitario di Biologia Marina ed Ecologia Applicata "G.Bacci"

MEDITS ANNUAL CHECK

LOWER PANEL



Lower panel

ID Netting	Mesh size [mm] Nom	Mesh size [mm] Eff	Netting Height [m] Nom	Netting Height [m] Eff
C1	20		5.00	5.25
C2	40		4.00	3,85
C3	40		2.40	2.38
C4	60		3.72	3,50
C5	80		5.44	5.22
C6	120		7.20	7.10
C7	140		12.88	12.30
C8	140		12.88	12.40

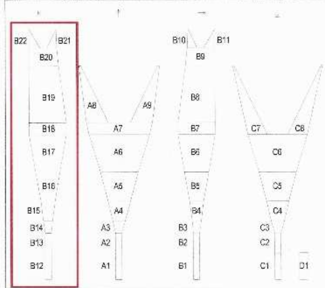
DATA_________ FIRMA_________

Pagina 1 di 1

Centro Interuniversitario di Biologia Marina ed Ecologia Applicata "G.Bacci"

MEDITS ANNUAL CHECK

SIDE PANEL (port)



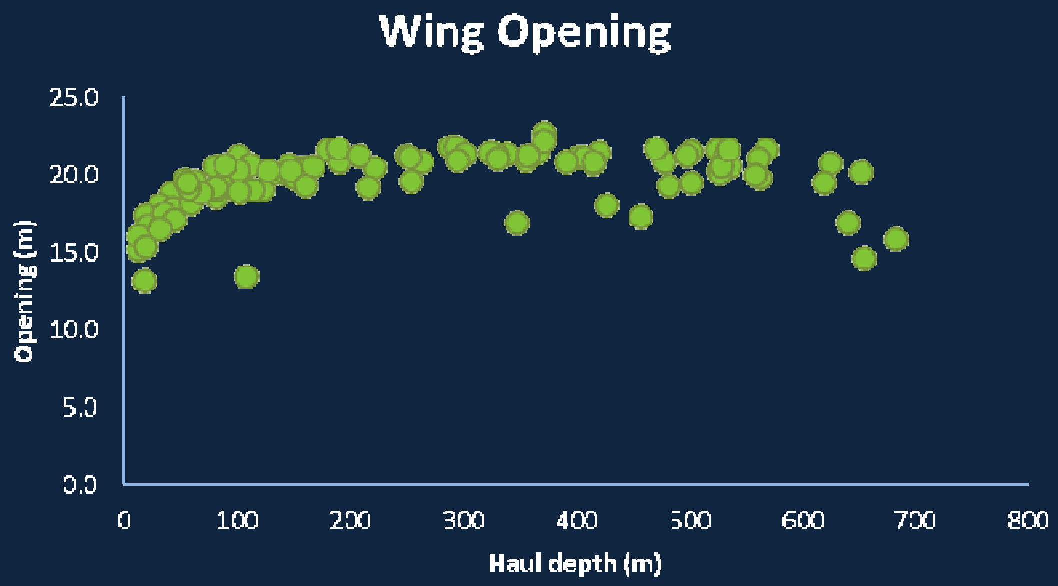
Side panel *(port)*

ID Netting	Mesh size [mm] Nom	Mesh size [mm] Eff	Netting Height [m] Nom	Netting Height [m] Eff
B12	20		5.00	5,25
B13	40		4.00	3.85
B14	40		2.40	2,35
B15	60		3.72	3,50
B16	80		5.44	5.20
B17	120		7.20	7.20
B18	140		2.24	2,20
B19	140		10.64	10.32
B20	140		3.36	3.20
B21	140		3.36	3.20
B22	140		3.36	3.20

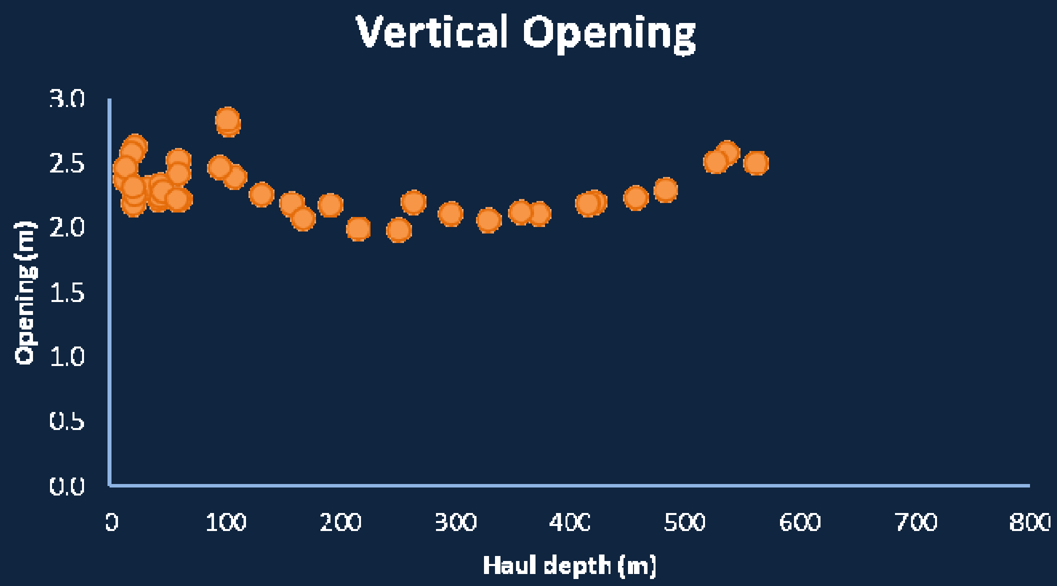
DATA_________ FIRMA_________

Pagina 1 di 1

Net measurements

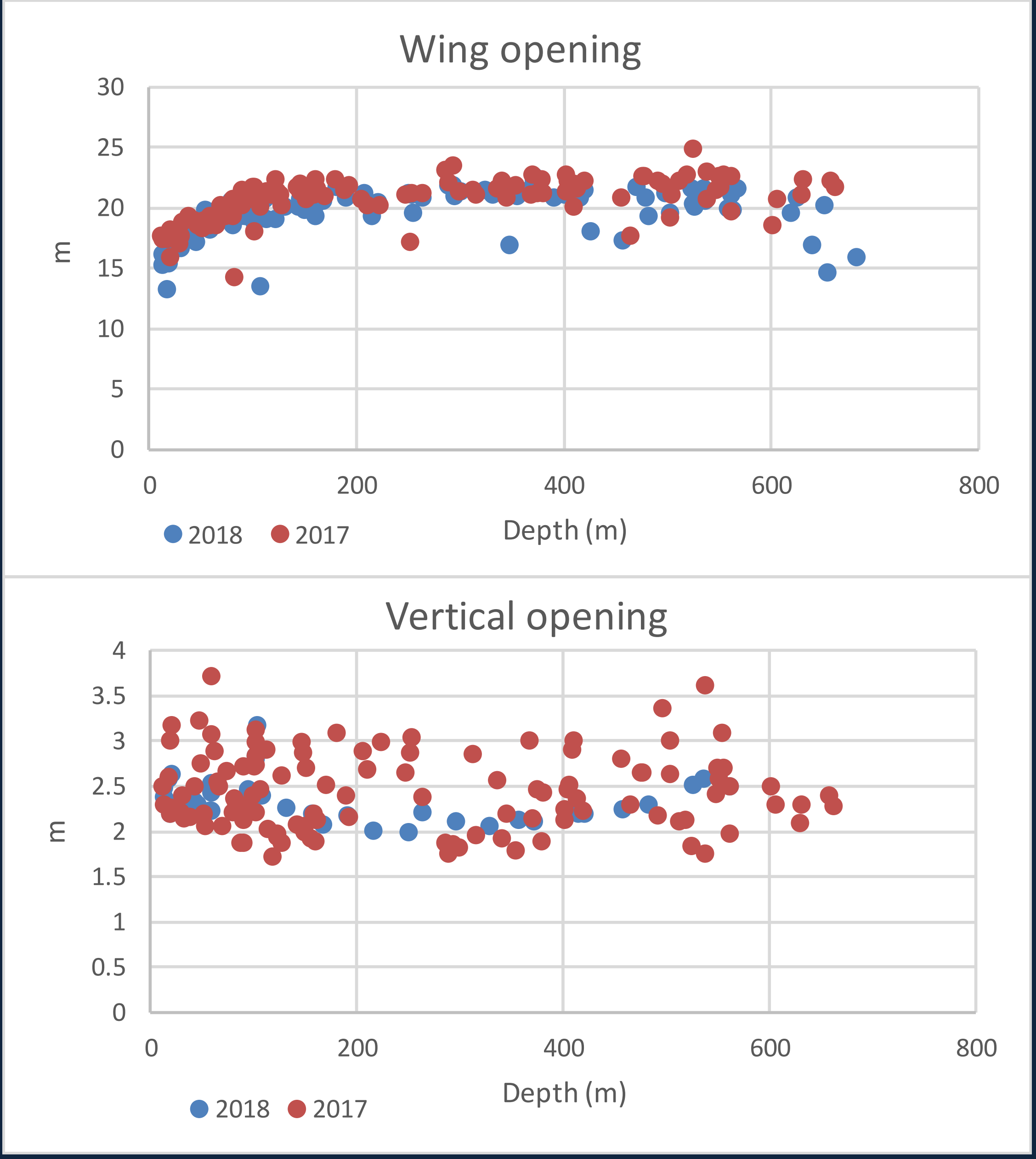


Positive hauls: 112 for HNO
39 for VNO

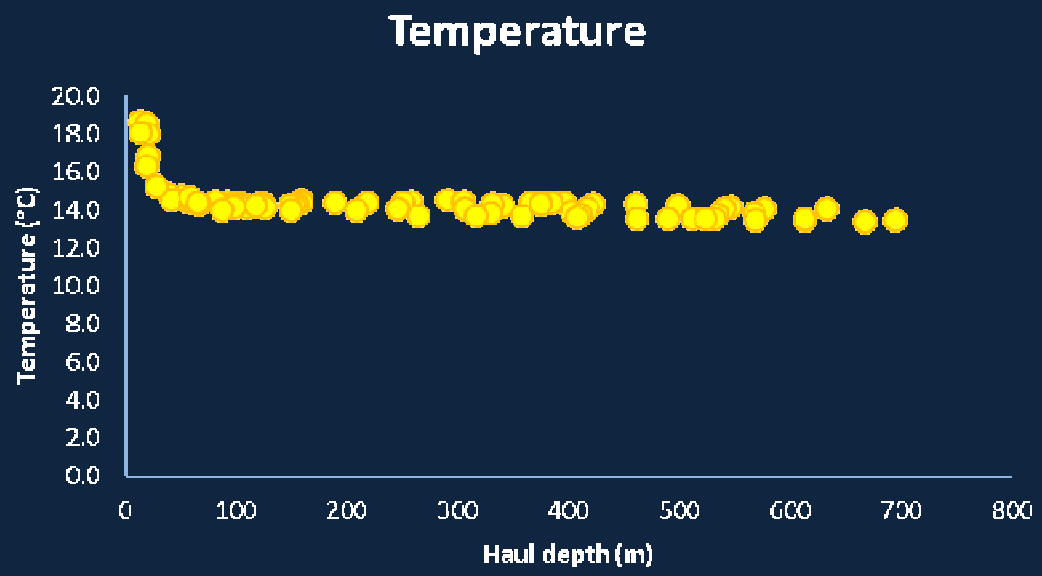


Medits – Coordination meeting – Sète (France) April 16-17, 2019

Net measurements – Comparison 2017-2018



Sea bottom temperature



Positive hauls: 120

DST Centi probe

Number of species classified by taxa collected during the 2018 Medits survey

Taxa	Number of species
Fish Osteichthyes	133
Fish Elasmobranchs	18
Cephalopods	29
Crustaceans Decapoda	55
Crustaceans Euphausiacea	1
Crustaceans Stomatopoda	2
Mollusca bivalvia	7
Mollusca Gastropoda	4
Mollusca Opistobranchia	7
Brachiopoda	1
Cnidaria	11
Echinodermata	25
Hirudinea	1
Polychaeta	3
Porifera	2
Tunicata	6
Vegetalia	2
Total	**307**

New species collected during the 2018 Medits survey

Fish Osteichthyes *Facciolella oxyrhyncha* (Bellotti, 1883) FACCOXY

Crustaceans Decapoda *Munida rutllanti* B. Zariquiey Alvarez. 1952 MUNIIRI
Necora puber (Linnaeus, 1767) MCPIPUB

Cephalopoda *Chiroteuthis veranii* (Férussac, 1835) CHIRVER
Octopoteuthis sicula Rüppell, 1844 OCTESIS

Mollusca Bivalvia *Abra alba* (Wood, 1802) ABRRALB

Mollusca Opisthobranchia *Peltodoris atromaculata* Bergh, 1880 PELTATR
Pleurobranchus testudinarius Cantraine, 1835 PLEBTES
Umbraculum umbraculum (Lightfoot, 1786) UMBAMED

Echinodermata *Molpadia musculus* Risso, 1826 MOLPMUC

Cnidaria *Actinauge richardi* (Marion, 1882) ACTARIC
Alcyonium acaule Marion, 1878 ALCYACA
Leptogorgia sarmentosa (Esper, 1789) LEPGSAR

Medits – Coordination meeting – Sète (France) April 16-17, 2019

Total number of classified individuals of the MEDITS reference list collected during the 2018 Medits survey

Group	Medits code	Scientific name	N. of specimens caught
Bony fish	ENGRENC	*Engraulis encrasicolus*	**111959**
	MERLMER	*Merluccius merluccius*	**19426**
	SARDPIL	*Sardina pilchardus*	**8187**
	MULLBAR	*Mullus barbatus*	**5849**
	TRACTRA	*Trachurus trachurus*	**5153**
	PHYIBLE	*Phycis blennoides*	**3957**
	TRACMED	*Trachurus mediterraneus*	**2800**
	SPICFLE	*Spicara flexuosa*	**1801**
	HELIDAC	*Helicolenus dactylopterus*	**1127**
	TRISCAP	*Trisopterus capelanus*	**1014**
	PAGEERY	*Pagellus erythrinus*	**829**
	BOOPBOO	*Boops boops*	**616**
	DIPLANN	*Diplodus annularis*	**514**
	MICMPOU	*Micromesistius poutassou*	**448**
	PAGEACA	*Pagellus acarne*	**316**
	ASPICUC	*Aspitrigla cuculus*	**296**
	SPICSMA	*Spicara smaris*	**295**
	LEPMBOS	*Lepidorhombus boscii*	**280**
	PAGEBOG	*Pagellus bogaraveo*	**272**
	EUTRGUR	*Eutrigla gurnardus*	**157**
	MULLSUR	*Mullus surmuletus*	**82**
	ZEUSFAB	*Zeus faber*	**77**
	LOPHBUD	*Lophius budegassa*	**76**
	SCOMSCO	*Scomber scombrus*	**68**
	CITHMAC	*Citharus linguatula*	**64**
	TRIGLUC	*Chelidonichthys lucerna*	**35**
	LOPHPIS	*Lophius piscatorius*	**9**
	TRIPLAS	*Trigloporus lastoviza*	**5**
	DIPLVUL	*Diplodus vulgaris*	**4**
	SOLEVUL	*Solea vulgaris*	**3**
	SCOMPNE	*Scomber colias*	**2**
	SPARPAG	*Pagrus pagrus*	**2**
	DIPLSAR	*Diplodus sargus*	**1**
	LITHMOR	*Lithognathus mormyrus*	**1**
	PSETMAX	*Psetta maxima*	**1**
	SPICMAE	*Spicara maena*	**1**

Group	Medits code	Scientific name	N. of specimens caught
Elasmobranchs	GALUMEL	*Galeus melastomus*	**3498**
	SCYOCAN	*Scyliorhinus canicula*	**647**
	ETMOSPI	*Etmopterus spinax*	**402**
	RAJACLA	*Raja clavata*	**109**
	SQUABLA	*Squalus blainvillei*	**96**
	RAJAOXY	*Dipturus oxyrhinchus*	**21**
	RAJAMIR	*Raja miraletus*	**16**
	RAJAPOL	*Raja polistigma*	**13**
	TORPMAR	*Torpedo marmorata*	**7**
	CENTGRA	*Centrophorus granulosus*	**5**
	RAJACIR	*Leucoraja circularis*	**5**
	RAJAAST	*Raja asterias*	**4**
	SCYMLIC	*Dalatias licha*	**4**
	HEXAGRI	*Hexanchus griseus*	**1**
Cephalopods	ILLECOI	*Illex coindetii*	**2105**
	ELEDCIR	*Eledone cirrhosa*	**354**
	LOLIVUL	*Loligo vulgaris*	**64**
	TODASAG	*Todarodes sagittatus*	**63**
	OCTOVUL	*Octopus vulgaris*	**32**
	SEPIOFF	*Sepia officinalis*	**5**
	ELEDMOS	*Eledone moschata*	**3**
Crustaceans	PAPELON	*Parapenaeus longirostris*	**20293**
	NEPRNOR	*Nephrops norvegicus*	**2208**
	ARISFOL	*Aristaeomorpha foliacea*	**1403**
	ARITANT	*Aristeus antennatus*	**176**
	SQUIMAN	*Squilla mantis*	**32**
	PENAKER	*Penaeus kerathurus*	**3**
	PALIELE	*Palinurus elephas*	**2**

Total number of sampled individuals for length distributions collected during the 2018 Medits survey

Group	Medits code	Scientific name	N. of specimens measured	% on the total catch
Bony fish	ASPICUC	*Aspitrigla cuculus*	296	100
	BOOPBOO	*Boops boops*	616	100
	TRIGLUC	*Chelidonichthys lucerna*	35	100
	CITHMAC	*Citharus linguatula*	64	100
	DIPLSAR	*Diplodus sargus*	1	100
	DIPLVUL	*Diplodus vulgaris*	4	100
	LEPMBOS	*Lepidorhombus boscii*	279	100
	LITHMOR	*Litognathus mormyrus*	1	100
	LOPHBUD	*Lophius budegassa*	76	100
	MULLSUR	*Mullus surmuletus*	82	100
	PAGEBOG	*Pagellus bogaraveo*	272	100
	SPARPAG	*Pagrus pagrus*	2	100
	PSETMAX	*Psetta maxima*	1	100
	SCOMPNE	*Scomber colias*	2	100
	SCOMSCO	*Scomber scombrus*	68	100
	SOLEVUL	*Solea vulgaris*	3	100
	SPICMAE	*Spicara maena*	1	100
	TRISCAP	*Trisopterus capelanus*	1014	100
	ZEUSFAB	*Zeus faber*	77	100
	EUTRGUR	*Eutrigla gurnardus*	155	99
	PHYIBLE	*Phycis blennoides*	3879	98
	HELIDAC	*Helicolenus dactylopterus*	1019	90
	LOPHPIS	*Lophius piscatorius*	8	89
	PAGEERY	*Pagellus erythrinus*	737	89
	PAGEACA	*Pagellus acarne*	250	79
	SPICFLE	*Spicara flexuosa*	1278	71
	SPICSMA	*Spicara smaris*	210	71
	DIPLANN	*Diplodus annularis*	342	67
	MICMPOU	*Micromesistius poutassou*	295	66
	MULLBAR	*Mullus barbatus*	2889	49
	MERLMER	*Merluccius merluccius*	8986	46
	TRACMED	*Trachurus mediterraneus*	1117	40
	TRIPLAS	*Trigloporus lastoviza*	2	40
	TRACTRA	*Trachurus trachurus*	1754	34
	SARDPIL	*Sardina pilchardus*	1878	23
	ENGRENC	*Engraulis encrasicolus*	3143	3

Group	Medits code	Scientific name	N. of specimens measured	% on the total catch
Elasmobranchs	CENTGRA	*Centrophorus granulosus*	5	100
	SCYMLIC	*Dalatias licha*	4	100
	ETMOSPI	*Etmopterus spinax*	402	100
	HEXAGRI	*Hexanchus griseus*	1	100
	RAJACIR	*Leucoraja circularis*	5	100
	RAJAAST	*Raja asterias*	4	100
	RAJACLA	*Raja clavata*	109	100
	RAJAMIR	*Raja miraletus*	16	100
	RAJAPOL	*Raja polistigma*	13	100
	SCYOCAN	*Scyliorhinus canicula*	647	100
	SQUABLA	*Squalus blainvillei*	96	100
	TORPMAR	*Torpedo marmorata*	7	100
	RAJAOXY	*Dipturus oxyrhinchus*	20	95
	GALUMEL	*Galeus melastomus*	2465	70
Cephalopods	ELEDCIR	*Eledone cirrhosa*	354	100
	ELEDMOS	*Eledone moschata*	3	100
	OCTOVUL	*Octopus vulgaris*	32	100
	SEPIOFF	*Sepia officinalis*	5	100
	ILLECOI	*Illex coindetii*	1727	82
	TODASAG	*Todarodes sagittatus*	44	70
	LOLIVUL	*Loligo vulgaris*	39	61
Crustaceans	ARISFOL	*Aristaeomorpha foliacea*	1403	100
	ARITANT	*Aristeus antennatus*	176	100
	NEPRNOR	*Nephrops norvegicus*	2208	100
	PALIELE	*Palinurus elephas*	1	100
	PENAKER	*Penaeus kerathurus*	3	100
	SQUIMAN	*Squilla mantis*	32	100
	PAPELON	*Parapenaeus longirostris*	8730	43

Total number of sampled individuals for sex and maturity collected during the 2018 Medits survey

	Medits code	Scientific name	N. of specimens for sex	% on the total catch	N. of specimens for maturity	% on the total catch
Bony fish	MERLMER	*Merluccius merluccius*	2114	11	2114	11
	MULLBAR	*Mullus barbatus*	2805	48	2805	48
	MULLSUR	*Mullus surmuletus*	65	79	65	79
Elasmobranchs	CENTGRA	*Centrophorus granulosus*	5	100	5	100
	ETMOSPI	*Etmopterus spinax*	402	100	402	100
	GALUMEL	*Galeus melastomus*	2465	70	2465	70
	HEXAGRI	*Hexanchus griseus*	1	100	1	100
	RAJAAST	*Raja asterias*	4	100	4	100
	RAJACIR	*Leucoraja circularis*	5	100	5	100
	RAJACLA	*Raja clavata*	109	100	108	99
	RAJAMIR	*Raja miraletus*	16	100	16	100
	RAJAOXY	*Dipturus oxyrhinchus*	20	95	20	95
	RAJAPOL	*Raja polistigma*	13	100	13	100
	SCYMLIC	*Dalatias licha*	4	100	4	100
	SCYOCAN	*Scyliorhinus canicula*	647	100	647	100
	SQUABLA	*Squalus blainvillei*	96	100	96	100
	TORPMAR	*Torpedo marmorata*	7	100	7	100
Cepha-lopods	ILLECOI	*Illex coindetii*	1560	74	1560	74
	LOLIVUL	*Loligo vulgaris*	24	38	24	38
Crustaceans	ARISFOL	*Aristaeomorpha foliacea*	1403	100	696	50
	ARITANT	*Aristeus antennatus*	176	100	162	92
	NEPRNOR	*Nephrops norvegicus*	2208	100	1025	46
	PAPELON	*Parapenaeus longirostris*	8730	43	4309	21

Total number of sampled individuals for individual weight collected during the 2018 Medits survey

	Medits code	Scientific name	N. of specimens for individual weight	% on the total catch
Bony fish	MERLMER	*Merluccius merluccius*	640	3
	MULLBAR	*Mullus barbatus*	548	9
	MULLSUR	*Mullus surmuletus*	80	98
Elasmobranchs	CENTGRA	*Centrophorus granulosus*	5	100
	ETMOSPI	*Etmopterus spinax*	291	72
	GALUMEL	*Galeus melastomus*	579	17
	HEXAGRI	*Hexanchus griseus*	1	100
	RAJAAST	*Raja asterias*	4	100
	RAJACIR	*Leucoraja circularis*	5	100
	RAJACLA	*Raja clavata*	108	99
	RAJAMIR	*Raja miraletus*	16	100
	RAJAOXY	*Dipturus oxyrhinchus*	20	95
	RAJAPOL	*Raja polistigma*	13	100
	SCYMLIC	*Dalatias licha*	4	100
	SCYOCAN	*Scyliorhinus canicula*	424	66
	SQUABLA	*Squalus blainvillei*	95	100
	TORPMAR	*Torpedo marmorata*	7	100
Cepha-lopods	ILLECOI	*Illex coindetii*	608	29
	LOLIVUL	*Loligo vulgaris*	39	61
Crustaceans	ARISFOL	*Aristaeomorpha foliacea*	447	32
	ARITANT	*Aristeus antennatus*	176	100
	NEPRNOR	*Nephrops norvegicus*	599	27
	PAPELON	*Parapenaeus longirostris*	472	2

Number of samples of hard tissues collected for ageing by target species during the 2018 Medits survey

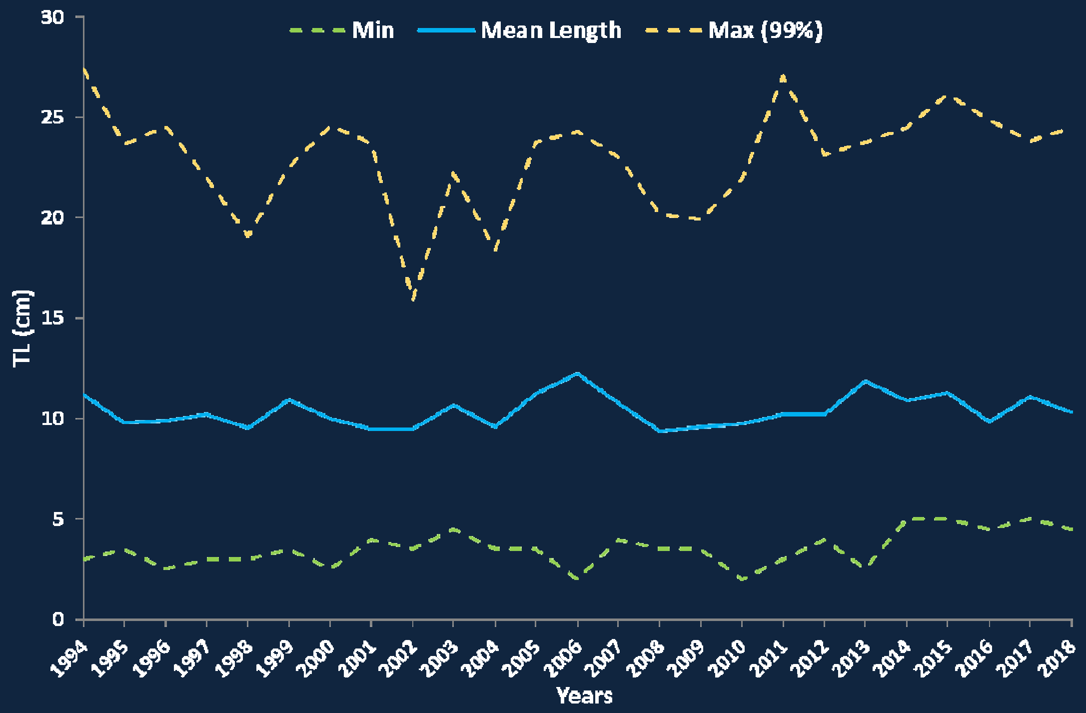
	Number of otoliths collected	Size range covered
Merluccius merluccius	385	4.5 - 65.5 cm TL
Mullus barbatus	510	9.5 - 24.5 cm TL
Mullus surmuletus	61	6.0 - 25.0 cm TL

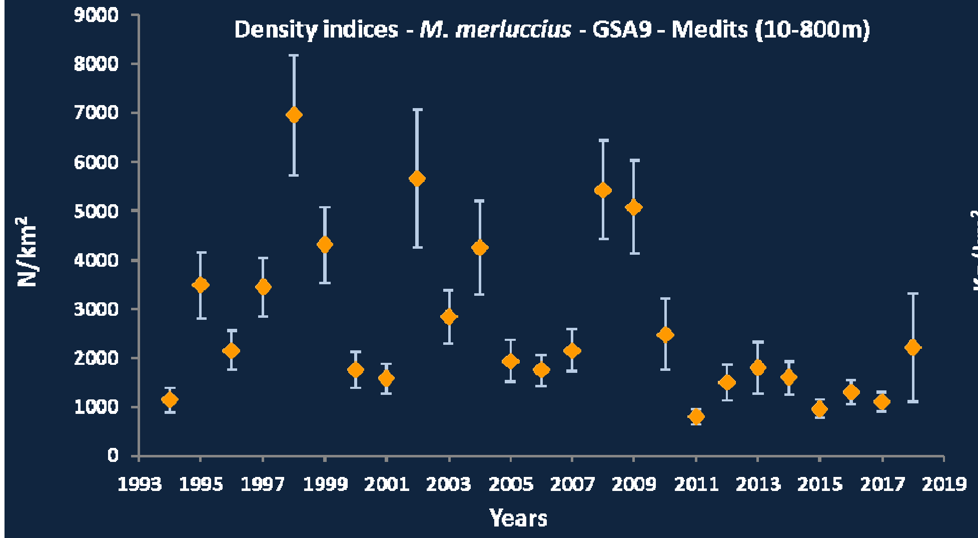
Merluccius merluccius

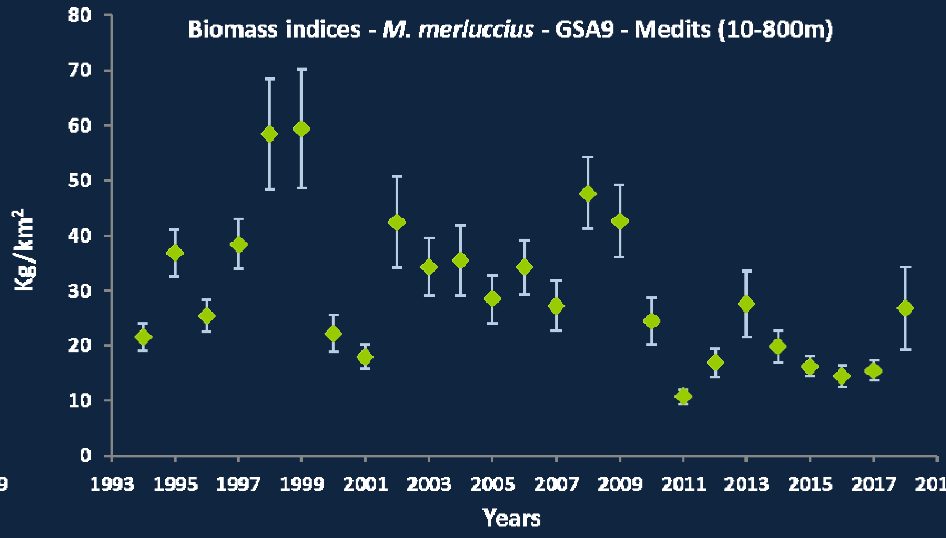
Historical trends of the demographic structure, density and biomass indices

Spearman's ρ

Density	Biomass	Mean length
-0.422	-0.496	0.258

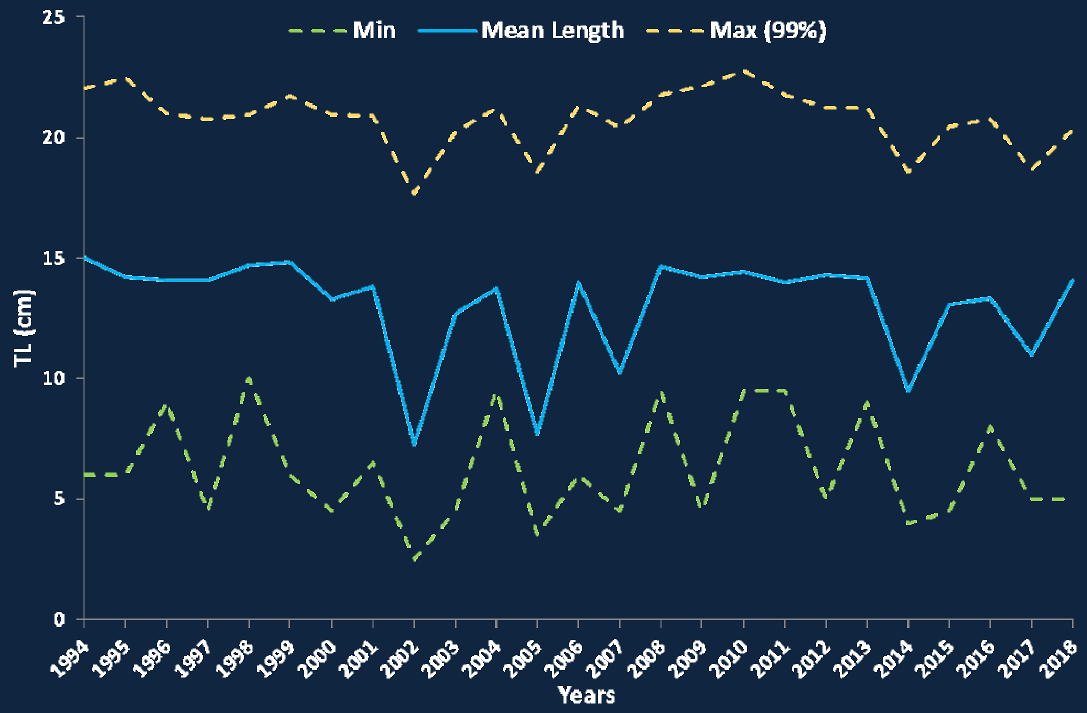






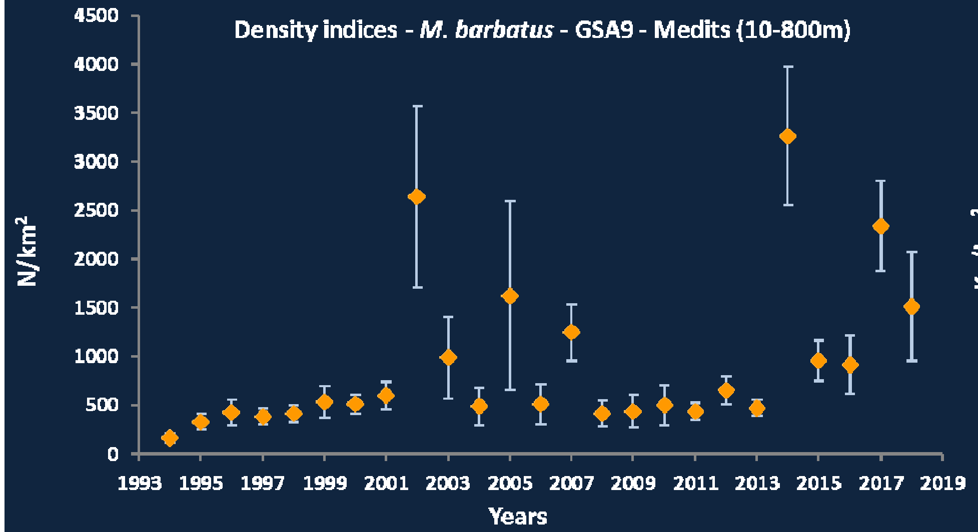
Mullus barbatus

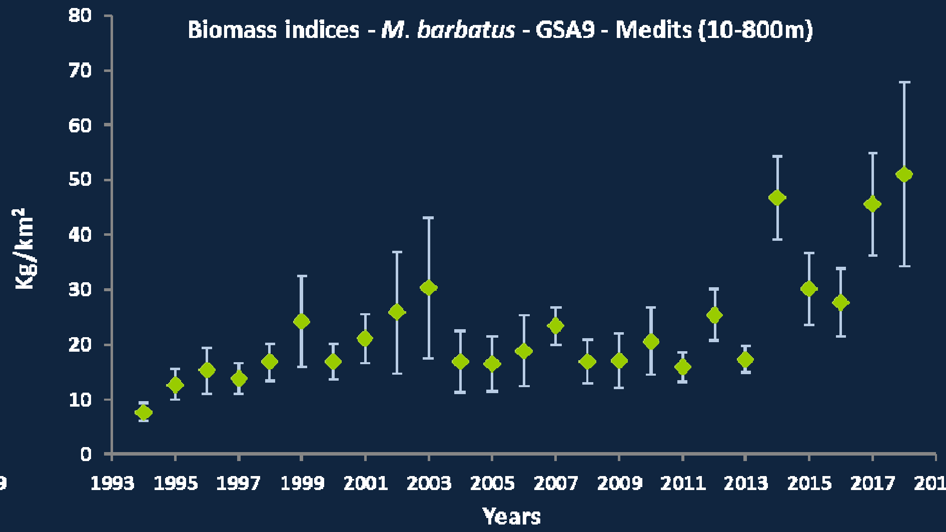
Historical trends of the demographic structure, density and biomass indices



Spearman's ρ

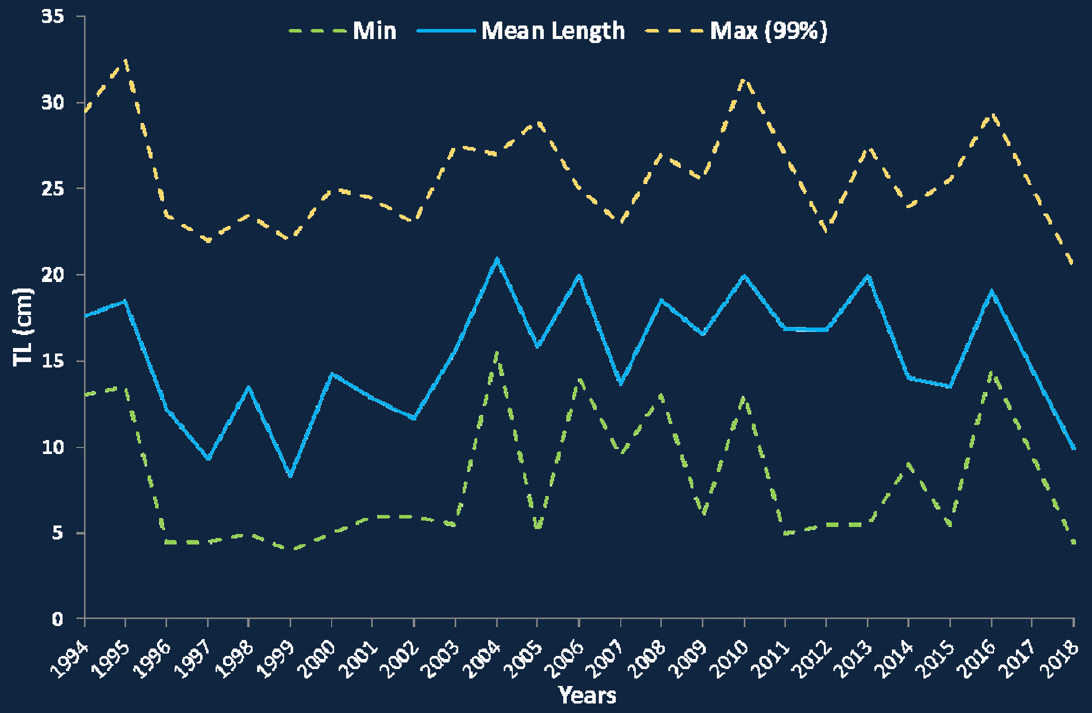
Density	Biomass	Mean length
0.562	0.701	-0.311





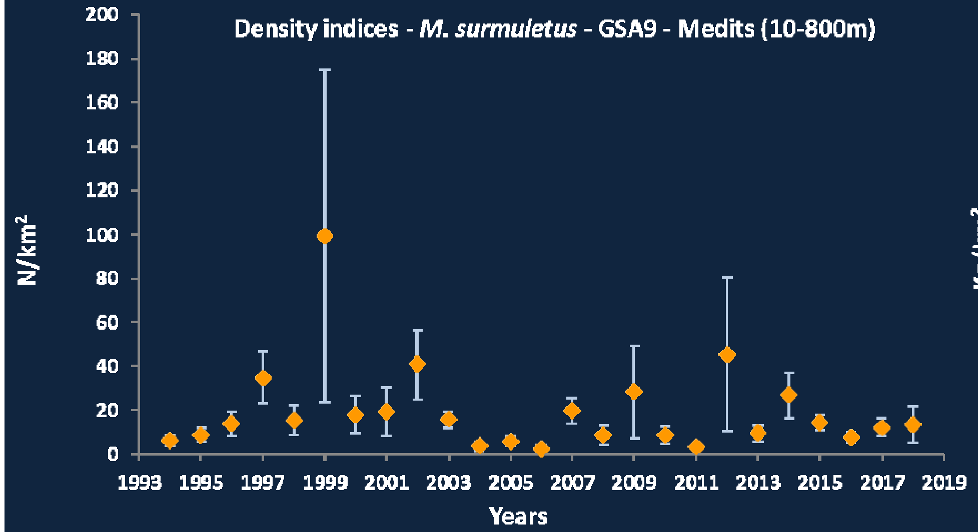
Mullus surmuletus

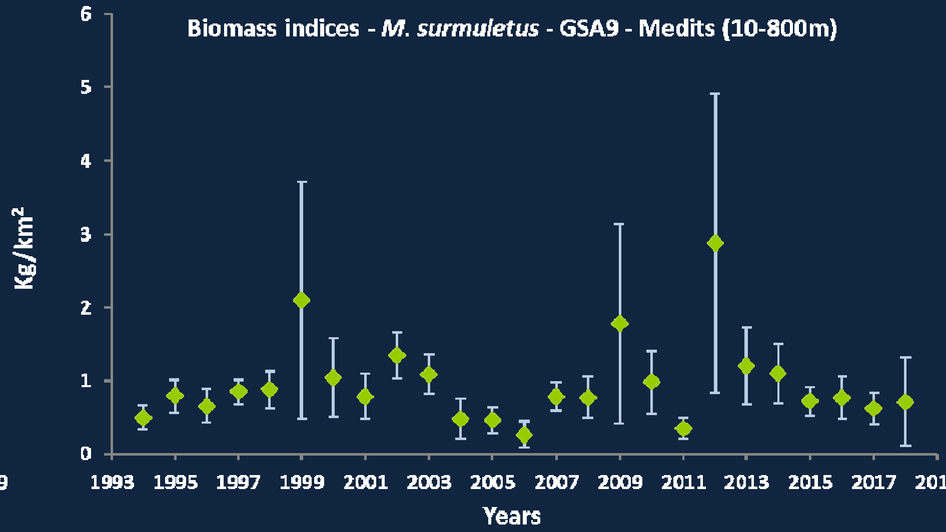
Historical trends of the demographic structure, density and biomass indices



Spearman's ρ

Density	Biomass	Mean length
-0.112	-0.044	0.218



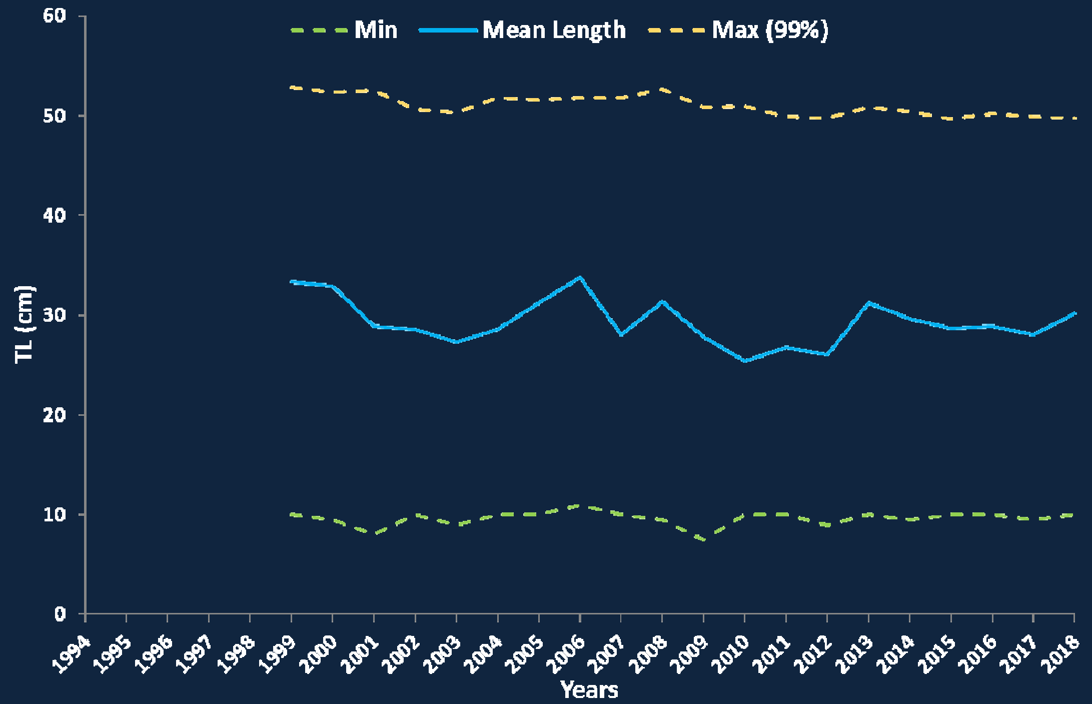


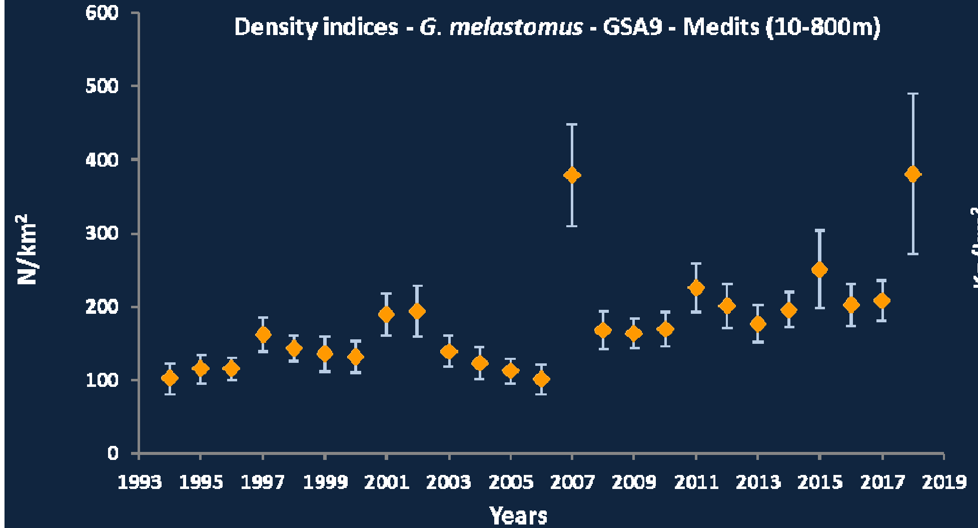
Galeus melastomus

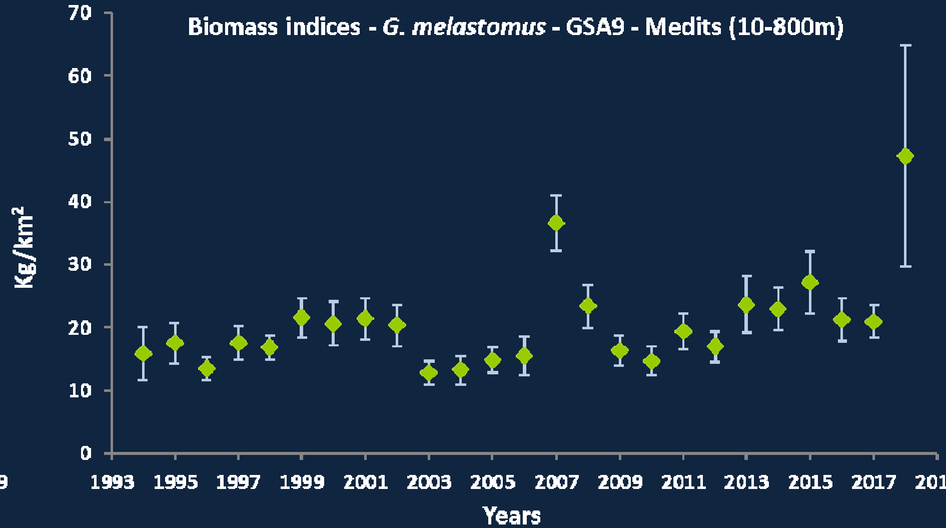
Historical trends of the demographic structure, density and biomass indices

Spearman's ρ

Density	Biomass	Mean length
0.744	0.462	-0.242







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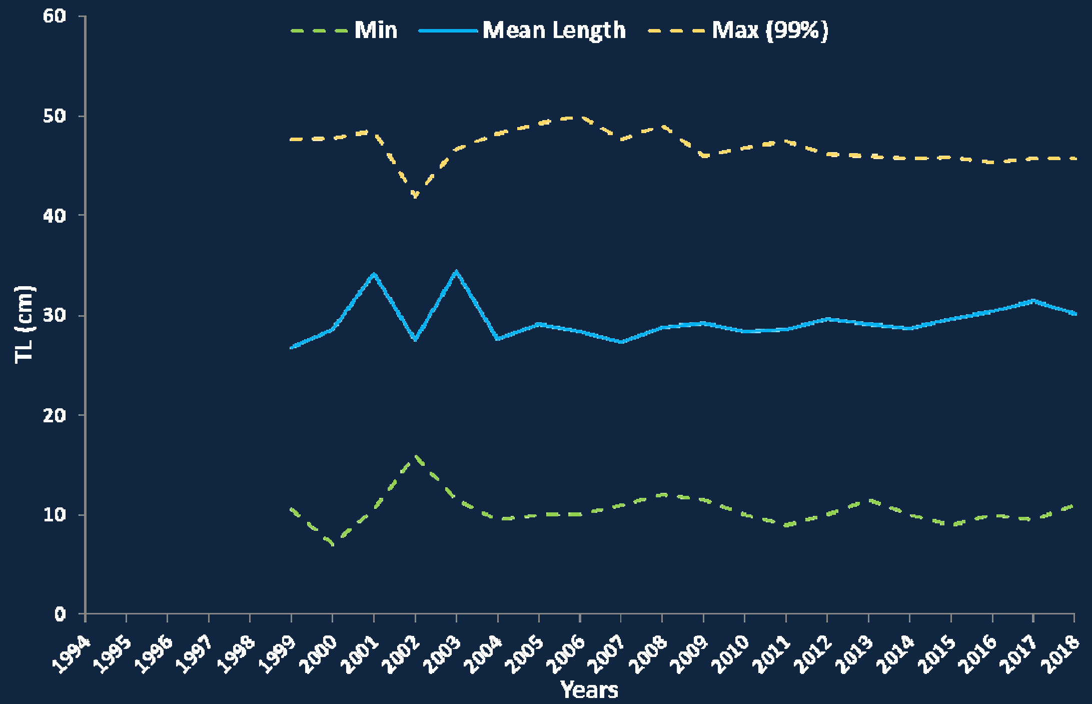
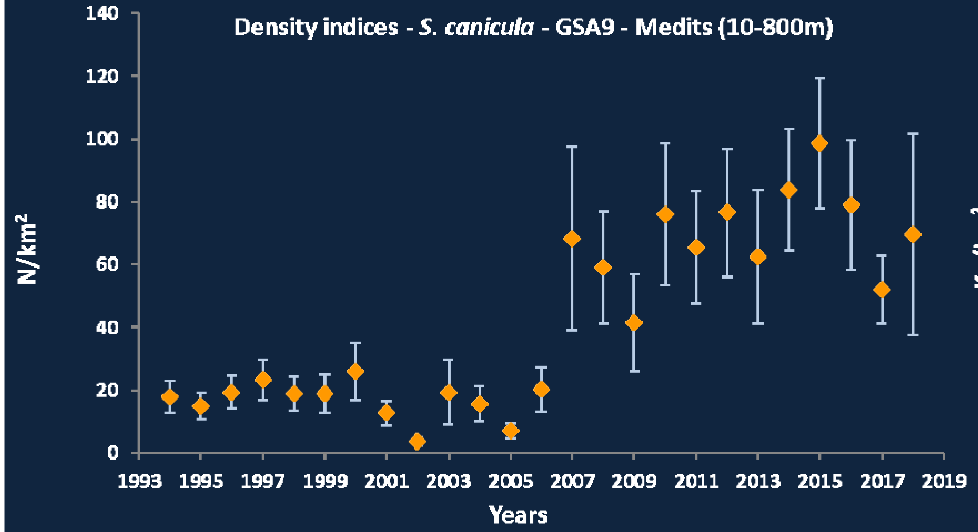
Scyliorhinus canicula

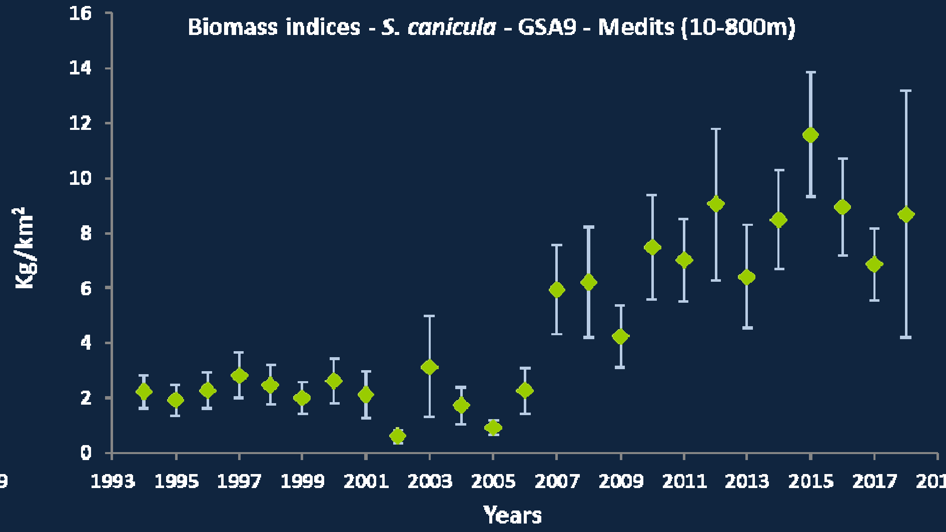
Historical trends of the demographic structure, density and biomass indices



Spearman's ρ

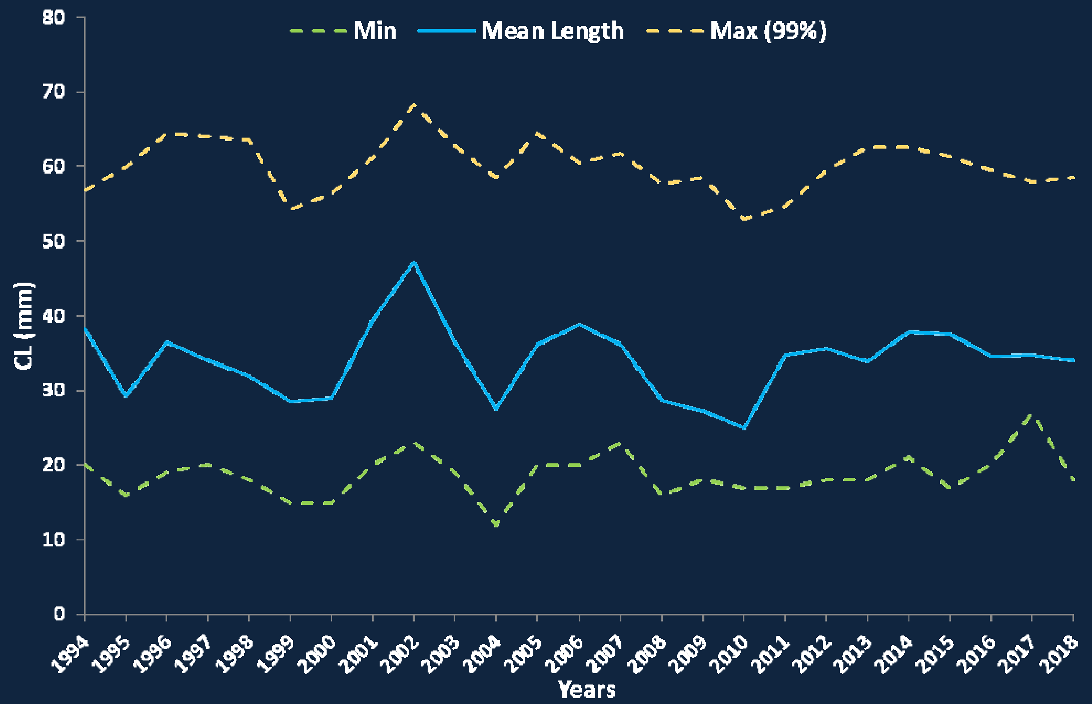
Density	Biomass	Mean length
0.772	0.788	0.412





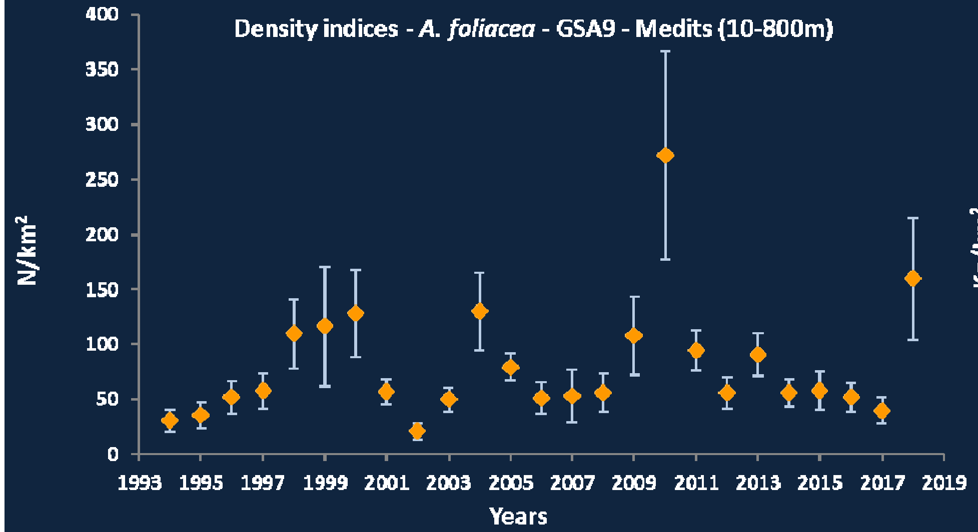
Aristaeomorpha foliacea

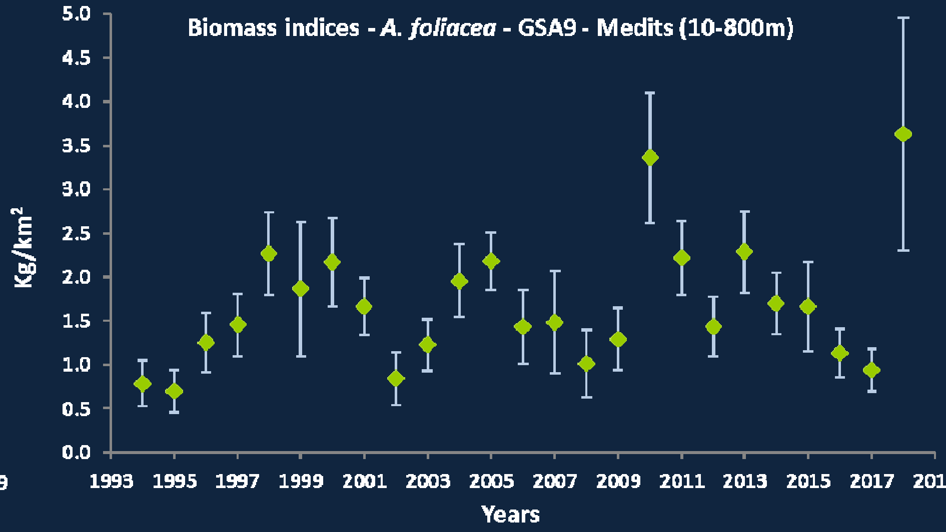
Historical trends of the demographic structure, density and biomass indices



Spearman's ρ

Density	Biomass	Mean length
0.198	0.262	-0.048

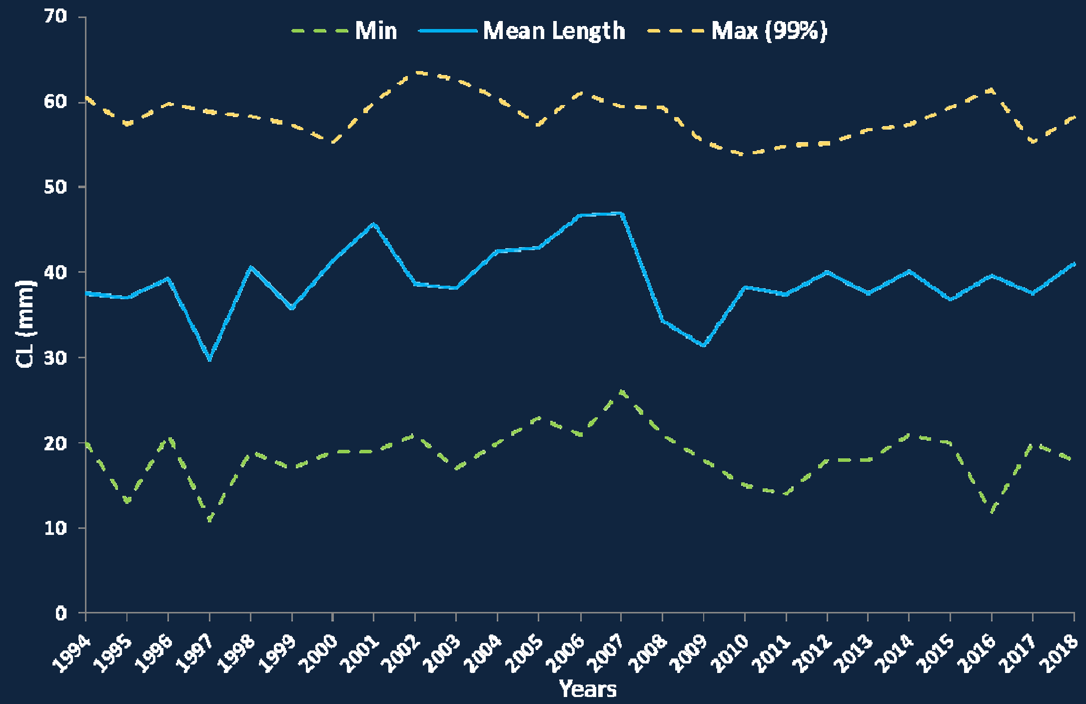


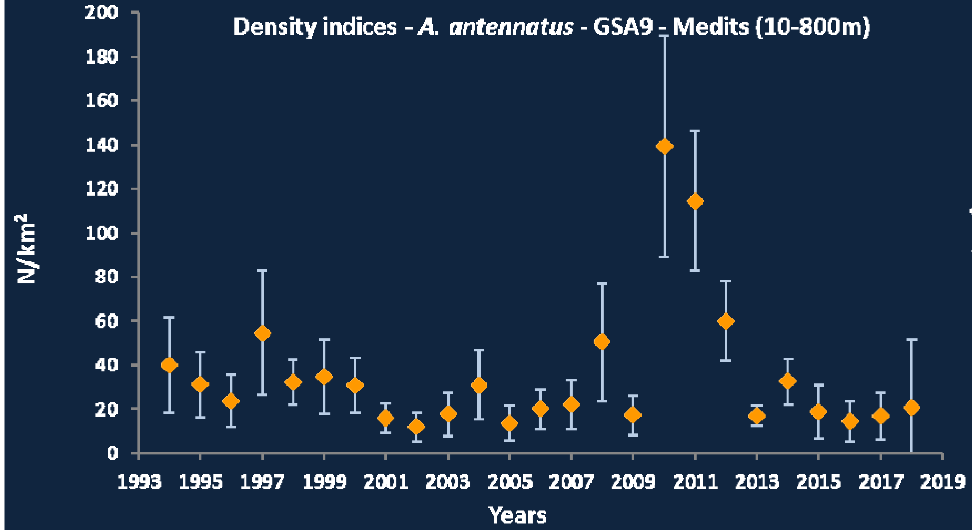


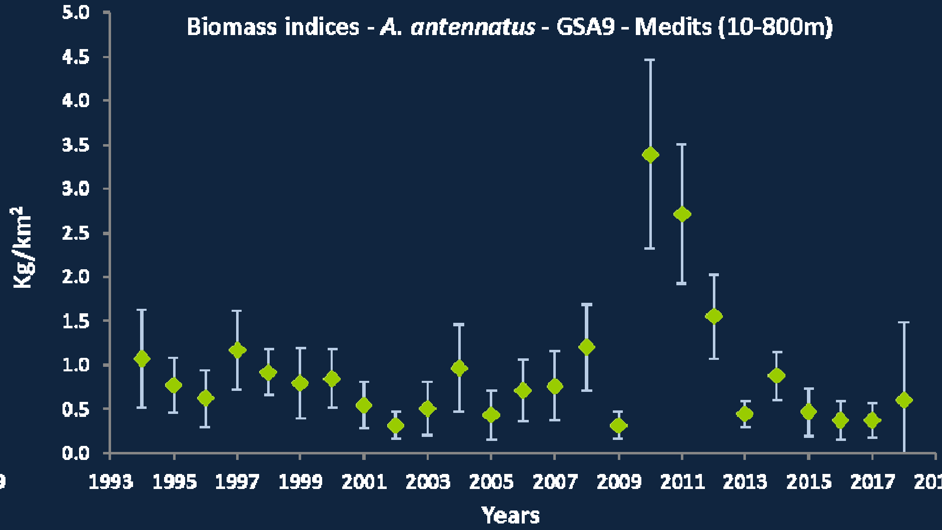
Aristeus antennatus

Historical trends of the demographic structure, density and biomass indices

Spearman's ρ		
Density	Biomass	Mean length
-0.203	-0.230	0.039







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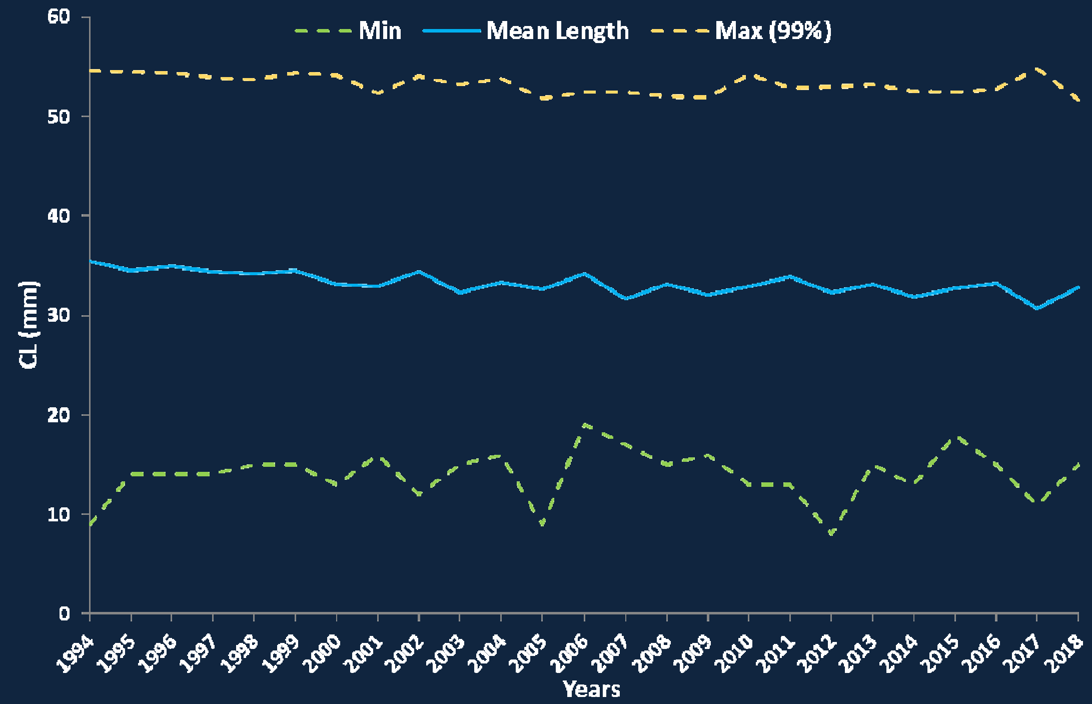
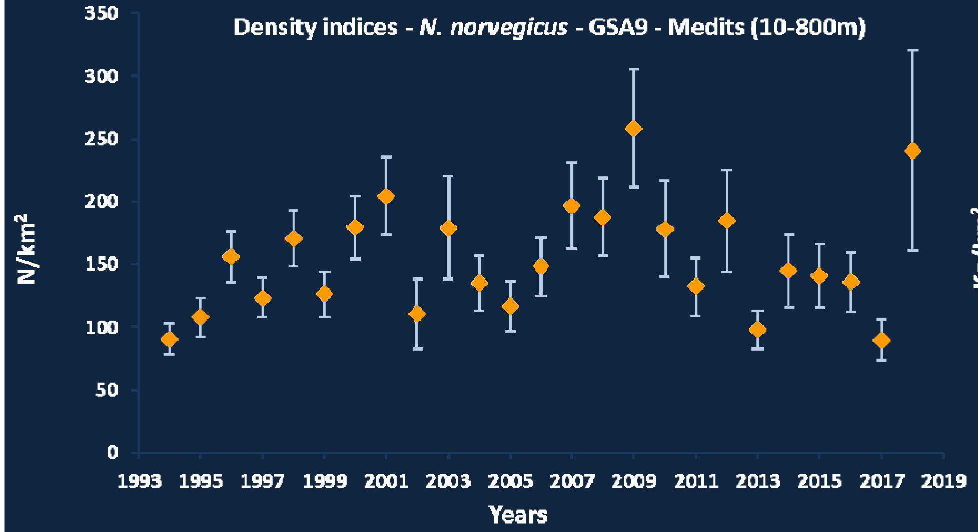
Nephrops norvegicus

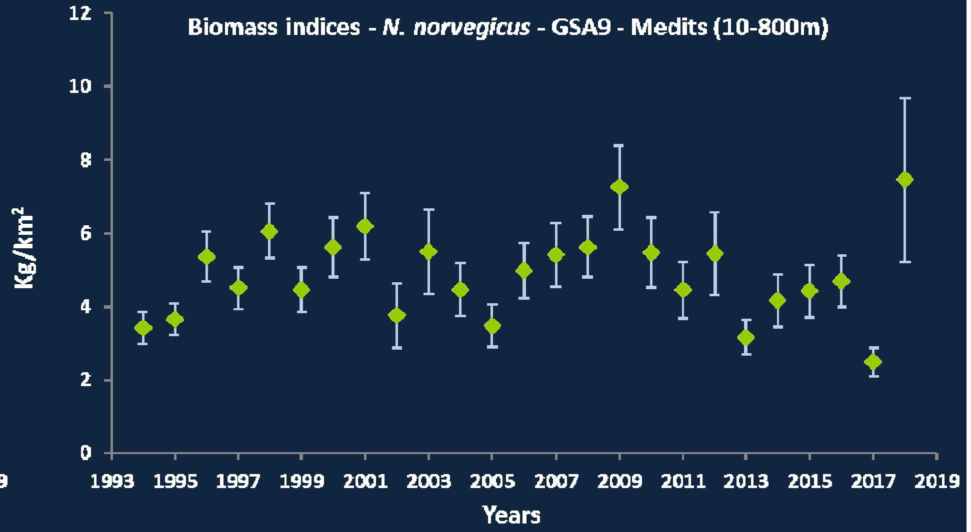
Historical trends of the demographic structure, density and biomass indices



Spearman's ρ

Density	Biomass	Mean length
0.169	-0.008	-0.685



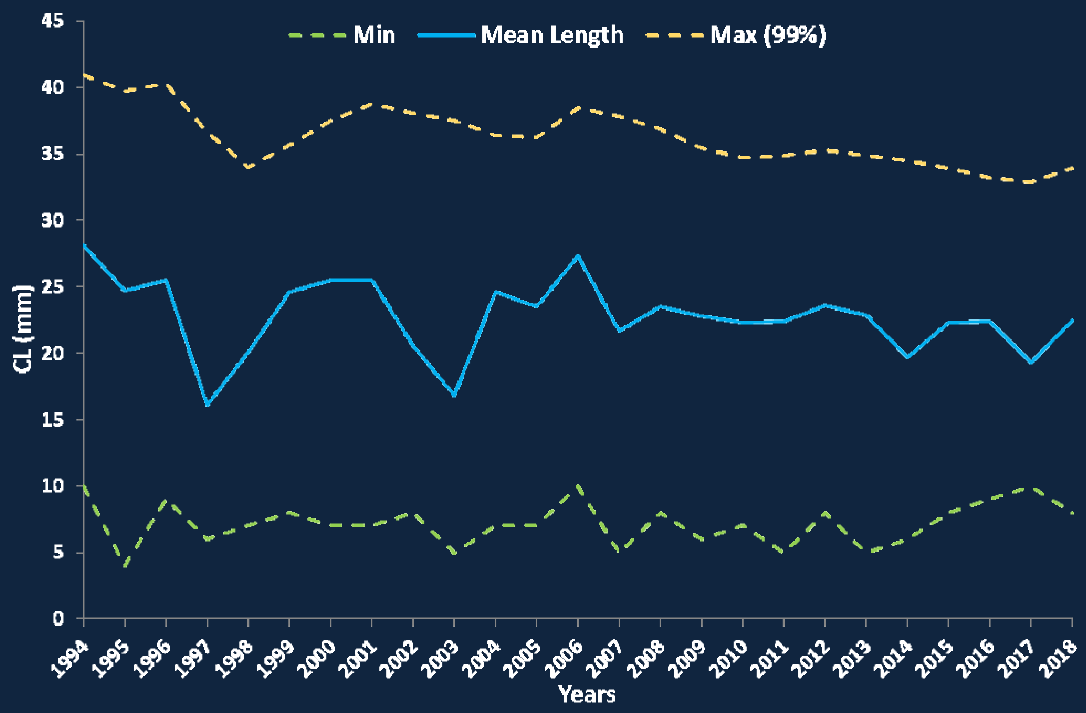


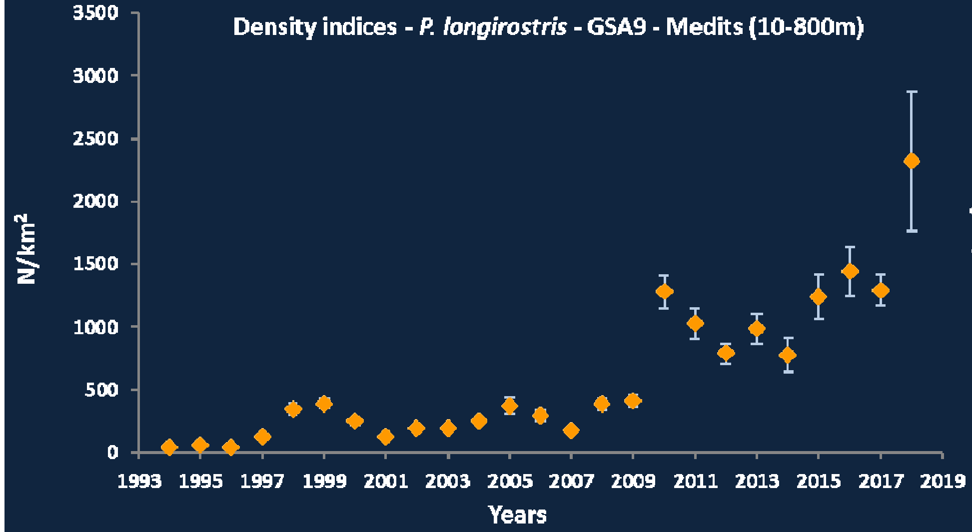
Parapenaeus longirostris

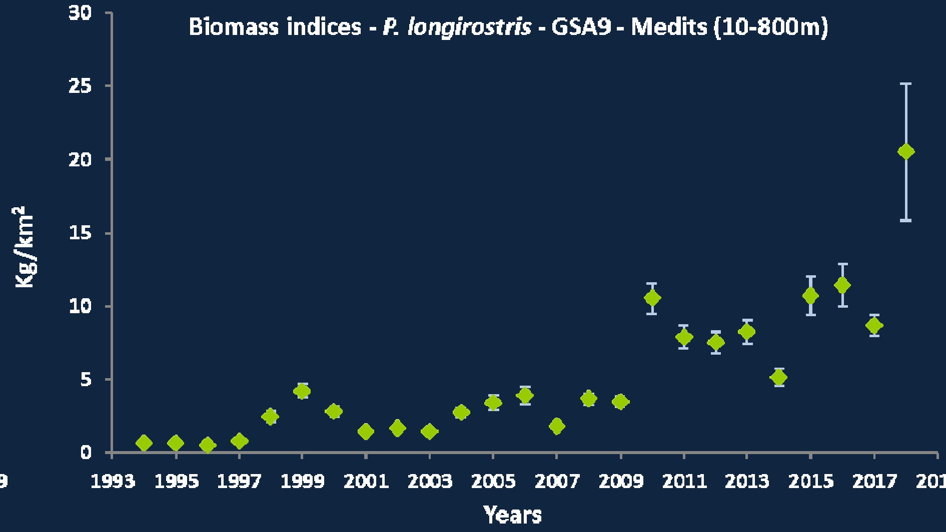
Historical trends of the demographic structure, density and biomass indices

Spearman's ρ

Density	Biomass	Mean length
0.888	0.895	-0.377





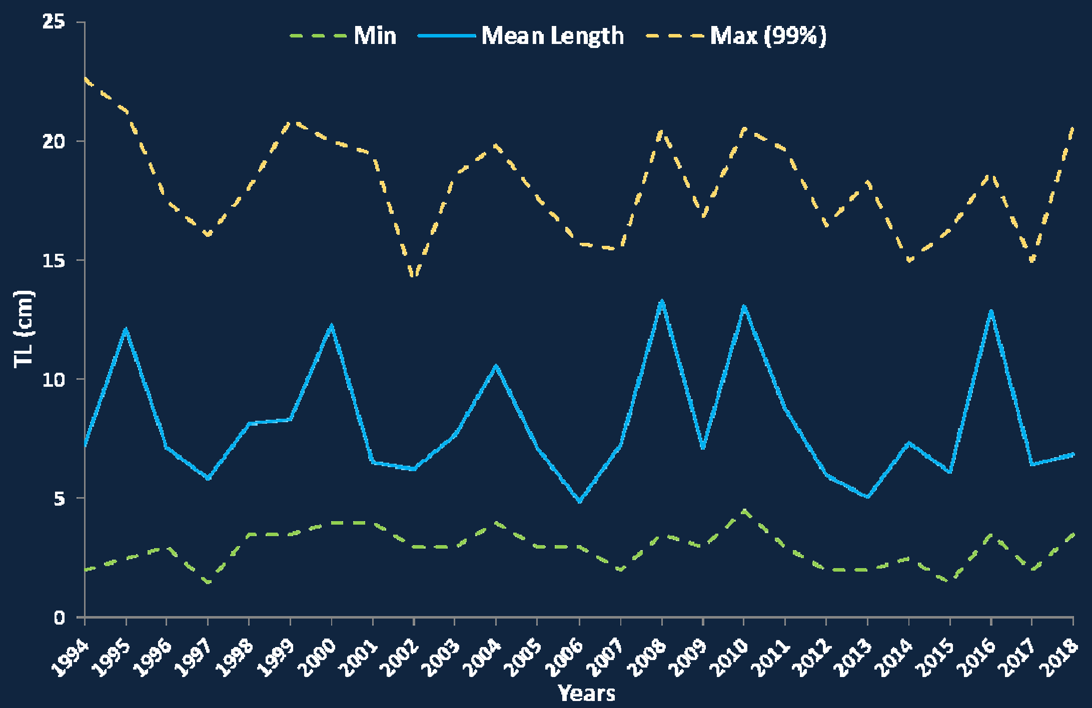


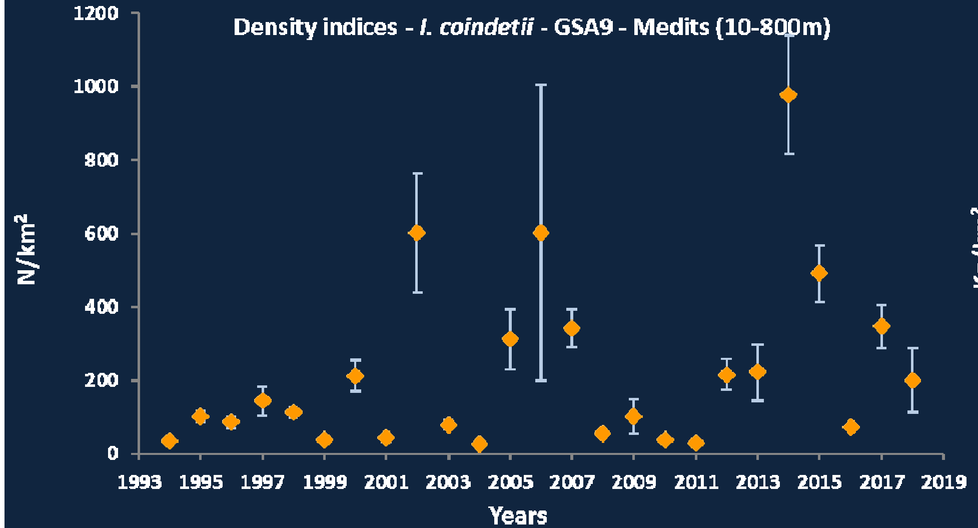
Illex coindetii

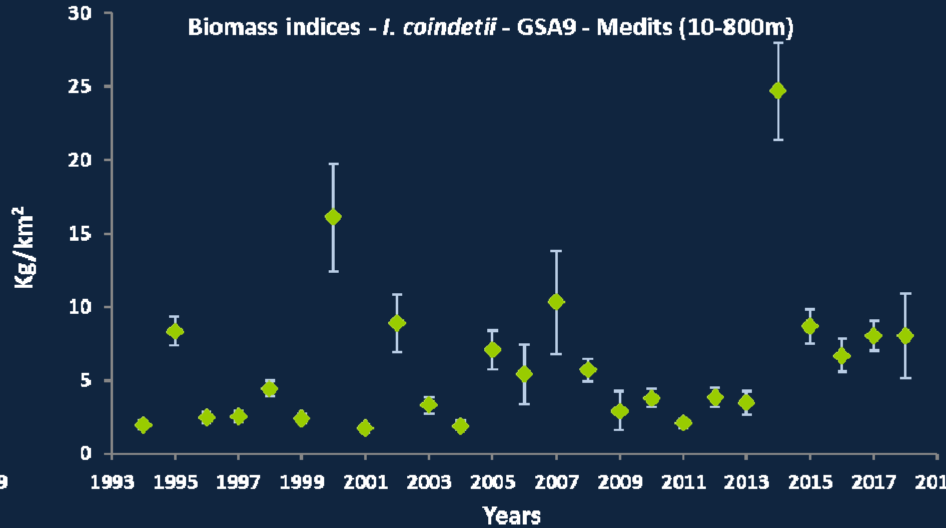
Historical trends of the demographic structure, density and biomass indices

Spearman's ρ

Density	Biomass	Mean length
0.335	0.350	-0.147





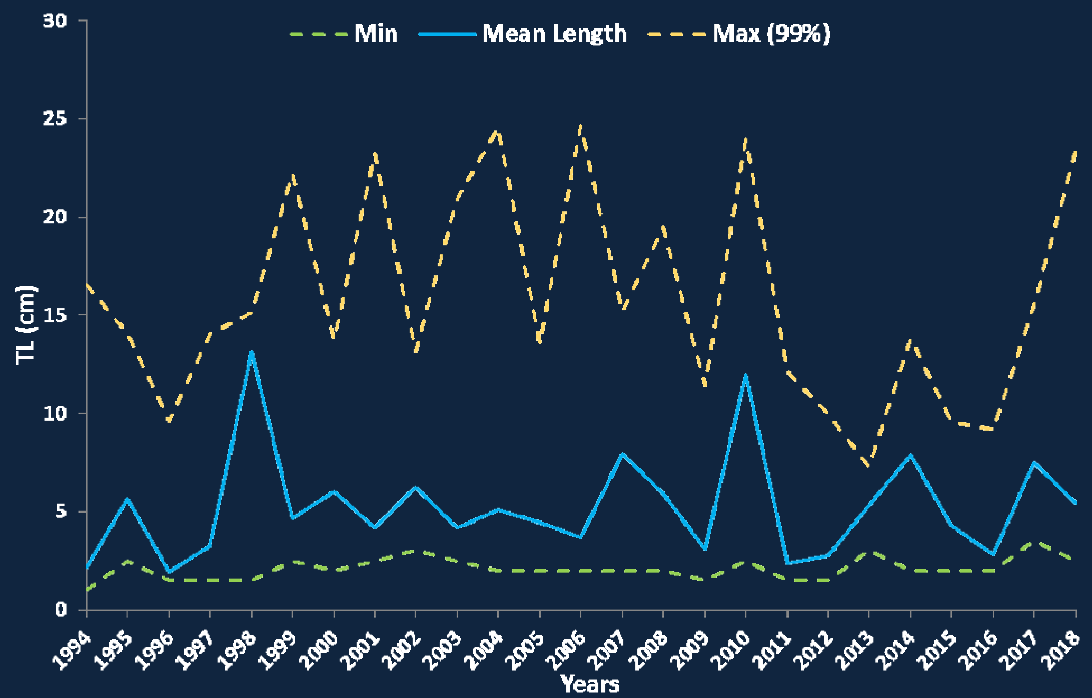


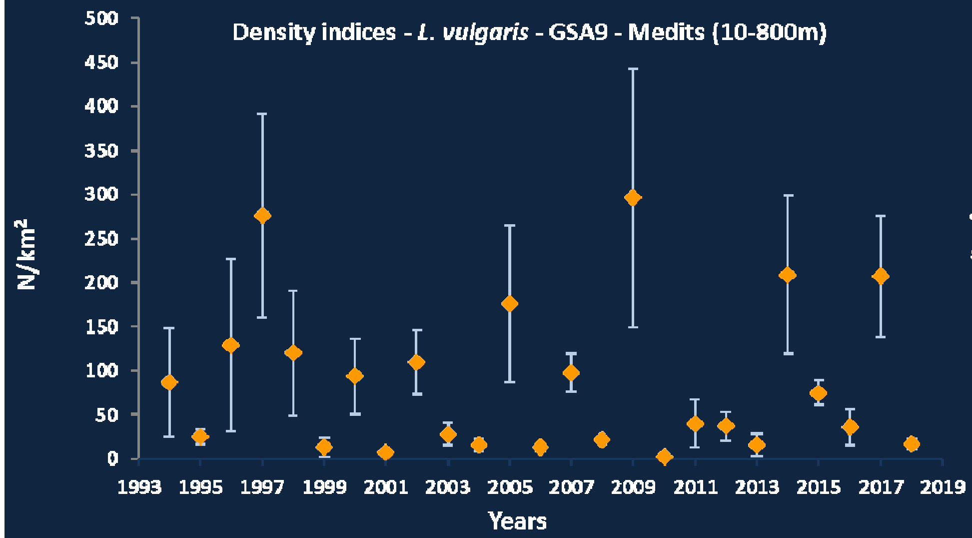
Loligo vulgaris

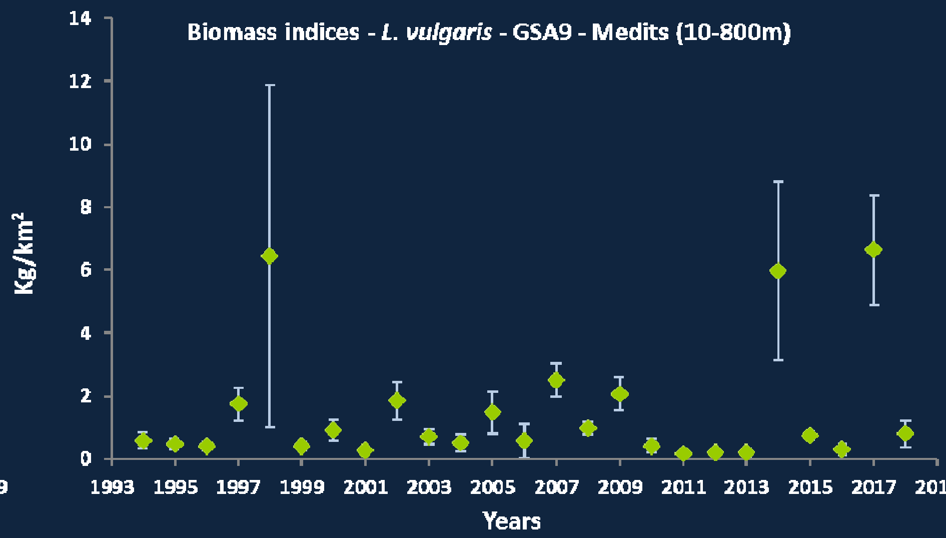
Historical trends of the demographic structure, density and biomass indices

Spearman's ρ

Density	Biomass	Mean length
-0.059	0.009	0.139







Results of Spearman's rho test

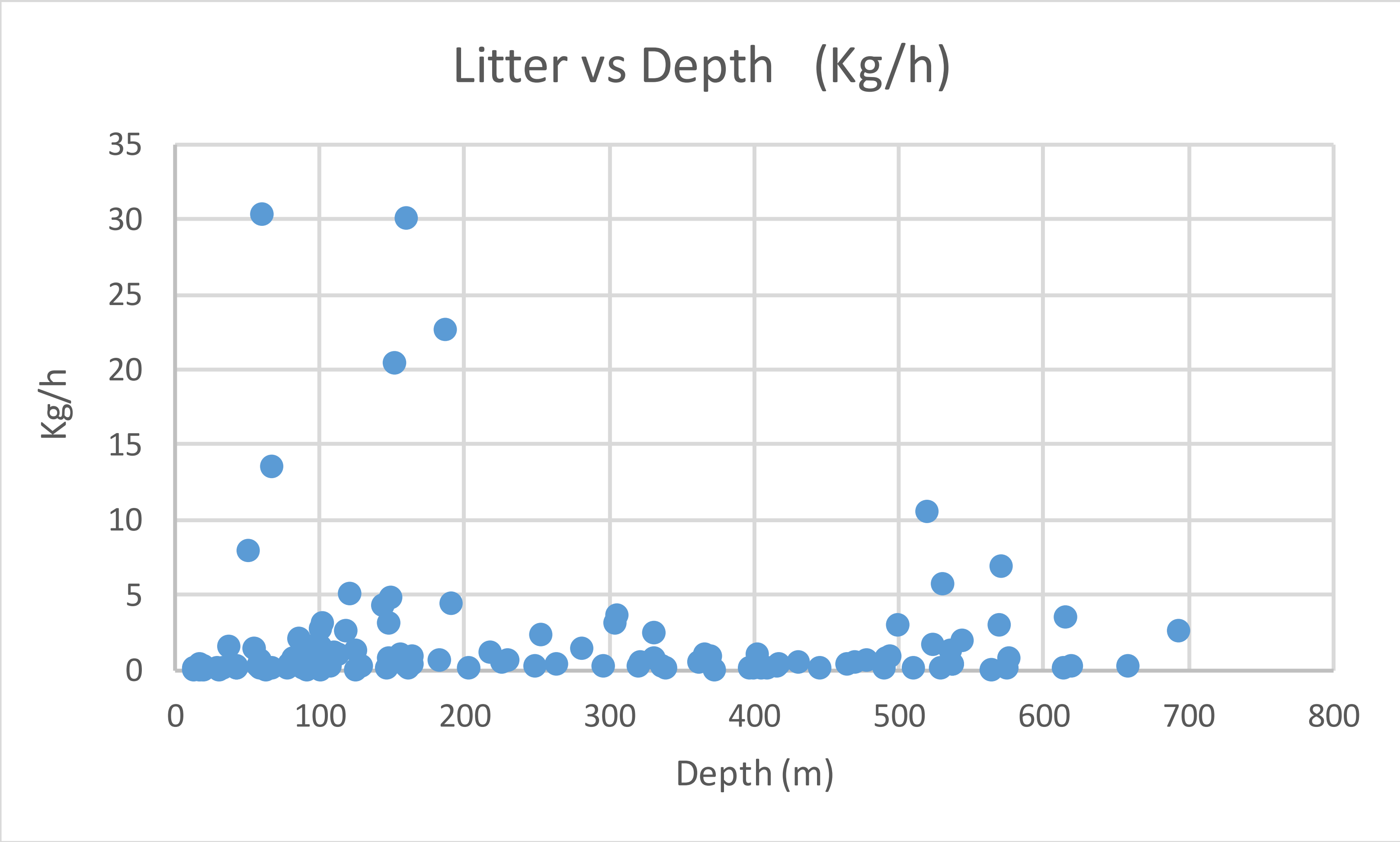
	Density		Biomass		Mean length	
	ρ value	significance	ρ value	significance	ρ value	significance
M. merluccius	-0.422	*	-0.496	*	0.258	n.s
M. barbatus	0.562	**	0.701	***	-0.311	n.s
M. surmuletus	-0.112	n.s.	-0.044	n.s.	0.218	n.s
N. norvegicus	0.169	n.s.	-0.008	n.s.	-0.685	***
P. longirostris	0.888	***	0.895	***	-0.377	n.s
A. foliacea	0.198	n.s.	0.262	n.s.	-0.048	n.s
A. antennatus	-0.203	n.s.	-0.230	n.s.	0.039	n.s
I. coindetii	0.335	n.s.	0.350	n.s.	-0.147	n.s
L. vulgaris	-0.059	n.s.	0.009	n.s.	0.139	n.s
G. melastomus	0.744	***	0.462	*	-0.242	n.s
S. canicula	0.772	***	0.788	***	0.412	n.s

n.s. = not significant   * = p<0.05   ** = p<0.01   *** = p<0.001

Litter was recorded in all hauls and classified according to the following scheme:

Type of Litter		Weight (kg) (mandatory for category and sub-category)	Number (facultative for subcategory)	Number (mandatory for category)
	a. Bags			
L1 Plastic	**b**. Bottles			
	c. Food wrappers			
	d. Sheets (table covers, e.t.c.)			
	e. Hard plastic objects (crates, containers, tubes, ash-trays, lids, etc.) ()			
	f. Fishing nets			
	g. Fishing lines			
	h. Other fishing related (pots, floats, etc.) ()			
	i. Ropes/strapping bands			
	j others			
	a. Tyres			
L2 Rubber	**b**. Other (gloves, boots/shoes, olskins etc.) ()			
	a. Beverage cans			
	b. Other food cans/wrappers			
	c. Middle size containers (of paint, oil, chemicals)			
	d. Large metalic objects (barrels, pieces of machinery, electric appliances) ()			
L3 Metal	**e**. Cables			
	f. Fishing related (hooks, spears, etc.) ()			
	a. Bottles			
L4	**b**. Pieces of glass			
Glass / Ceramic	**c**. Ceramic jars			
	d. Large objects (specify)			
	a. Clothing (clothes, shoes)			
L5 Cloth (textil)/ natural fibres	**b**. Large pieces (carpets, mattresses, etc) (specify)			
	c. Natural ropes			
	d. Sanitaries (diapers, cotton buds, etc.)			
L6 Wood processed (palettes, crates, etc.)				
L7 Paper and cardboard				
L8 Other (specify)				
L9 Unspecified				

Recording of litter



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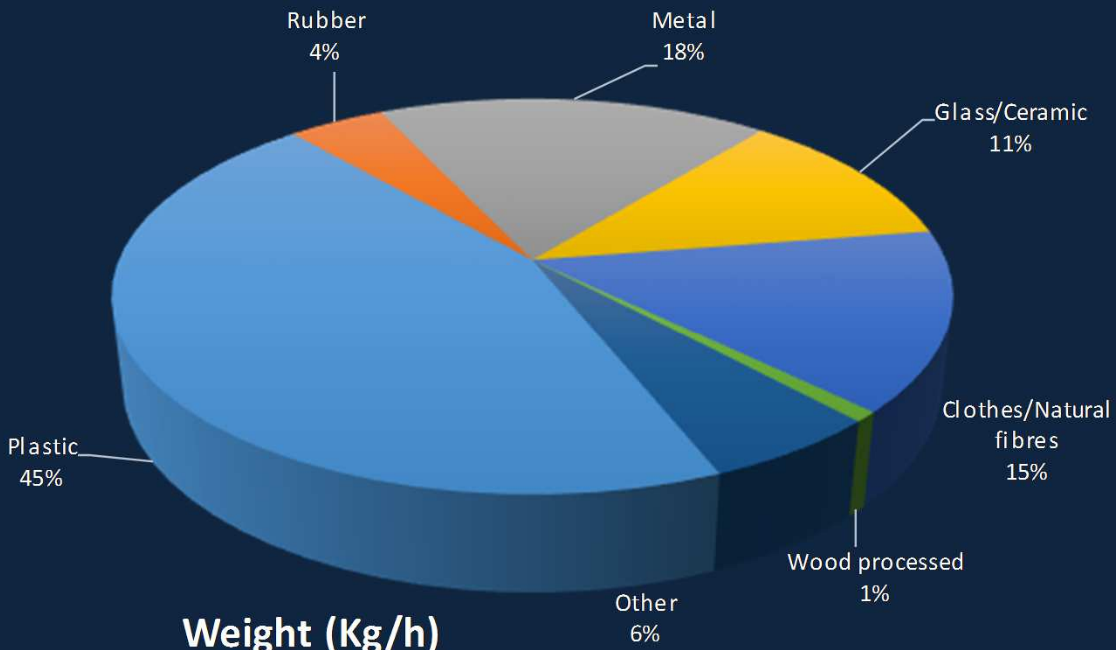
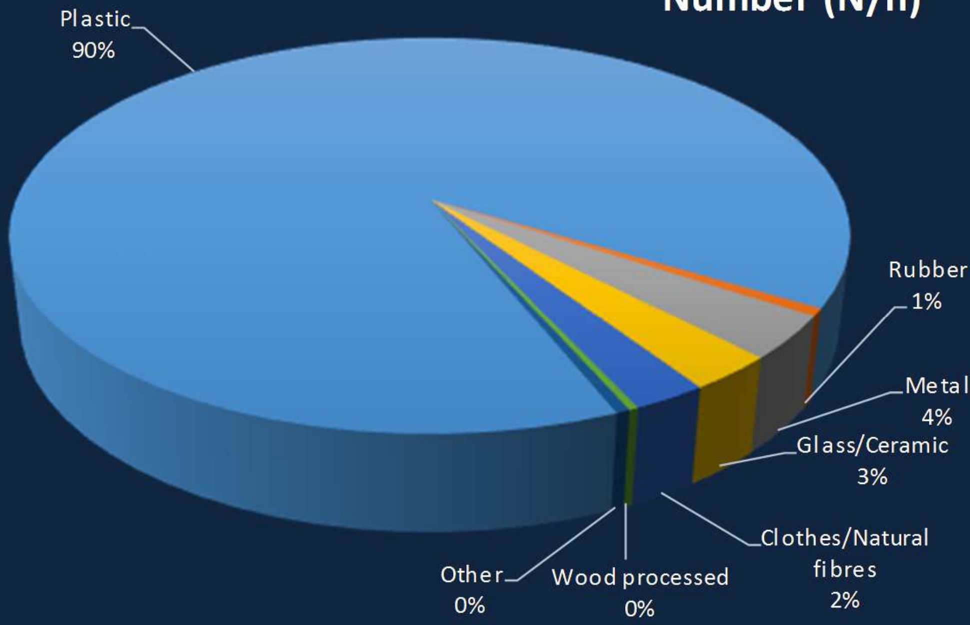
Litter 2018



Weight (Kg/h)

Number (N/h)



	N OF HAULS	OCCURRENCE %
Plastic	108	90.0
Rubber	10	8.3
Metal	33	27.5
Glass/Ceramic	36	30.0
Clothes/Natural fibres	36	30.0
Wood processed	4	3.3
Other	6	5.0

Medits – Coordination meeting – Sète (France) April 16-17, 2019

Periods of the Medits survey and schedule for 2019

THANK YOU FOR YOUR ATTENTION!

Consiglio Nazionale delle Ricerche
IRBIM - Istituto per le Risorse Biologiche e le Biotecnologie Marine, SS Mazara del Vallo

MEDITS 2018
GSA 16 - South of Sicily
Report

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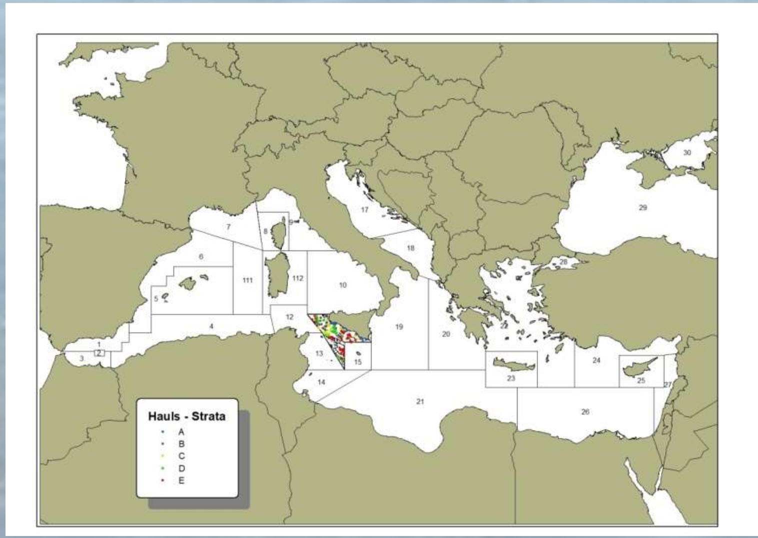
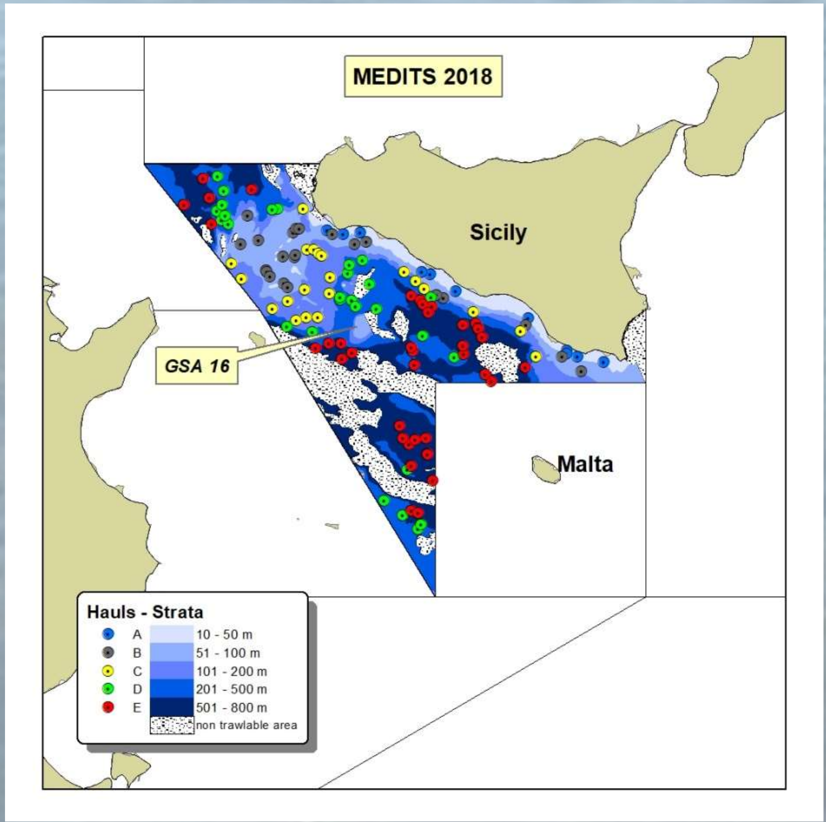
2019 MEDITS Coordination meeting
Sète, France
April 16-17, 2019

- **Geographical area:** GSA 16 – South of Sicily

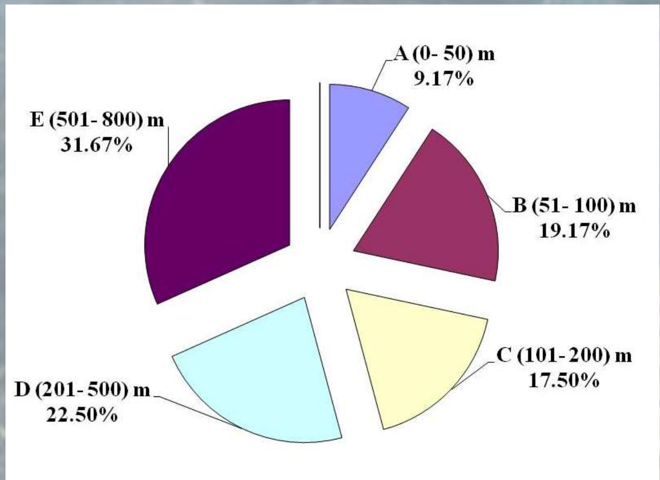


- **Survey period:** July 24 – August 21,2018
- **Vessel:** M/B S.Anna used since 1994 was demolished. The M/B Pegaso of similar characterisitcs was used

➢ **Number of hauls:** 120

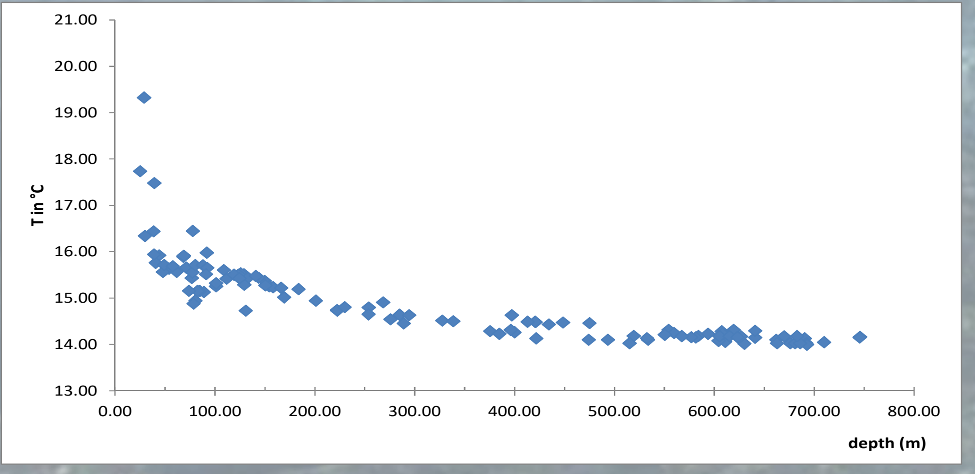


Stratum (m)	N° of hauls
A: 10-50	11
B: 51-100	23
C:101-200	21
D:201-500	27
E:501-800	38
	120



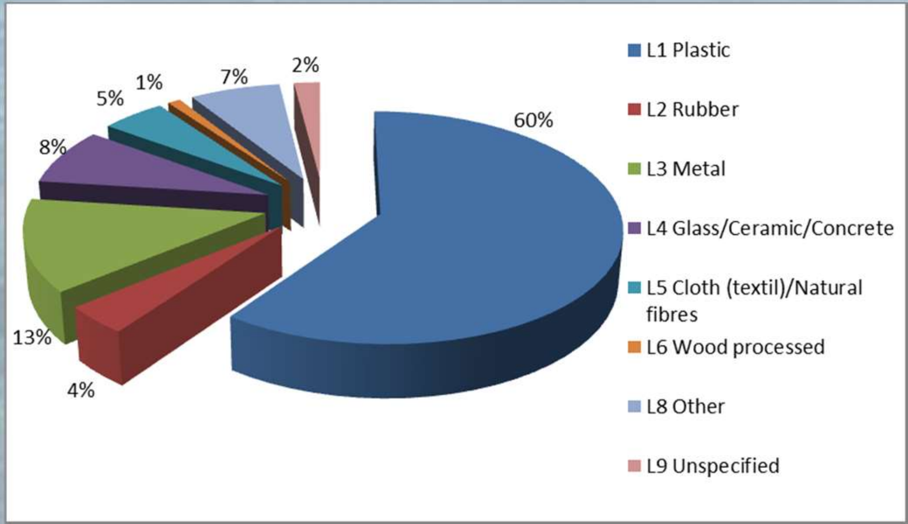
- **SiMRAD equipment:** due to a malfunction HO and VO were not recorded

- **Star-oddi probe:** Temperature/depth profile was recorded in all 120 hauls



➢ Litter recording:

MEDITS 2018	
% of dirty hauls	88%
Total weight (kg)	775
Total number of items	641



➢ Macrobenthos processing:

Sheet for proposal of inclusion of new species and code

Name of scientist: Daniela Massi & Antonino Titone Date: 12.04.2019

GSA: 16

Proposed Code		Scientific name	Reference for scientific name description	Geographical position	Stratum
Genus	Species				
ANTA	DEN	Antalis dentalis		Lat.i.361449; Long.i.131052	E
CARD	DES	Acanthocardia deshayesii		Lat.i.372819; Long.i.125486	B
CUMI	RET	Cumia reticulata		Lat.i.354606; Long.i.143830	C
MODI	SPP	Modiolus spp.		Lat.i.363859; Long.i.145753	A
PROT	SPP	Protula spp.		Lat.i.340227; Long.i.120401	B

List of new species proposed in 2018.....still pending

Sheet for proposal of inclusion of new species and code

Name of scientist: Daniela Massi & Antonino Titone Date: 16.07.2018

GSA: 16

Proposed Code		Scientific name	Reference for scientific name description	Geographical position	Stratum
Genus	Species				
CARD	DES	Acanthocardia deshayesii		Lat.i.372819; Long.i.125486	B
ANTP	SUB	Antipathella subpinnata		Lat.i.373815; Long.i.114267	D
AREN	MAR	Arenicola marina		Lat.i.371519; Long.i.131547	C
CALX	NIC	Calyx nicaeensis		Lat.i.371396; Long.i.120570	E
FLEX	SPP	Flexopecten spp.		Lat.i.373815; Long.i.114267	D
PARN	LAR	Parantipathes larix		Lat.i.371619; Long.i.124434	C-D
PLES	NAR	Plesionika narval		Lat.i.370922; Long.i.125836	D

➢ Classified taxa

	Faunistic category	N. of species	Total weight (kg)	Total number
Ae	Fish Chondrichthyes	26	1000.79	3465
Ao	Fish Osteichthyes	115	2161.73	123104
B	Crustaceans Decapoda	48	232.68	48964
Bci	Crustaceans Cirripedia	1	0.11	114
Bis	Crustaceans Isopoda	1	0.00	1
Bst	Crustaceans Stomatopoda	2	0.53	19
C	Cephalopoda	26	260.13	3362475
Dmb	Mollusca Bivalvia	2	0.01	3
Dmg	Mollusca Gastropoda	8	2.42	141
Dtu	Tunicata	2	0.22	7
Ean	Annelida	1	0.20	7
Eba	Brachiopoda	1	0.01	10
Ebr	Bryozoa	1	0.11	1
Ecn	Cnidaria	18	61.22	2216
Eec	Echinodermata	29	1616.55	19264
Ehi	Hirudinea	1	0.00	1
Emb	Mollusca Bivalvia	10	13.41	980
Emg	Mollusca Gastropoda	9	4.43	322
Emo	Mollusca Opisthobranchia	3	0.68	57
Epo	Polychaeta	4	0.51	23
Esp	Porifera (sponges)	5	22.35	65
Etu	Tunicata	4	1.37	31
V	Plantae (vegetals)	7	591.00	184
		324	**5970.45**	**3561454**

➢ Otoliths collected for ageing

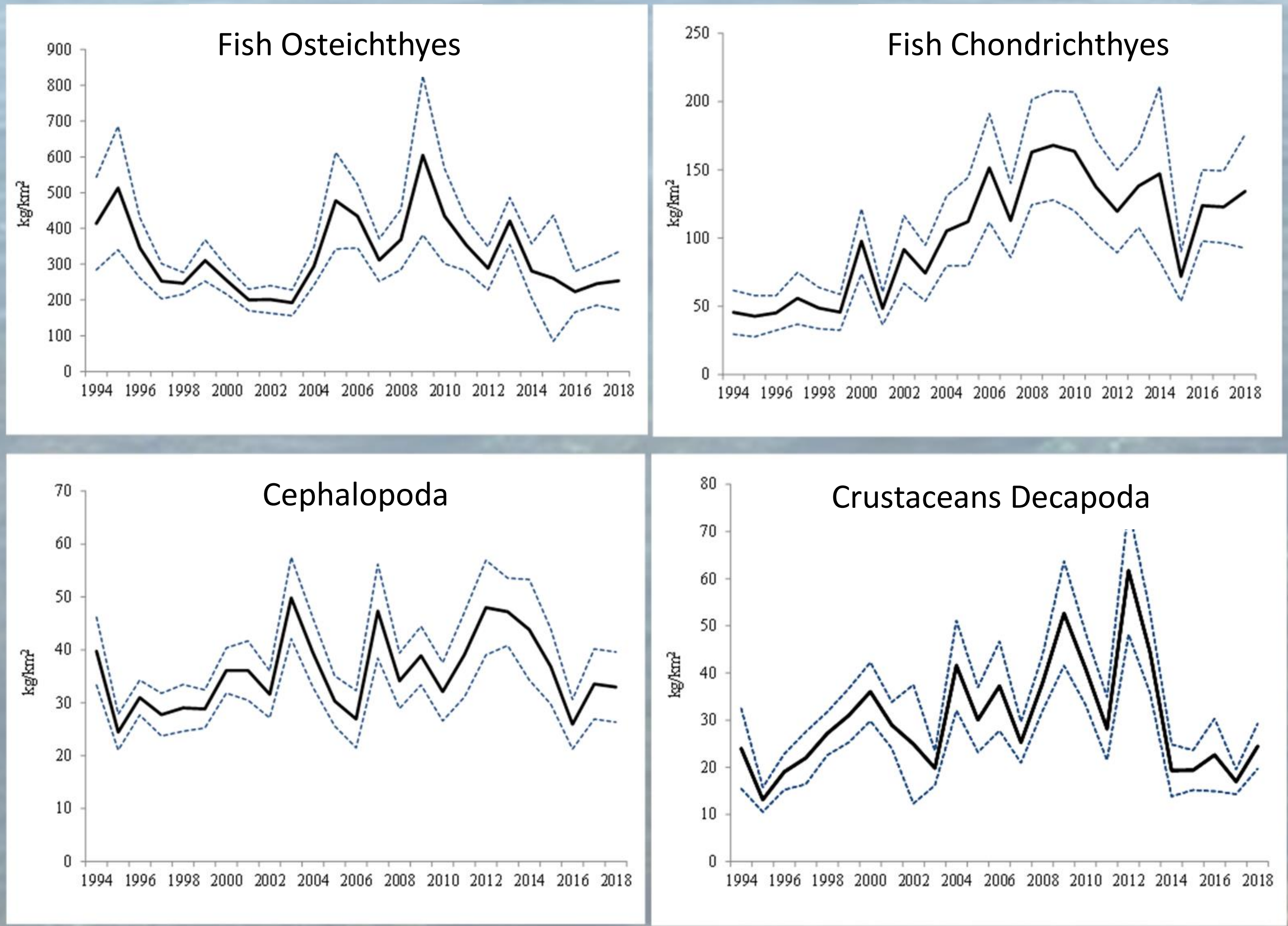
Species	Num. of otoliths
Merluccius merluccius	478
Mullus barbatus	586
Mullus surmuletus	162

➢ Data input and validation:

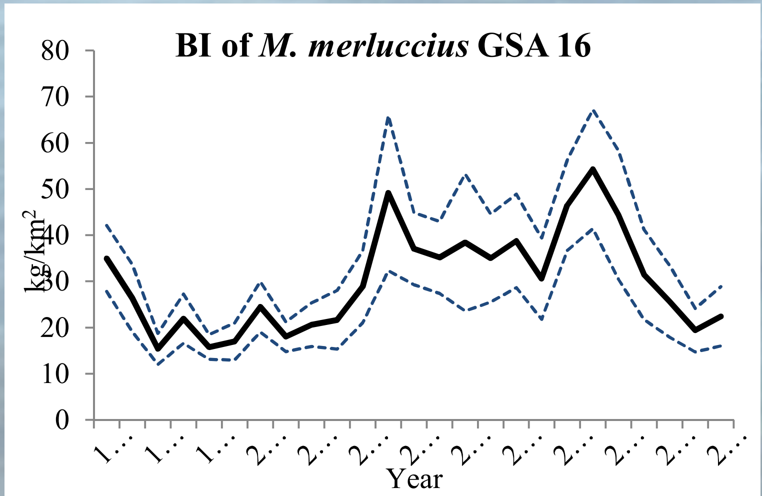
Database SEATRIM developed in CNR was used for data input and first validation
Database FISHTRALW was used for the final validation (Rome routine) and data storage

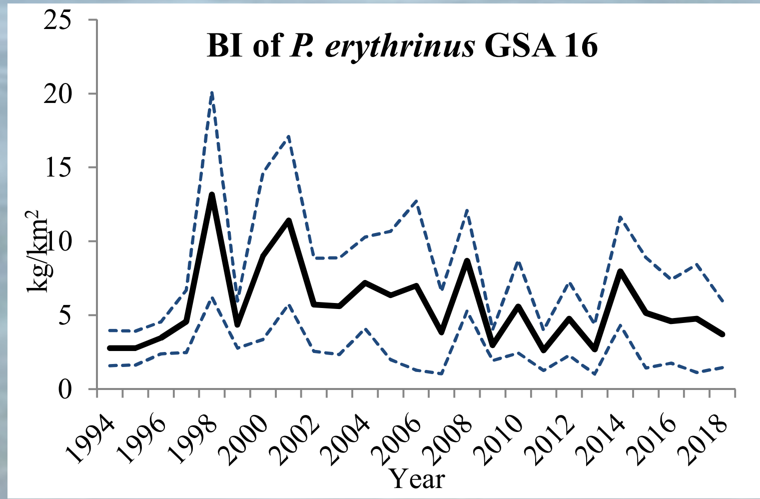
Consiglio Nazionale delle Ricerche
IRBIM - Istituto per le Risorse Biologiche e le Biotecnologie Marine, SS Mazara del Vallo

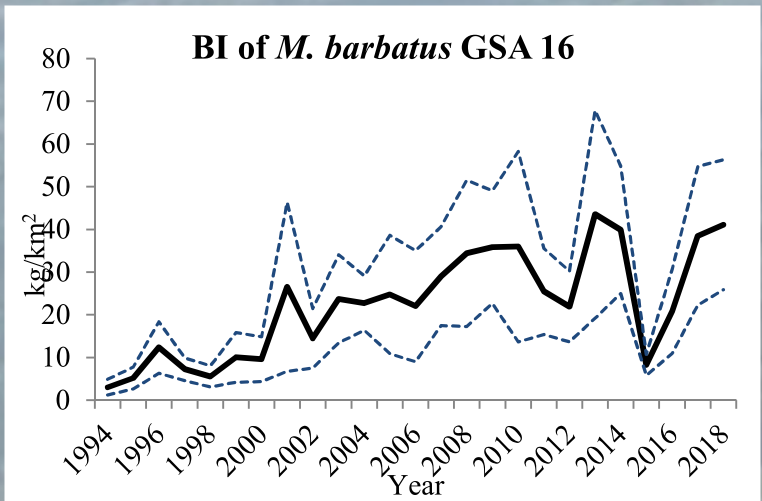
➢ **Historical trends:** Biomass Index of faunistic category

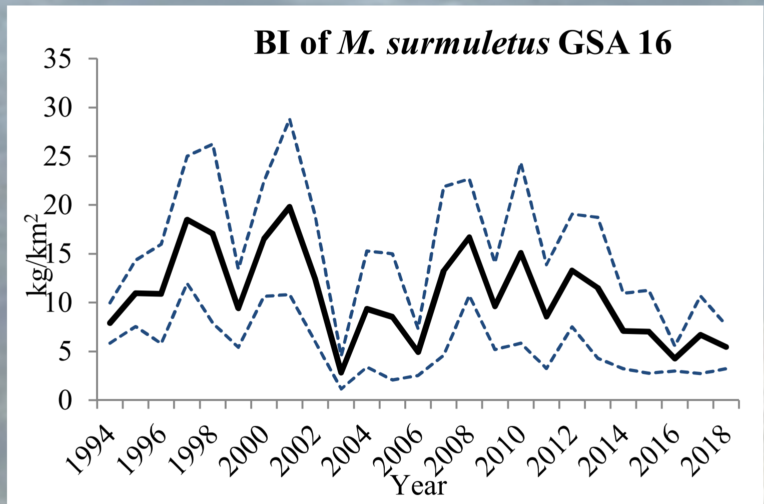


➢ **Historical trends:** Biomass Index of target species









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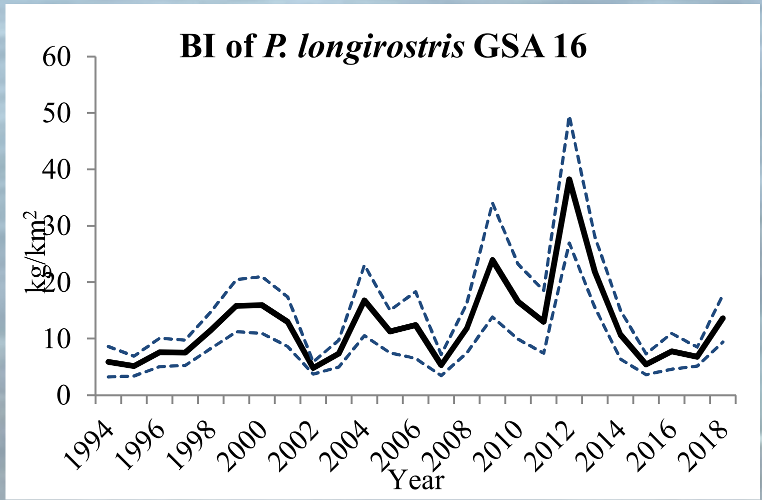

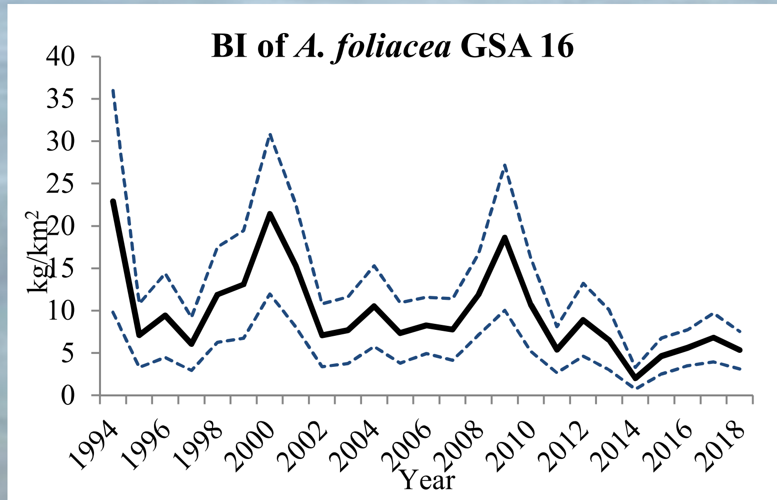

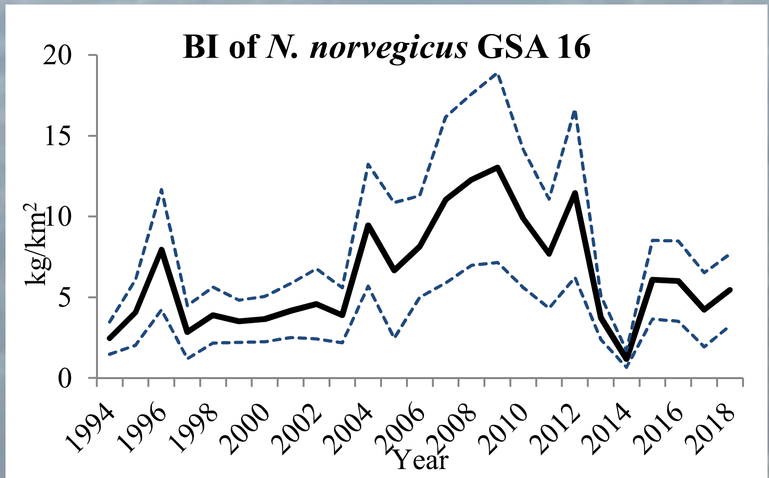

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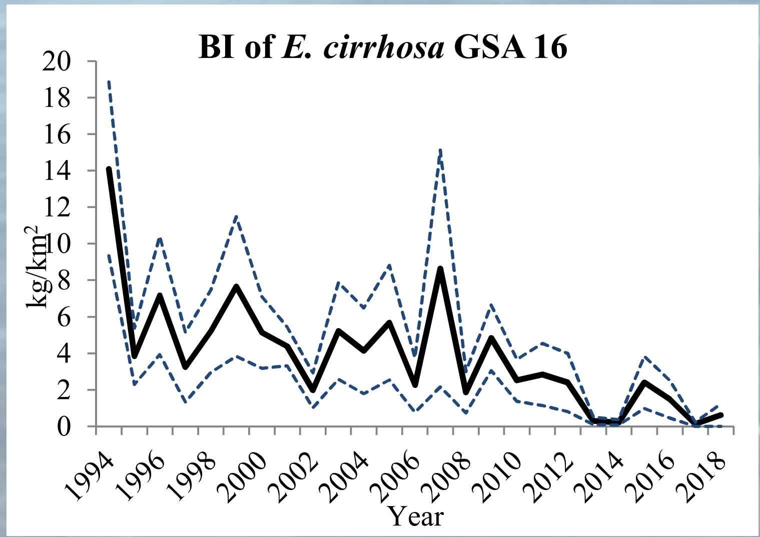

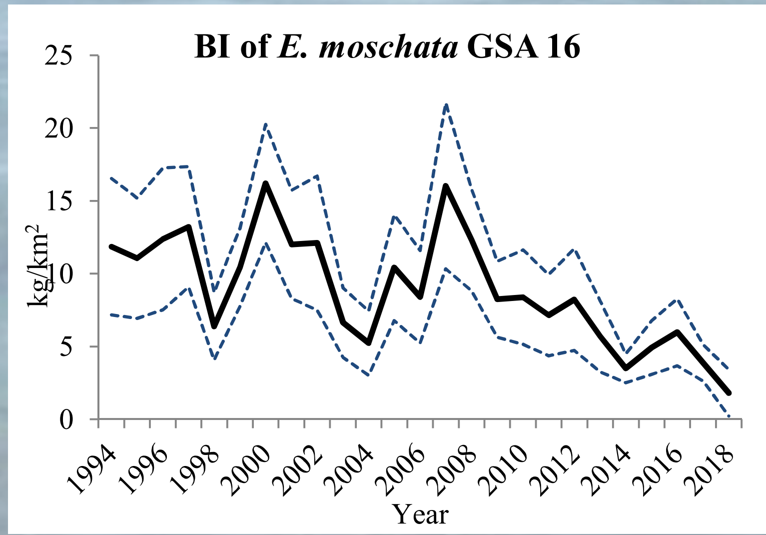

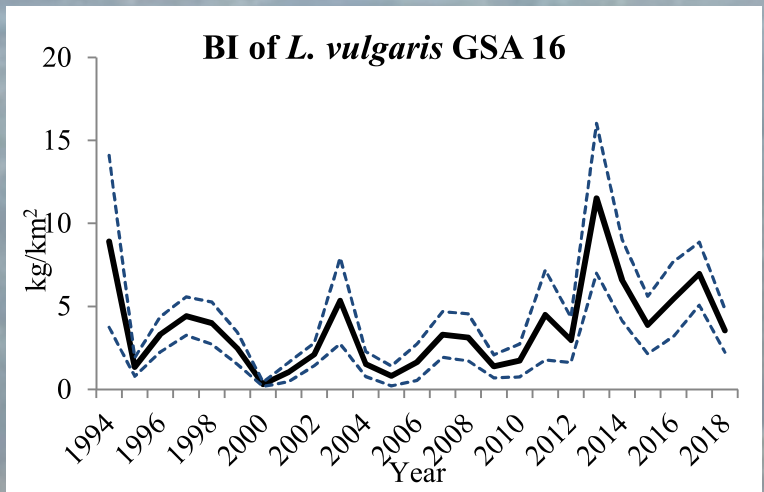

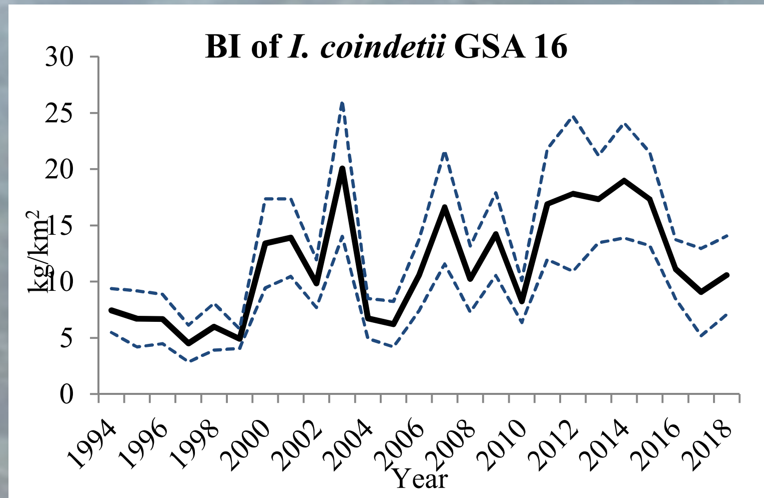

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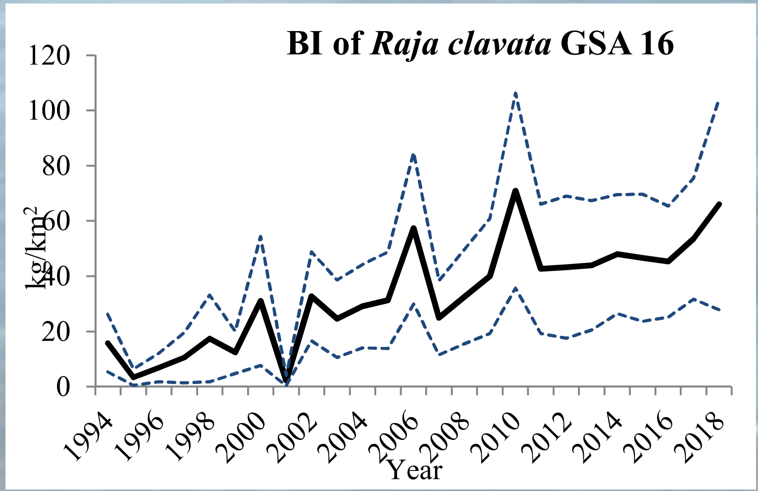
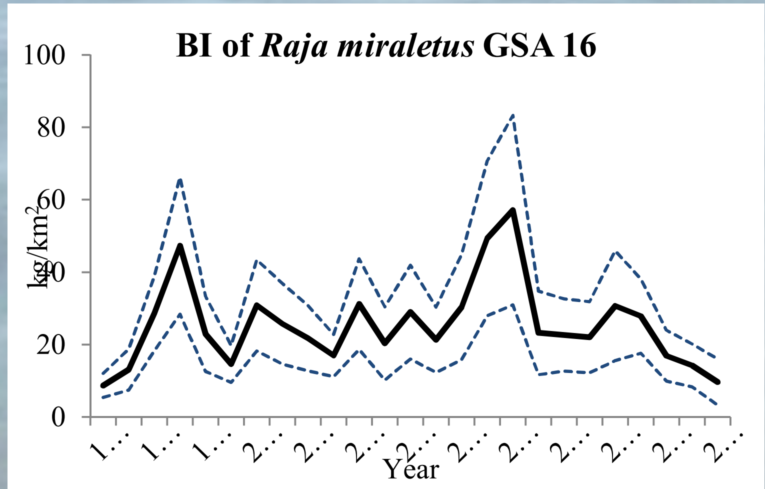
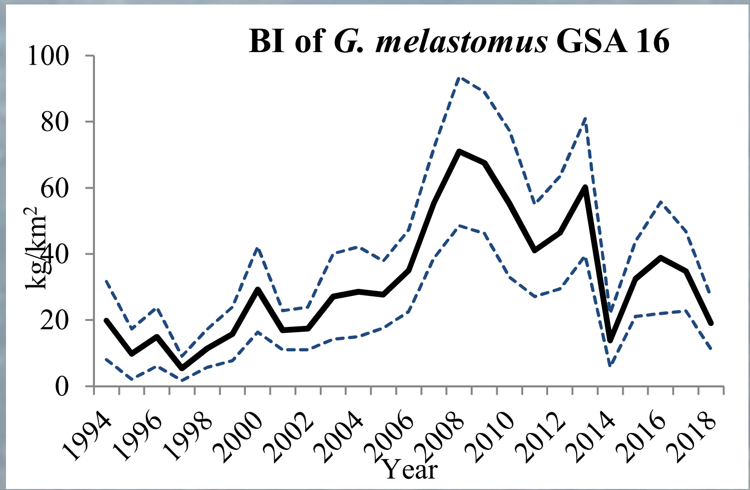
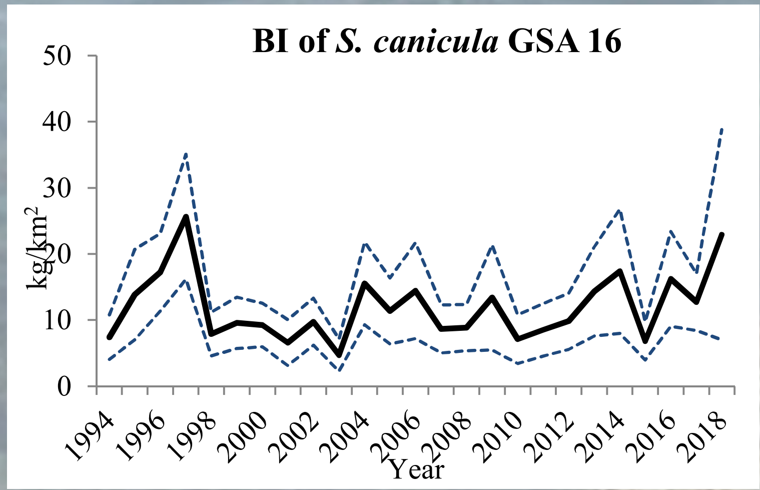








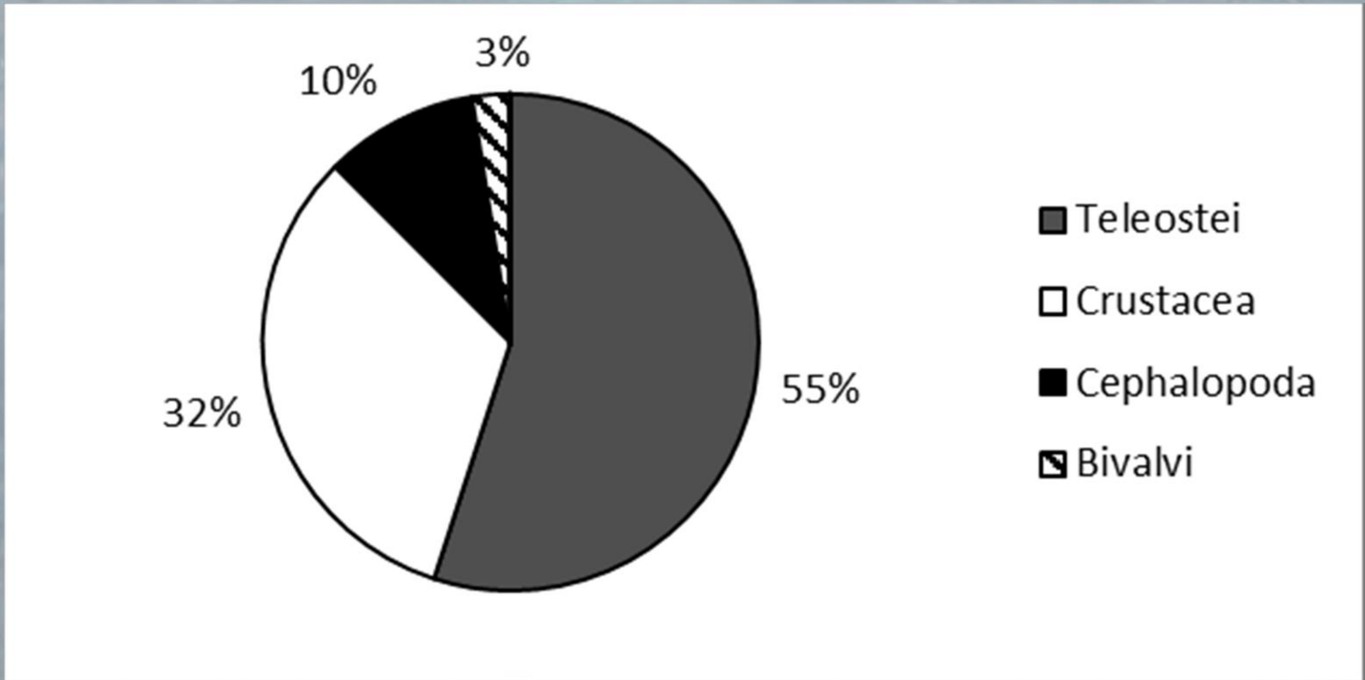
➢ Preliminary comparison of vessel performance

Stratum	Faunistic category	2018 Mean BI (kg/km^2)	2011-2012-2015-2016 Mean BI (95% Boot CI)	2015-2016 Mean BI (95% Boot CI)
	BONY FISH	353.8	213.6 (170.2 – 322.1)	**190.4 (116.5 – 439.9)**
A	CRUSTACEANS	2.2	6.1 (4.2 – 9.1)	5.5 (3.6 – 9.9)
	CEPHALOPODS	51.2	**45.2 (37.8 – 59.1)**	33.8 (25.6 – 42.8)
	BONY FISH	205.7	282.6 (239.4 – 386.3)	**246.1 (203.1 – 314.5)**
B	CRUSTACEANS	15.5	**17.2 (11.7 – 25.9)**	**10.2 (6.2 – 18.6)**
	CEPHALOPODS	37.6	**41.9 (36.7 – 47.6)**	37.9 (32.2 – 44.3)
	BONY FISH	342.5	**329.7 (278.1 – 400.1)**	**301.0 (235.9 – 404.2)**
C	CRUSTACEANS	34.6	**35.5 (25.7 – 50.6)**	11.5 (8.5 – 16.3)
	CEPHALOPODS	53.1	**66.1 (52.8 – 89.2)**	**44.1 (35.9 – 54.8)**
	BONY FISH	432.3	**409.1 (309.8 – 725.8)**	**439.5 (265.2 – 105.6)**
D	CRUSTACEANS	39.5	61.8 (50.8 – 76.7)	**40.3 (31.1 – 64.5)**
	CEPHALOPODS	44.8	**41.4 (35.1 – 49.8)**	**41.3 (31.6 – 55.6)**
	BONY FISH	73.0	**80.1 (70.5 – 92.4)**	**72.2 (59.8 – 88.7)**
E	CRUSTACEANS	20.2	28.8 (25.8 – 32.4)	24.7 (21.6 – 28.4)
	CEPHALOPODS	6.6	12.7 (10.7 – 15.0)	11.7 (9.2 – 14.8)

➢ **Collateral activities:** Pilot study on hake diet

- Within the framework of PLNRDA 2017-2019, a pilot project focused on diet of *Merluccius merluccius*

- 75 stomachs sampled in GSA 16 during the MEDITS 2018



➢ **Collateral activities:** DCF Pilot study on hake diet

Preys	HABITAT	Preys	HABITAT
OSTEICHTYES		**CRUSTACEA**	
Callionymus maculatus	B	*Alpheus glaber*	B
Ceratoscopelus maderensis	P	*Chlorotocus crassicornis*	B
Chlorophtalmus agassizi	BP	*Decapoda*	
Coelorhincus caelorhincus	B	*Euphausiacea*	BP
Engraulis encrasicholus	BP	*Lophogaster typicus*	BP
Gadiculus argenteus	BP	*Mysidacea*	
Glossanodon leioglossus	BP	*Nyctiphanes couchii*	BP
Gobius niger	B	*Parapenaeus longirostris*	B
Helicolenus dactylopterus	B	*Pasiphea sivado*	BP
Hymenocephalus italicus	BP	*Philocheras sculptus*	B
Lepidopus caudatus	BP	*Plesionika heterocarpus*	B
Maurolicus muelleri	P	*Solenocera membranacea*	B
Merluccius merluccius	BP	*Squilla spp.*	B
Mullus surmuletus	B		
Myctophidae	P	**CEPHALOPODA**	
Notoscopelus spp.	P	*Abralia veranyi*	BP
Pagellus erythrinus	B	*Illex coindetii*	BP
Phycis blennioides	BP	*Sepietta spp.*	B
Sardina pilchardus	BP	*Sepiola spp.*	B
Sudis hyalina	P		
Trachurus mediterraneus	BP	**BIVALVIA**	
Trachurus trachurus	BP	*Venus spp.*	B

➢ **Collateral activities:** DCF Pilot study on hake diet

The analysis of the trophic spectrum confirmed different preferences according to the size:

- in the size class **< 10 cm TL** hake feed on crustaceans, with the predominance of Eufausiaceans especially *Nyctiphanes couchii*

- in the second class of size (**10,5-15 cm**) the diet appears more varied and based on Crustaceans, Fish and Cephalopods (out of 17 preys 8 are Crustaceans, 7 Fish and 2 Cephalopods)

- in the third size class (**15.5-20 cm**), Fish (12 out of 20 items) predominate, followed by Crustacean Decapods (5 out of 20). There are also 1 *Sepiola* spp. (Cephalopod), 1 *Venus* spp. (Bivalvs) and Vegetable fragments

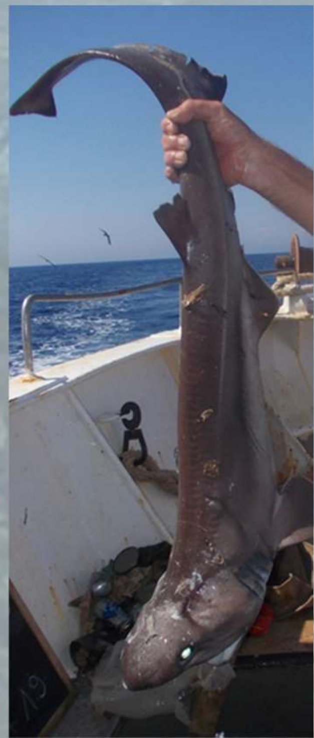
- in the IV size class (**20,5-32,5 cm**) the predominance of preys is constituted by Fish (23 out of 30 items) followed by Crustaceans (6 out of 30). There is also 1 specimen of the squid *Abralia veranyi*

- finally, in class V (**> 32.5 cm**) the scarce stomach contents are equally distributed between Fish and Crustacean Decapods (only 8 items in total)

➢ **Collateral activities:** Elasmobranchs tagging

Tagged in 2018

Species	Number
Dasiatis pastinaca	4
Hexanchus griseus	1
Mustelus mustelus	8
Mustelus punctulatus	1
Raja clavata	32
Rostroraja alba	1
Squalus blainvillei	2
	49



➢ **Collateral activities:** Zero Duration Haul (ZDH) experiment

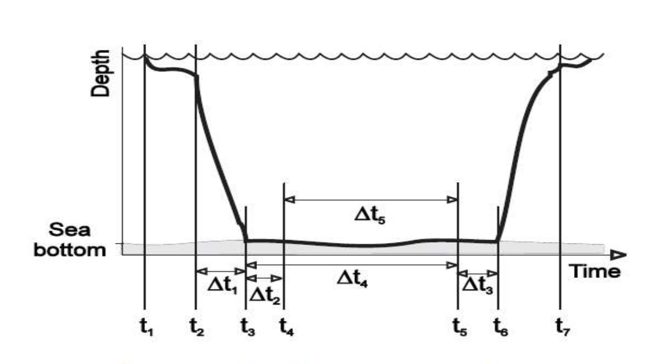


FIG. 2. – Theoretic trajectory of a gear from trawl shooting to end of warp retrieving (notations in the text).

From Bertrand et al., 2002

Δ_{t5} = official haul duration
Δ_{t4} = effective haul duration

Effective haul (EFH) ⟶ pre-haul + official haul

Zero duration haul (ZDH) ⟶ pre-haul + ~~official~~ haul

Hypothesis : Catch $_{ZDH}$ = 0

5 ZDHs in stratum D:201-500 m (pre-haul time = 11 min)

5 ZDHs in stratum E:501-800 m (pre-haul time = 15 min)

➢ **Collateral activities:** Zero Duration Haul (ZDH) experiment

Stratum	Faunistic category	N. of species	Total weight (kg)	Total number
	Fish Chondrichthyes	4	3.527	11
	Fish Osteichthyes	32	10.426	805
D: 201- 500 m	Crustaceans (Decapoda)	14	2.157	416
	Cephalopoda	7	0.645	54
	Other animal species	9	0.155	17
		66	**16.91**	**1303**
	Fish Chondrichthyes	3	1.783	8
	Fish Osteichthyes	17	1.623	137
E: 501-800 m	Crustaceans (Decapoda)	17	0.671	207
	Cephalopoda	1	0.008	2
	Other animal species	4	0.075	4
		42	**4.16**	**358**

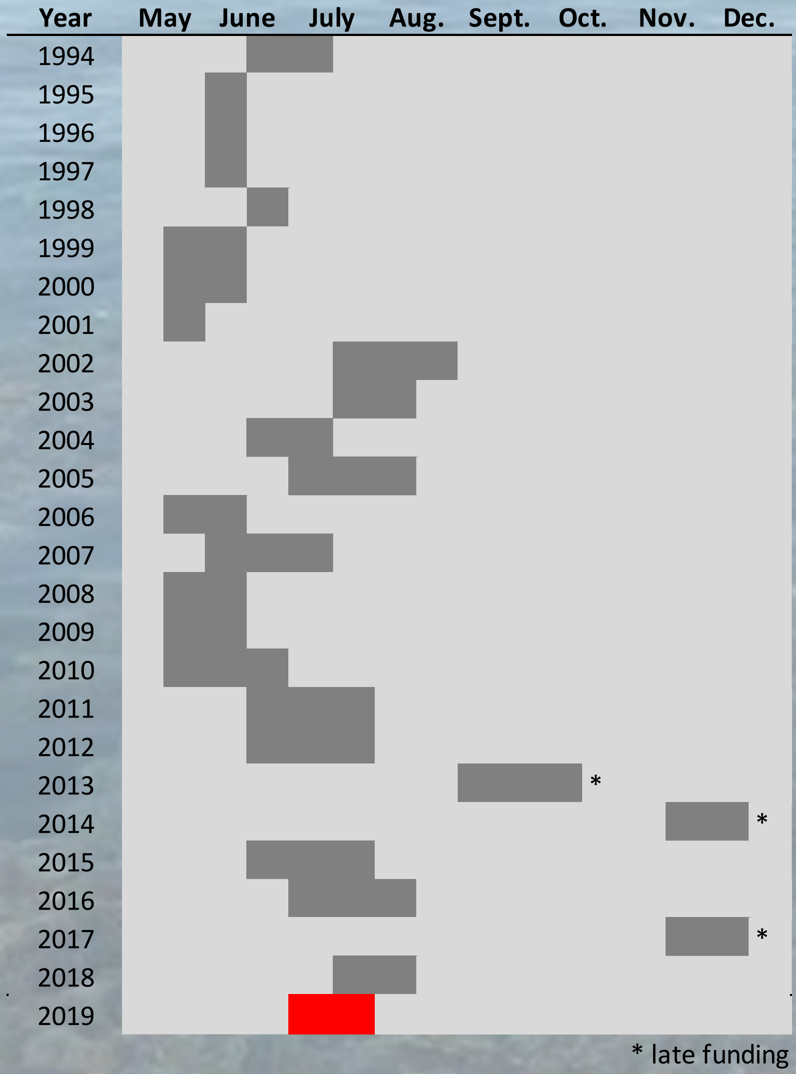
➢ **Collateral activities:** Zero Duration Haul (ZDH) experiment

Stratum	CATFAU	MEDITS_Code	Total number
201-500 m	Ae	ETMOSPI	1
201-500 m	Ae	GALUMEL	4
201-500 m	Ae	RAJACLA	3
201-500 m	Ae	SCYOCAN	3
201-500 m	Ao	ARGRHEM	1
201-500 m	Ao	CALMPHA	1
201-500 m	Ao	CAPOAPE	8
201-500 m	Ao	CERAMAD	29
201-500 m	Ao	CLORAGA	443
201-500 m	Ao	COELCOE	127
201-500 m	Ao	DIAPMET	3
201-500 m	Ao	DIAPRAF	4
201-500 m	Ao	EPIGDEN	3
201-500 m	Ao	FACCOXY	6
201-500 m	Ao	GADIARG	37
201-500 m	Ao	GLOSLEI	1
201-500 m	Ao	GOBISUE	4
201-500 m	Ao	HELIDAC	4
201-500 m	Ao	HYGOBEN	2
201-500 m	Ao	HYMEITA	47
201-500 m	Ao	LAMAPUS	1
201-500 m	Ao	LEPICAU	3
201-500 m	Ao	LEPMBOS	1
201-500 m	Ao	LEPTCAV	2
201-500 m	Ao	LOBIGEM	1
201-500 m	Ao	LOBISPP	16
201-500 m	Ao	LOPHBUD	5
201-500 m	Ao	MACOSCO	2
201-500 m	Ao	MAURMUE	5
201-500 m	Ao	MERLMER	6
201-500 m	Ao	MYCOSPP	10
201-500 m	Ao	NEZUSCL	2
201-500 m	Ao	PHYIBLE	26
201-500 m	Ao	SYMPNIG	1
201-500 m	Ao	TRACMED	2
201-500 m	Ao	TRIGLYR	2
201-500 m	B	ARISFOL	2
201-500 m	B	CHLOGRA	3
201-500 m	B	DARDARR	1
201-500 m	B	LATRELE	1
201-500 m	B	NEPRNOR	5
201-500 m	B	PAPELON	235

Stratum	CATFAU	MEDITS_Code	Total number
201-500 m	B	PASIMUL	1
201-500 m	B	PASISIV	13
201-500 m	B	PLESANT	9
201-500 m	B	PLESGIG	1
201-500 m	B	PLESHET	106
201-500 m	B	PLESMAR	33
201-500 m	B	POLCTYP	5
201-500 m	B	SOLOMEM	1
201-500 m	C	ABRAVER	33
201-500 m	C	ELEDCIR	1
201-500 m	C	RONDMIN	11
201-500 m	C	ROSSMAC	1
201-500 m	C	SCAEUNI	3
201-500 m	C	SEPEOWE	4
201-500 m	C	TODIEBL	1
201-500 m	Dmg	ARGOOLE	1
201-500 m	Ecn	ACTICAR	3
201-500 m	Ecn	FUNIQUA	2
201-500 m	Ecn	ISIDELO	3
201-500 m	Ecn	KOPHLEU	2
201-500 m	Ecn	LEIOGLA	1
201-500 m	Eec	ECHNACU	1
201-500 m	Eec	LEPRPHA	1
201-500 m	Eec	STYLAFF	3
201-500 m	Esp	PORIERA	1
201-500 m	V	ALGHBRU	1
201-500 m	V	CYMONOD	1
201-500 m	V	POSIOCE	1
201-500 m	V	SARGVUL	1

Stratum	CATFAU	MEDITS_Code	Total number
501-800 m	Ae	GALEGAL	6
501-800 m	Ae	GALUMEL	1
501-800 m	Ae	SQUABLA	1
501-800 m	Ao	ARGRHEM	2
501-800 m	Ao	CALMPHA	1
501-800 m	Ao	CHAUSLO	1
501-800 m	Ao	DIAPMET	26
501-800 m	Ao	DIAPRAF	11
501-800 m	Ao	EPIGDEN	6
501-800 m	Ao	HELIDAC	1
501-800 m	Ao	HYMEITA	31
501-800 m	Ao	LAMACRO	6
501-800 m	Ao	MERLMER	1
501-800 m	Ao	MYCOSPP	12
501-800 m	Ao	NEZUSCL	25
501-800 m	Ao	NOTABON	1
501-800 m	Ao	PHYIBLE	8
501-800 m	Ao	STOMBOA	3
501-800 m	Ao	TRACMED	1
501-800 m	Ao	TRACTRA	1
501-800 m	B	ARISFOL	13
501-800 m	B	ARITANT	3
501-800 m	B	CHLOGRA	52
501-800 m	B	GENNELE	2
501-800 m	B	LATRELE	1
501-800 m	B	MUNIIRI	1
501-800 m	B	NEPRNOR	3
501-800 m	B	PANDSPP	1
501-800 m	B	PAPELON	17
501-800 m	B	PASIMUL	3
501-800 m	B	PASISIV	88
501-800 m	B	PLESEDW	1
501-800 m	B	PLESHET	3
501-800 m	B	PLESMAR	2
501-800 m	B	POLCTYP	3
501-800 m	B	SERGARC	12
501-800 m	B	SOLOMEM	2
501-800 m	C	ABRAVER	2
501-800 m	Ecn	FUNIQUA	1
501-800 m	Ecn	LYTOMYR	1
501-800 m	Ecn	NEMERAM	1
501-800 m	Ecn	PENNPHO	1

➢ Calendar of the MEDITS time series



Thanks for your attention

MEDITS Coordination Meeting
Sète, France, 16-17 April 2019

MEDITS Survey 2018
in the eastern Ionian Sea (GSA 20)

Lefkaditou E., Apostolidis H., Badouvas N., Bordbar L., Charalambous K., Chatzispyrou A., Christidis G., Dogrammatzi A., Dokos J., Fytilakos J., Karachle P., Kavadas S., Ketsilis V., Koutsidi M., Mantopoulou D. & C. Stamouli

MEDITS 2018

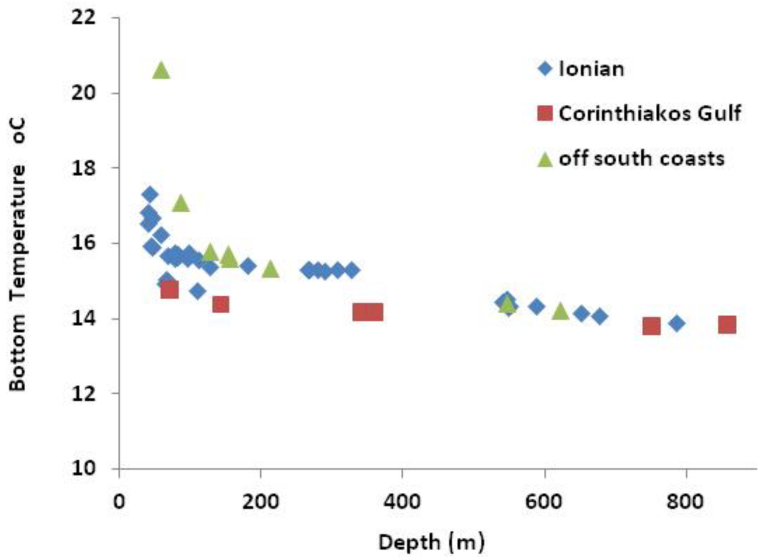
GSA 20

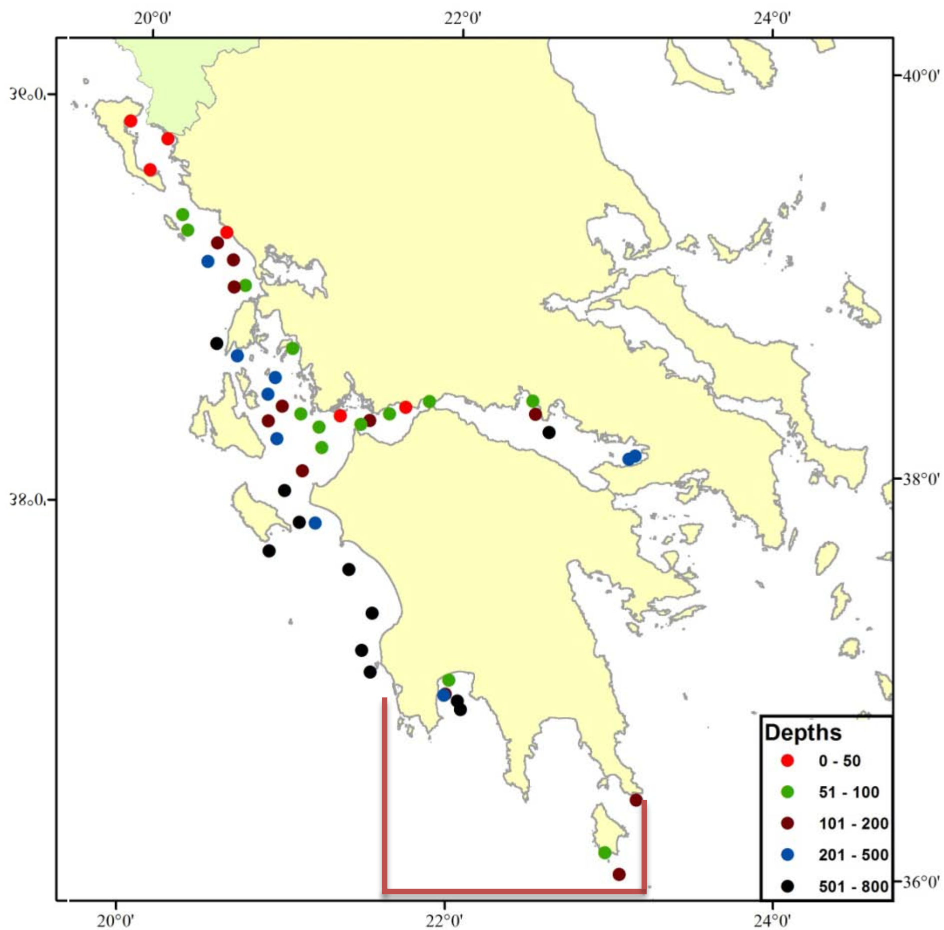
hcmr
ΕΛΚΕΘΕ

Hauls Number and Distribution
(+additional hauls in the southern part)

Sampling Period: 1-24 / 8 /2018

Depth Strata	No Hauls
<50	6
50-100	11+2
100-200	8+3
200-500	8+1
500-800	10+2
TOTAL	43+8





MEDITS 2018

GSA 20

Necton Fauna Category	No Species
Chondrichthyes	15
Osteichthyes	120
Crustaceans	20
Cephalopods	24

Benthic Fauna Category	No Species
Amphipoda	1
Isopoda	1
Bivalvia	6
Gastropoda	9
Echinoderms	23
Ascidiacea	10
Brachiopoda	1
Echiura	2
Cnidaria	10
Hirudinea	1
Opistobranchia	2
Polyplacophora	1
Polychaeta	4
Scaphopoda	1
Porifera	20

MEDITS 2018

GSA 20

Biological Data

Osteichthyes

Species	Length	Sex	Maturity Stage	Individual Weight	Otoliths
MERLMER	1434	559	559	621	374
MULLBAR	1603	436	435	719	842
MULLSUR	7	6	6	7	7
DENTGIB	5	5	5	5	
DIPLANN	748				
DIPLPUN	2				
DIPLVUL	54				
ENGRENC	682	143	143	189	
EPINAEN	7	7	7	7	
EUTRGUR	70				
GADUMER	14				
HELIDAC	894				
HOPLMED	467				
LAMACRO	160				
LEPMBOS	95				
LEPMWHS	8				
LOPHBUD	120	50	50	50	
MICMPOU	434				

Species	Length	Sex	Maturity Stage	Individual Weight
PAGEACA	437			
PAGEBOG	580			
PAGEERY	1745	90	90	102
PHYIBLE	591			
SARDPIL	1198	96	96	224
SCOMPNE	20			15
SCOMSCO	2			
SERACAB	100			
SOLEVUL	13			
SPARAUR	21			
SPARPAG	33			
SPICFLE	1741			
SPICSMA	906			
TRACMED	1323	102	102	193
TRACPIC	1			
TRACTRA	1387	45	45	112
TRIGLUC	13			
TRIPLAS	246			
TRISCAP	283			
ZEUSFAB	89			

MEDITS 2018

GSA 20

Biological Data

Chondrichthyes

Species	Length	Sex	Maturity Stage	Individual Weight
ETMOSPI	1	1	1	1
GALUMEL	523	523	523	523
HEPTPER	3	3	3	3
RAJAAST	1	1		1
RAJACLA	42	42	42	42
SCYOCAN	73	62	61	73
SQUABLA	93	93	93	93
TORPMAR	1	1	1	1

Cephalopods

Species	Length	Sex	Maturity Stage	Individual Weight
ILLECOI	2450	2133	2100	957
LOLIVUL	321	147	147	170
ELEDCIR	40	38	38	4
ELEDMOS	8	8	8	5
LOLIFOR	9	1	1	2
OCTOVUL	19	19	19	19
SEPIOFF	5	5	5	5
TODASAG	20	15	13	13
TODIEBL	88	88	88	1
SCAEUNI	4	4	4	

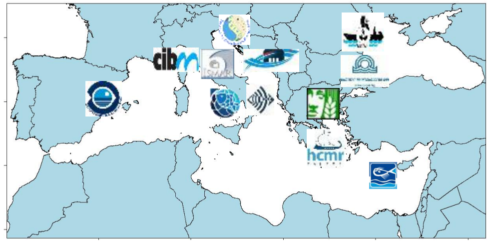
Crustaceans

Species	Length	Sex	Maturity Stage	Individual Weight
ARISFOL	709	709	709	709
ARITANT	197	197	197	197
NEPRNOR	91	91	91	43
PAPELON	1848	1842	1841	1848
PALIELE	1			
SQUIMAN	7	7	7	7

Call for Proposals MARE/2016/22
“Strengthening regional cooperation in the area of fisheries data collection”

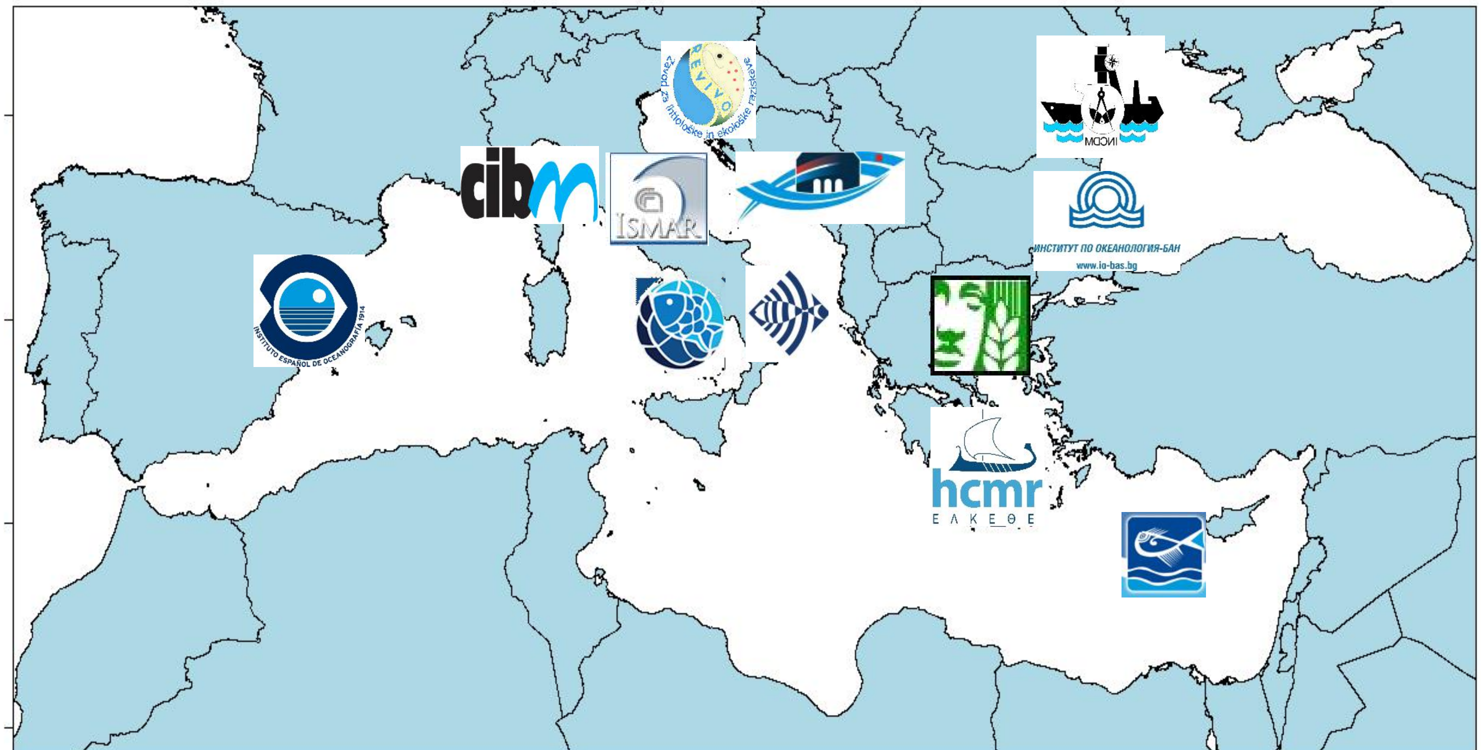
Work Package 4 – Regional Sampling Program for the collection of data on fisheries impacts on the ecosystem

Deliverable 4.2 “Protocols for data analysis and computation of relative abundance indices and species co-occurrence” (Responsible C. Garcia, IEO)



Project funded by the European Union

STREAM is one of the four grants funded under the EU Call for Proposals MARE/2016/22 “Strengthening regional cooperation in the area of fisheries data collection”



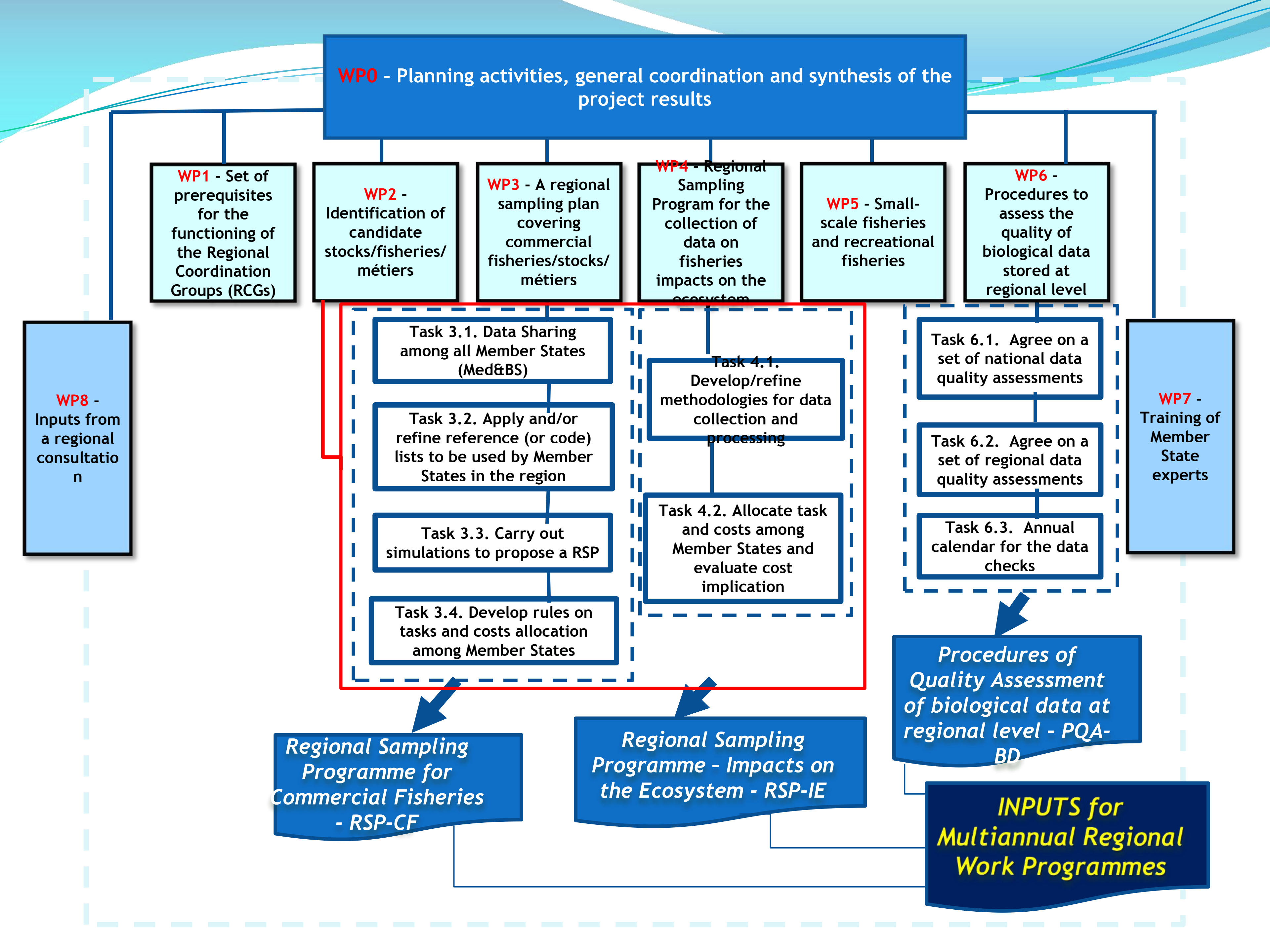
- 12 institutes, 8 Member States
- The consortium reunites many of the participants of the previous grant MARE/2014/19 Med&BS
- The Project started in December 2017, and will finish in May 2019 (2-months

MAIN OBJECTIVES

Building on the experience from the grants MARE/2014/19 Med&BS and FishPi, STREAM intends to provide elements, tools and expertise that will promote and support the design of Multiannual Regional Work Programmes (MRWP) in the Mediterranean and Black Sea relying on a common and harmonized design.

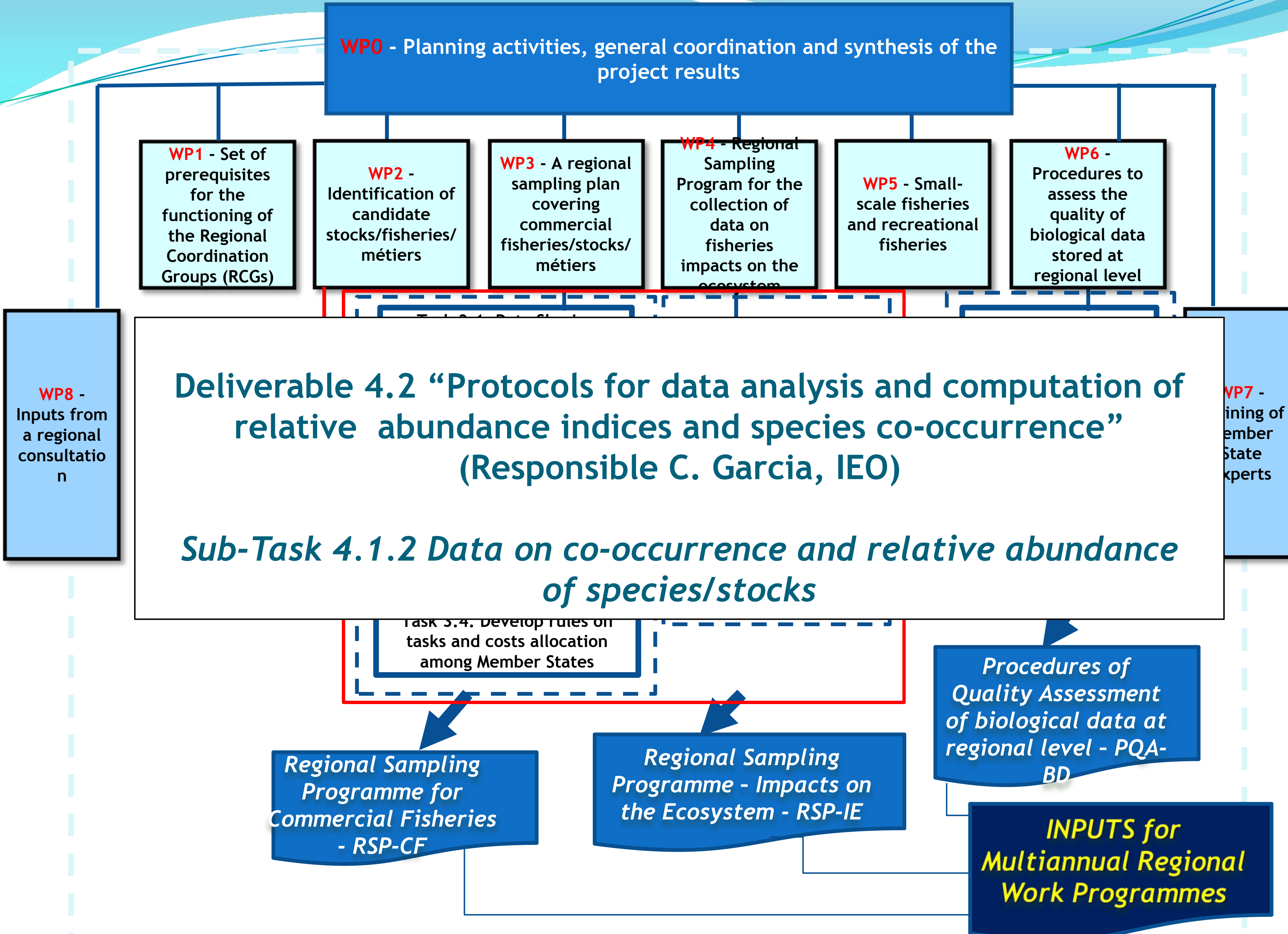
The MRWP is including a regional sampling scheme covering commercial fisheries, impacts on the ecosystem (i.e., community indicators, trophic ecology, bycatch), and procedures for quality assessment of biological data at regional level.

STREAM is providing tools (e.g. routines, R scripts, methodological approaches, etc.) useful to the improvement of data precision, completeness and accuracy.


WP0 - Planning activities, general coordination and synthesis of the project results
WP1 - Set of prerequisites for the functioning of the Regional Coordination Groups (RCGs)
WP2 - Identification of candidate stocks/fisheries/ métiers
WP3 - A regional sampling plan covering commercial fisheries/stocks/ métiers
WP4 - Regional Sampling Program for the collection of data on fisheries impacts on the ecosystem
WP5 - Small-scale fisheries and recreational fisheries
WP6 - Procedures to assess the quality of biological data stored at regional level
WP8 - Inputs from a regional consultation
WP7 - Training of Member State experts
Task 3.1. Data Sharing among all Member States (Med&BS)
Task 3.2. Apply and/or refine reference (or code) lists to be used by Member States in the region
Task 3.3. Carry out simulations to propose a RSP
Task 3.4. Develop rules on tasks and costs allocation among Member States
Task 4.1. Develop/refine methodologies for data collection and processing
Task 4.2. Allocate task and costs among Member States and evaluate cost implication
Task 6.1. Agree on a set of national data quality assessments
Task 6.2. Agree on a set of regional data quality assessments
Task 6.3. Annual calendar for the data checks
Procedures of Quality Assessment of biological data at regional level - PQA-BD
Regional Sampling Programme for Commercial Fisheries - RSP-CF
Regional Sampling Programme - Impacts on the Ecosystem - RSP-IE
INPUTS for Multiannual Regional Work Programmes

Deliverable 4.2 “Protocols for data analysis and computation of relative abundance indices and species co-occurrence” (Responsible C. Garcia, IEO)

Sub-Task 4.1.2 Data on co-occurrence and relative abundance of species/stocks



Sub-Task 4.1.2 - Data on co-occurrence and relative abundance of species/stocks

Rationale

The new Regional Sampling Program will cover the collection of data on fisheries impacts on the ecosystem. Consultations with bodies (such as STECF, ICES, GFCM and other RFMO) have identified several new categories of data. Among them, there are the **data on co-occurrence and relative abundance of species/stocks.**

Objectives of Sub-task 4.1.2

- **To propose a common procedure of data analysis for identifying and monitoring the main species assemblages;**
- **To monitor the species co-occurrence, relative biomass and density over time, according to standardized methodological approaches.**

The relative abundance analyses will inform on spatial/temporal trends at regional level, while the analysis of co-occurrence patterns will be helpful to quantify relative habitat breadth.

Studies at community level have not been carried out on a regional basis so far. Therefore, this work provides the methodological platform to progress towards the improvement of the knowledge of Mediterranean and Black Sea marine communities and fisheries at regional level.

Proposed methodological approach

- Data collected from **experimental fishing**
  - large time series of abundance/biomass standardized indices;
  - information on the structure of the main species assemblages.

- **Standardised routines**
  - to identify and periodically monitor the structure of the main demersal species assemblages
  - to analyse the co-occurrence and relative abundances of the most important species of each assemblage.

The methodological approach have been developed according to three case studies:

- **GSA 1 (Alboran Sea)**
- **GSA 5 (Balearic Islands)**
- **GSA 9 (Ligurian and Northern Tyrrhenian Sea)**

This methodological approach can be generalized to other areas and fisheries.

Phase 1.
Identification and monitoring of the main demersal species assemblages

I. Creation of data matrices

II. Data transformation

III. Creation of a similarity matrix

IV. Clustering procedure

V. Identification of groups of samples

VI. Identification of the species characterizing each group

Phase 2.
Analysis of co-occurrence and relative abundances of the species characterizing each assemblage.

I. Spearman's rho index

II. Temporal evolution of the frequency of occurrence

III. co-occurrence index in small pelagic stocks

IV. Intersection-union tests

Phase 1. Identification and monitoring of the main demersal species assemblages

The classical methods for the ordination and classification of species community will be applied, as follows:

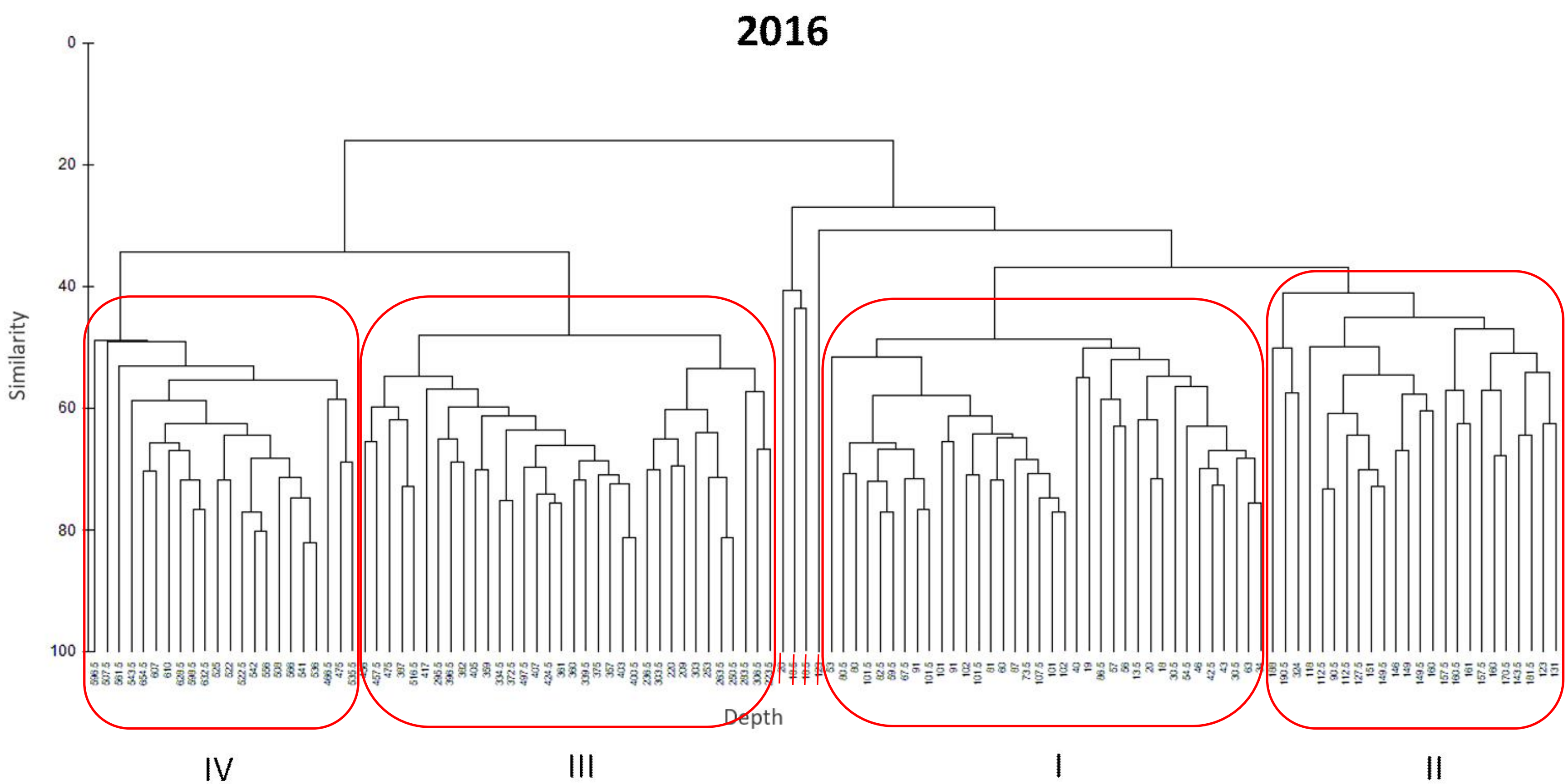
I. **Creation of data matrices** - Starting from experimental trawl survey data (e.g. MEDITS), **species/station matrices** will be created (using biomass, kg/km^2, and density, n/km^2, data). Year will be the temporal step for each matrix.

II. **Data transformation** - To reduce variability and skewness, consider possible removal of occasional species, as well as data transformation (e.g. log, square root, double square root, presence/absence)

III. **Creation of a similarity matrix** - The proposed algorithm to evaluate similarity level between samples is the Bray-Curtis index (Clifford and Stephenson, 1975).

IV. **Clustering procedure** - We propose to build dendrograms using the UPGMA method (Unweighted per Group Mean Average, Sneath and Sokal, 1973).

An example for GSA9 – MEDITS data of 2016.



V. **Identification of groups of samples.** In general grouping of station follows the bathymetric criterion, with temporal and spatial stability.

	2015	2016	2017
Group I			
Depth range	13 - 90	13 - 107	11 - 113
N° of stations	28	36	27
Stations always present	19		
Group II			
Depth range	87 - 225	90 - 190	58 - 205
N° of stations	38	24	37
Stations always present	22		
Group III			
Depth range	250 - 420	209 - 475	210 - 419
N° of stations	27	34	27
Stations always present	24		
Group IV			
Depth range	469 - 653	466 - 654	410 - 661
N° of stations	26	22	28
Stations always present	21		

VI. **Identification of the species characterizing each group**, in terms of percentage contribution to the similarity of the group (density and biomass). SIMPER is the proposed routine.

Group I	% contribution to similarity	Standard deviation of % contribution
Mullus barbatus	12.81	3.21
Sardina pilchardus	10.95	1.55
Trachurus mediterraneus	9.12	1.25
Pagellus erythrinus	9.43	0.02
Spicara flexuosa	6.97	1.77
Engraulis encrasicolus	14.78	-
Merluccius merluccius	8.22	-

Group II	% contribution to similarity	Standard deviation of % contribution
Illex coindetii	8.80	1.93
Merluccius merluccius	11.23	0.69
Mullus barbatus	10.58	1.97
Parapenaeus longirostris	8.20	2.81
Trachurus trachurus	8.38	1.48
Trisopterus capelanus	7.97	1.63

Group III	% contribution to similarity	Standard deviation of % contribution
Merluccius merluccius	7.00	0.94
Parapenaeus longirostris	9.51	0.47
Gadiculus argenteus	6.53	0.23
Galeus melastomus	6.02	0.42
Phycis blennoides	6.99	1.22
Todaropsis eblanae	6.90	0.93
Eledone cirrhosa	7.77	-

Group IV	% contribution to similarity	Standard deviation of % contribution
Etmopterus spinax	8.35	1.16
Galeus melastomus	14.89	0.50
Hymenocephalus italicus	7.42	0.20
Phycis blennoides	10.71	0.69
Hoplostethus mediterraneus	7.32	-
Nephrops norvegicus	7.20	-
Parapenaeus longirostris	7.54	-

Phase 2. To analyse the co-occurrence and relative abundances of the species characterizing each assemblage.

The proposal is to use simple indicators that could be easily applied to survey datasets for the evaluation of impacts of fisheries on the ecosystem.

I. **Spearman's rho index** - The index is applied on density and biomass indices time series. An R routine to calculate the index is available.

	Density		Biomass	
	ρ value	significance	ρ value	significance
E. cirrhosa	-0.516	*	-0.58	**
E. encrasicolus	0.383	n.s.	0.231	n.s.
E. spinax	0.410	*	0.405	n.s.
G. argenteus	-0.394	n.s.	-0.214	n.s.
G. melastomus	0.710	***	0.419	*
H. mediterraneus	0.802	***	0.832	***
H. italicus	0.313	n.s.	0.226	n.s.
I. coindetii	0.326	n.s.	0.330	n.s.
M. merluccius	-0.472	*	-0.528	**
M. barbatus	0.534	**	0.662	***
N. norvegicus	0.069	n.s.	0.021	n.s.
P. erythrinus	0.104	n.s.	0.150	n.s.
P. longirostris	0.874	***	0.882	***
P. blennoides	0.086	n.s.	0.044	n.s.
S. pilchardus	-0.267	n.s.	-0.407	*
S. flexuosa	-0.611	**	-0.590	**
T. eblanae	0.077	n.s.	-0.048	n.s.
T. mediterraneus	0.518	*	0.335	n.s.
T. trachurus	-0.282	n.s.	-0.147	n.s.
T. capelanus	-0.330	n.s.	-0.516	*

n.s. = not significant, * = p<0.05, ** = p<0.01, *** = p<0.001

GSA 9. Spearman's rho results: rho values and significance levels. Green cells identify the positive correlations, red cells the negative ones.

II. To analyse the **temporal evolution of the frequency of occurrence** (e.g. the number of positive hauls/total number of hauls per survey) at species/area level.

III. As regards the small pelagic species (e.g. anchovy, sardine, horse mackerel and Mediterranean horse mackerel, sprat), other than the approaches I and II, another suggestion is to use the **co-occurrence index in small pelagic stocks**, that can be affected also by environmental drivers (see a previous application in the Bay of Biscay).

IV. For small pelagic we also propose the use of the **Intersection-union tests** (Trenkel and Rochet, 2009);

In conclusion

The proposed methodological approach suggests to periodically carry out standardised analyses to identify species assemblages and to monitor species co-occurrence and indices trends over time, starting from experimental fishing data.

- Monitoring of assemblages composition (Phase 1) - every three years
- Indices and trend of the selected species (Phase 2) – every year.

The proposed routines can be furtherly standardized and made available to the Member States.

Thank you

for your attention!

EASME/EMFF/2016/032

Medits coordination meeting
Sète, 16-17 March 2019

Standardization of MEDITS survey indices within RECFISH project

Specific Contract No. 1
RECovery of FISheries Historical time series for the Mediterranean and Black Sea stock assessment

George Tserpes
Isabella Bitetto
Walter Zupa
Maria Teresa Spedicato

WP2 - Data validation and standardization

Responsible: Cosimo Solidoro (OGS) and George Tserpes (HCMR)

Task 2.2 Standardization of the CPUEs

- ***Responsible***: Isabella Bitetto (COISPA) and George Tserpes
- ***Core team:*** **Georgi Daskalov[3], Walter Zupa[1]**, Simone Libralato, Francesc Maynou, Giacomo Milisenda, Claudia Musumeci

ISTITUTO NAZIONALE DI OCEANOGRAFIA E DI GEOFISICA SPERIMENTALE

hcmr ΕΛΚΕΘΕ

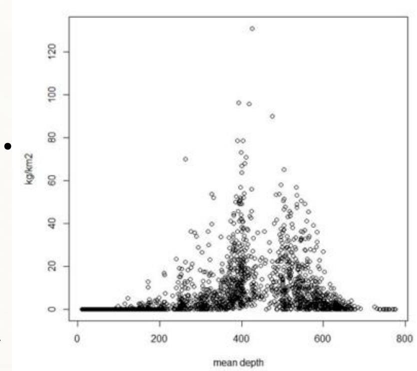
COISPA TECNOLOGIA & RICERCA
STAZIONE SPERIMENTALE PER LO STUDIO DELLE RISORSE DEL MARE

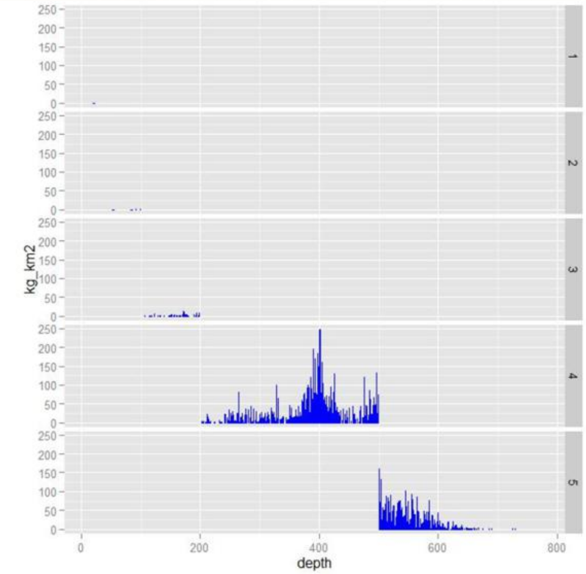
Objective and connections with other WPs

- To standardize a list of 40 time series among scientific survey indices and CPUEs (2 per GSA), using the data collected under **WP1**;
- To provide the standardized scientific survey indices and CPUE to **WP3** for the database construction;
- To provide the standardized scientific survey indices and CPUE to **WP4** to be used in the stock assessment.

Methodological approach

- **Dataset preparation**
  Survey data within TA,TB, TC formats
  environmental variables (EMODnet Bathymetry Consortium), e.g. SSt, Chl, etc…
- **Exploratory analysis**
  Selection of the explanatory variables, avoiding redundancy through Variance Inflation Factor (VIF, Zuur, 2010) and inspection of Pearson's correlation matrix
  Selection of depth range for modelling



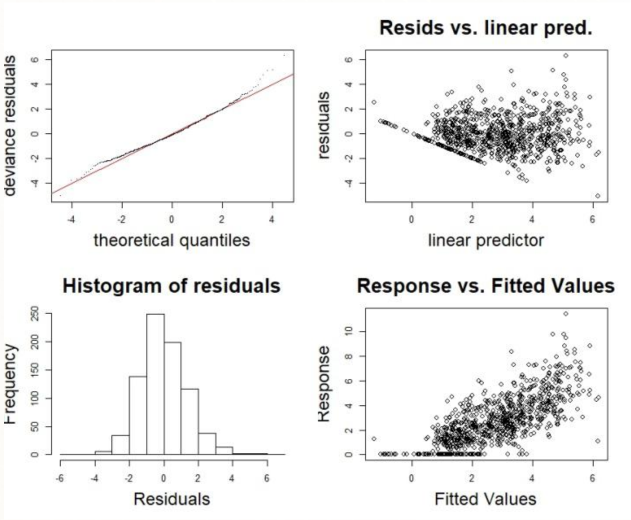


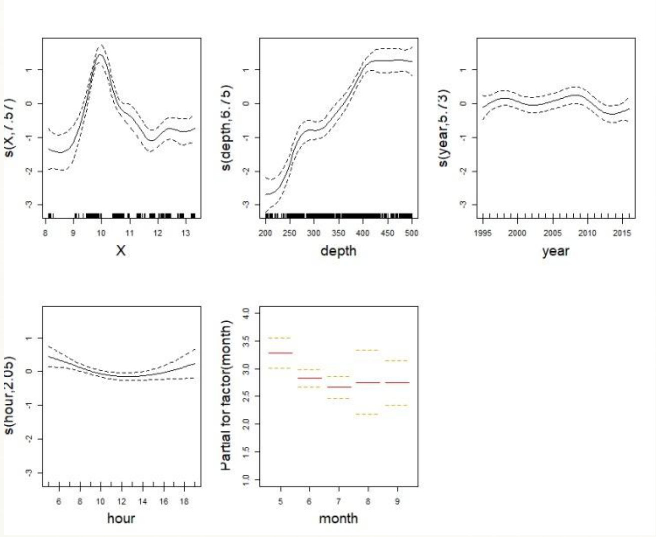
EMODnet Bathymetry Consortium (2018). EMODnet Digital Bathymetry (DTM 2018). EMODnet Bathymetry Consortium. https://doi.org/10.12770/18ff0d48-b203-4a65-94a9-5fd8b0ec35f6

Zuur et al. (2010). A protocol for data exploration to avoid common statistical problems. Methods in Ecology and Evolution 1: 3-14.

Standardization of abundance indices

- **GAM modelling**
  exploring different transformations (log, inverse, sqrt, etc…) and family distributions (gaussian, quasi-poisson, tweedie, Gamma) and link functions (log, inverse, identity, etc…)
- **Selection criteria:**
  Stepwise forward/backward selection (inspecting GVC, % deviance explained, significance of splines on the independent variables, REML method for tweedie distribution)



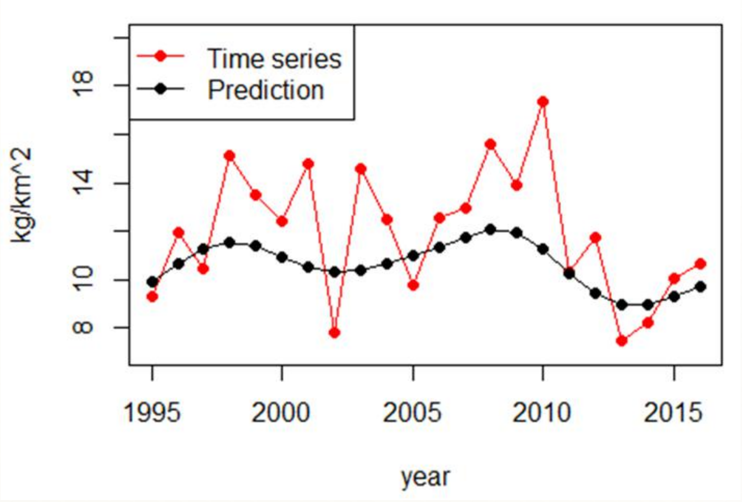


Standardization of abundance indices

- **Creation of predictive grid** represented by a set of points with regular positions:

1. using the sampled positions;
2. constructing a reticulate of points regularly distributed in the space with a given resolution

<u>repeated for all the years;</u>
<u>The reference month must be the same every year, as well as the vessel (if present in the best model)</u>



- **Estimation of standardized index** using the Souplet formula on the abundance indices predicted by the best model on each point of the grid.

E. cirrhosa in GSA 18

- Bathimetry 10-200 m
- selected explanatory variables:
  - Longitude (X)
  - Latitude (Y)
  - depth
  - year
  - month
  - sea surface temperature (SST)
  - shooting hour
  - the number of hauls done in each survey

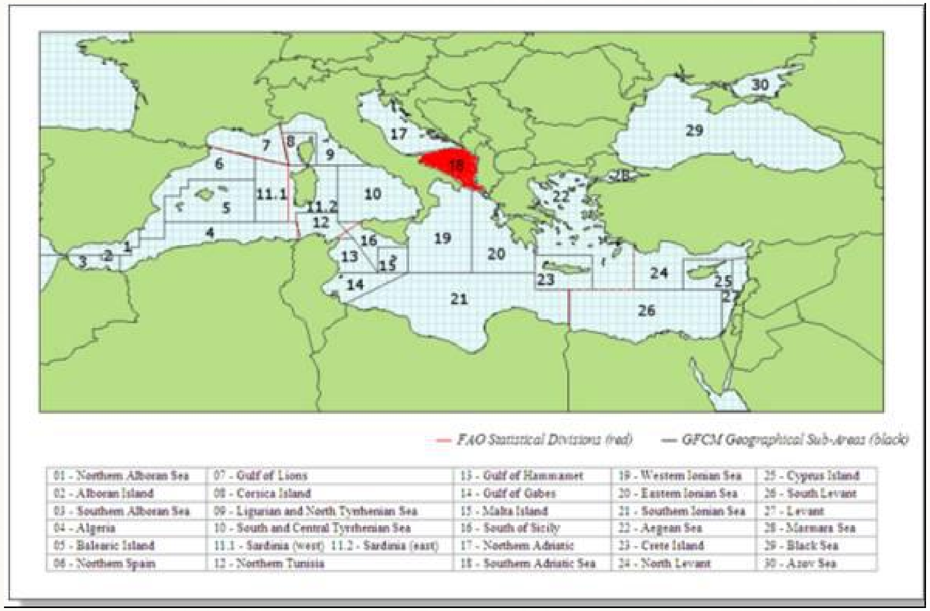


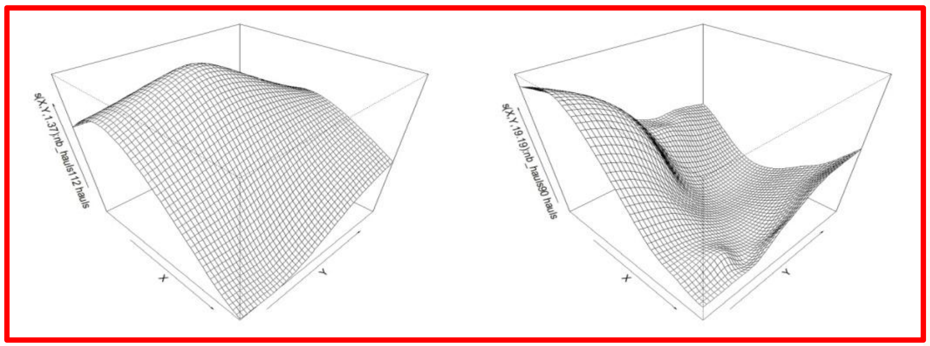
Table 1 - Correlation table

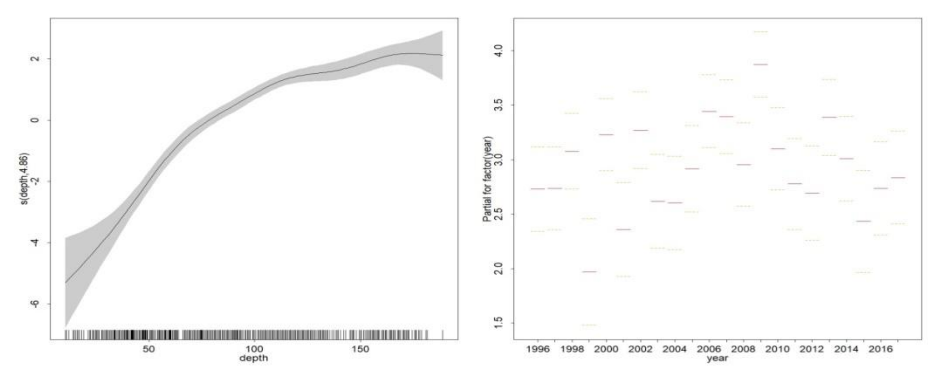
	year	month	SST	X	Y	depth	hour
year		0.43	0.07	0.08	0.04	-0.01	0.03
month	0.43		0.22	0.12	-0.01	0.03	0.03
SST	0.07	0.22		0.49	-0.17	0.36	0.05
X	0.08	0.12	0.49		-0.45	0.34	0.00
Y	0.04	-0.01	-0.17	-0.45		-0.27	0.04
depth	-0.01	0.03	0.36	0.34	-0.27		0.02
hour	0.03	0.03	0.05	0.00	0.04	0.02	

E. cirrhosa in GSA 18

```
Family: Tweedie(p=1.315)
Link function: log

Formula:
response ~ s(X, Y, by = nb_hauls) + s(depth) + factor(year) +
    0
```

2 different splines adapting to the sampling intensity





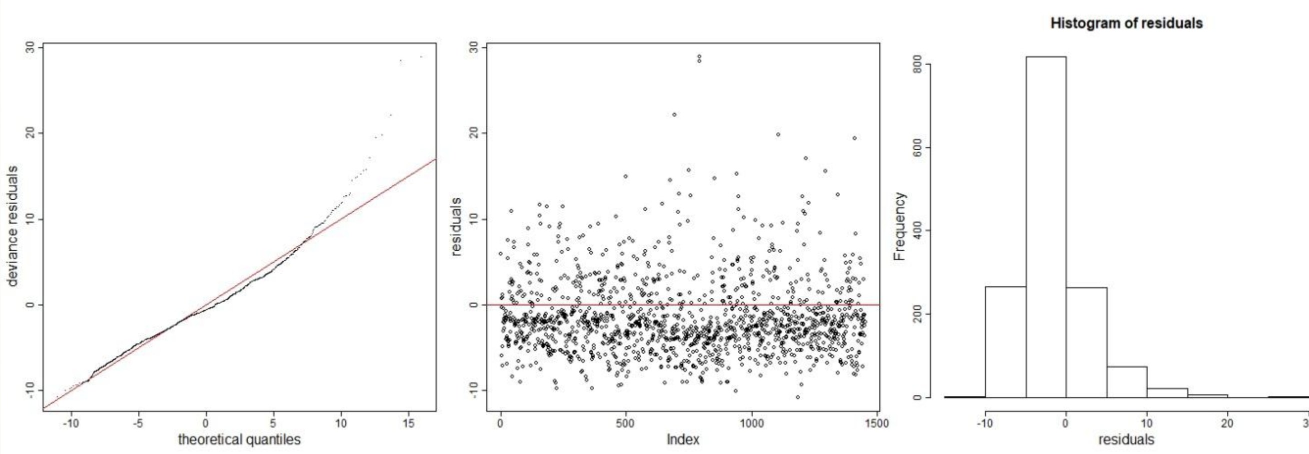

```
Parametric coefficients:
                 Estimate Std. Error t value Pr(>|t|)
factor(year)1996   2.7307     0.1934  14.121  < 2e-16 ***
factor(year)1997   2.7373     0.1900  14.406  < 2e-16 ***
factor(year)1998   3.0782     0.1742  17.667  < 2e-16 ***
factor(year)1999   1.9707     0.2441   8.074 1.45e-15 ***
factor(year)2000   3.2307     0.1661  19.456  < 2e-16 ***
factor(year)2001   2.3599     0.2156  10.948  < 2e-16 ***
factor(year)2002   3.2718     0.1756  18.635  < 2e-16 ***
factor(year)2003   2.6177     0.2158  12.132  < 2e-16 ***
factor(year)2004   2.6040     0.2145  12.141  < 2e-16 ***
factor(year)2005   2.9165     0.1982  14.718  < 2e-16 ***
factor(year)2006   3.4443     0.1673  20.592  < 2e-16 ***
factor(year)2007   3.3948     0.1690  20.088  < 2e-16 ***
factor(year)2008   2.9553     0.1914  15.441  < 2e-16 ***
factor(year)2009   3.8740     0.1496  25.895  < 2e-16 ***
factor(year)2010   3.1014     0.1893  16.380  < 2e-16 ***
factor(year)2011   2.7766     0.2087  13.302  < 2e-16 ***
factor(year)2012   2.6933     0.2150  12.525  < 2e-16 ***
factor(year)2013   3.3879     0.1740  19.476  < 2e-16 ***
factor(year)2014   3.0100     0.1948  15.453  < 2e-16 ***
factor(year)2015   2.4348     0.2336  10.421  < 2e-16 ***
factor(year)2016   2.7379     0.2142  12.782  < 2e-16 ***
factor(year)2017   2.8366     0.2126  13.341  < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:
                              edf Ref.df      F p-value
s(X,Y):nb_hauls112 hauls    1.370     29  0.123  0.0411 *
s(X,Y):nb_hauls90 hauls    19.195     29  8.736  <2e-16 ***
s(depth)                    4.863      9 29.788  <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) =  0.202   Deviance explained = 42.9%
-REML = 3067.8  Scale est. = 24.906    n = 1453
```

The estimation of the splines was significant as well as the estimation of the factors values of the year variable

E. cirrhosa in GSA 18

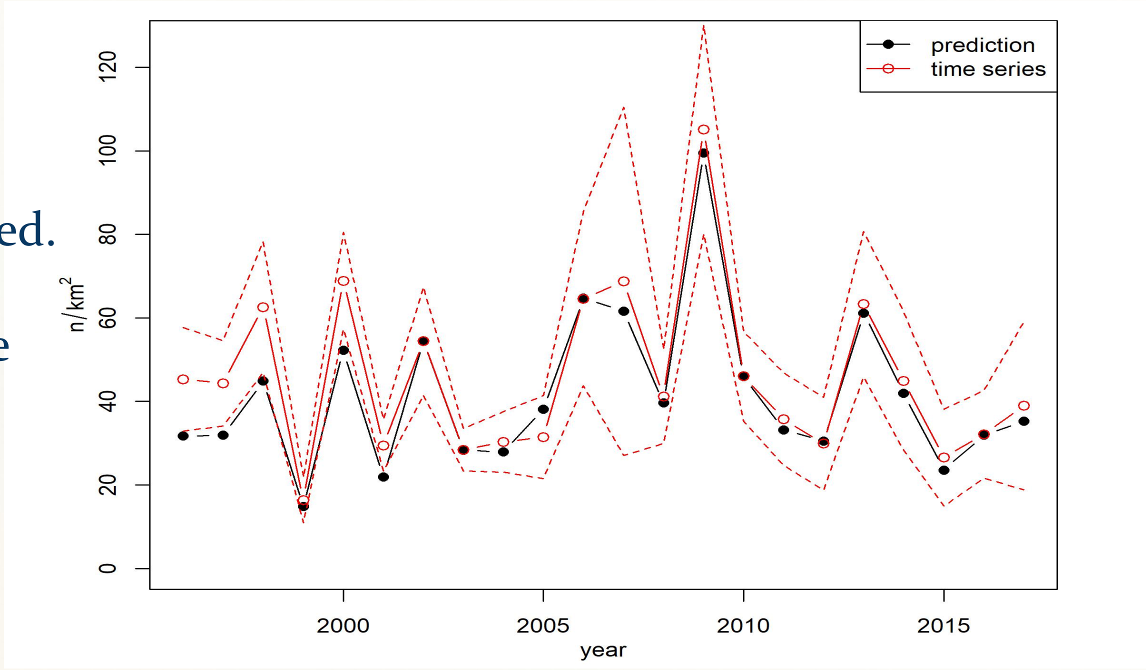
The residuals with a quite skewed distribution.

The predictive grid was made of reticulate of points regularly distributed in the space with a resolution of 0.03 degrees in latitude and longitude.



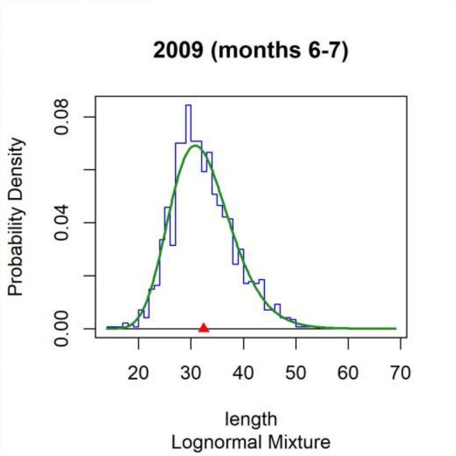
The model underestimates the original time series before 2002, when the sampling intensity changed.

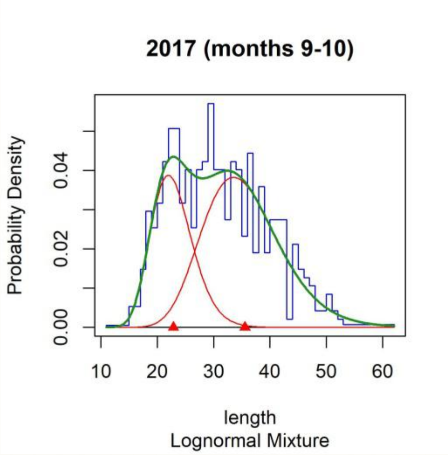
From 2002 the predictions are more similar to the original values being the variations are well inside the confidence interval.



Standardization of LFDs

- **Decomposition of the annual LFDs**
  to derive for each year the characteristics of the interpolating distributions
- **Creation of a data frame**
  containing by year the estimates obtained in the previous step.
  The prevalent month is associated to each year.
  The detected modes are numbered year by year.





Standardization of LFDs

- **Characterization of the LFDs as sum of normal or lognormal distributions** through the linear modelling of the annual theoretical distributions obtained in the previous step.
- Each parameter of the detected distributions is modelled separately from the other.
- It is important to identify the characteristics of the LFDs coming from the surveys carried out in the period established by the survey protocol, in order to select the number of distributions actually useful to describe the standardized LFD.

pi	mu	sigma	year	Month
1.0	34.7	8.2	1994	6
1.0	34.2	7.3	1995	6
1.0	35.4	6.7	1996	6
1.0	34.8	7.5	1997	7
0.1	22.3	3.3	1998	7
0.9	35.2	6.5	1998	7

Standardization of LFDs

- The outcome of this phase are the parameters and the weights fitted by the models (linear model, a GLM or a simple mean) and that will be used to define to theoretical LFD of the survey in the month established in the survey protocol.

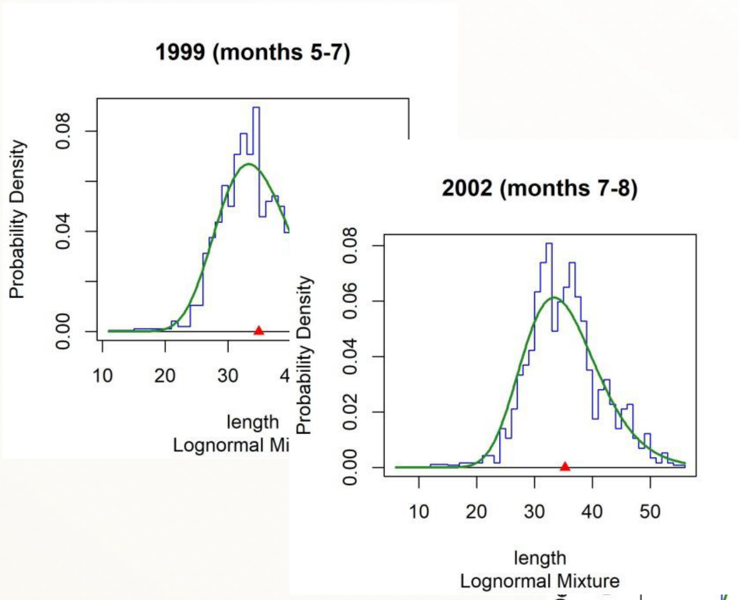
Table 2 – Characteristics of the 3 log-normal distributions representing the standardized LFD.

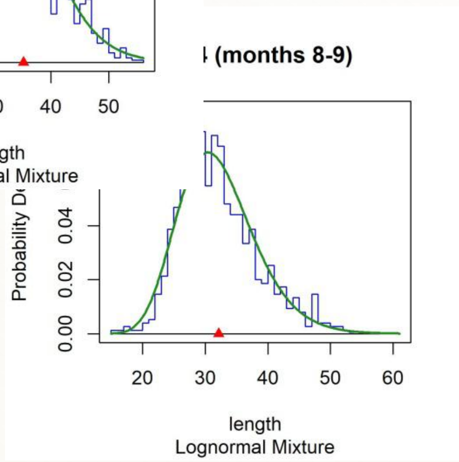
Mode	mu	sd	pi
1	25.3	5.6	0.46
2	33.5	5.1	0.4
3	41.3	4.25	0.14

Depending on the number of years available and on the LFDs actually useful to indentify the standardized LFD, the characteristics of the distributions can be estimated year by year or not.

N. norvegicus GSA 9

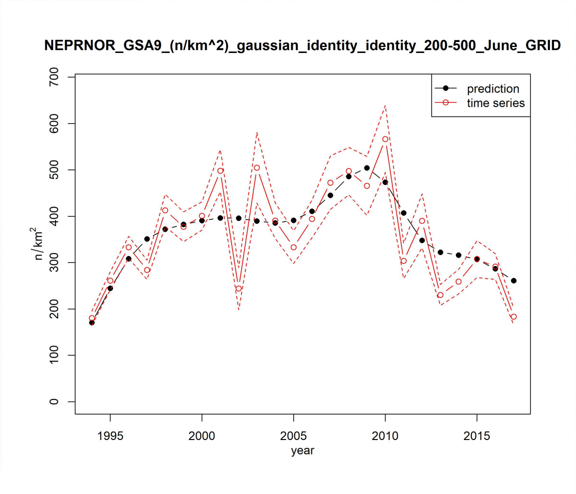
- A unique mode was detectable in almost all the MEDITS LFDs.
- The standardized frequency is obtained as a log-normal distribution having the mean equal to 34.4 mm (CL) and sd 7 mm.

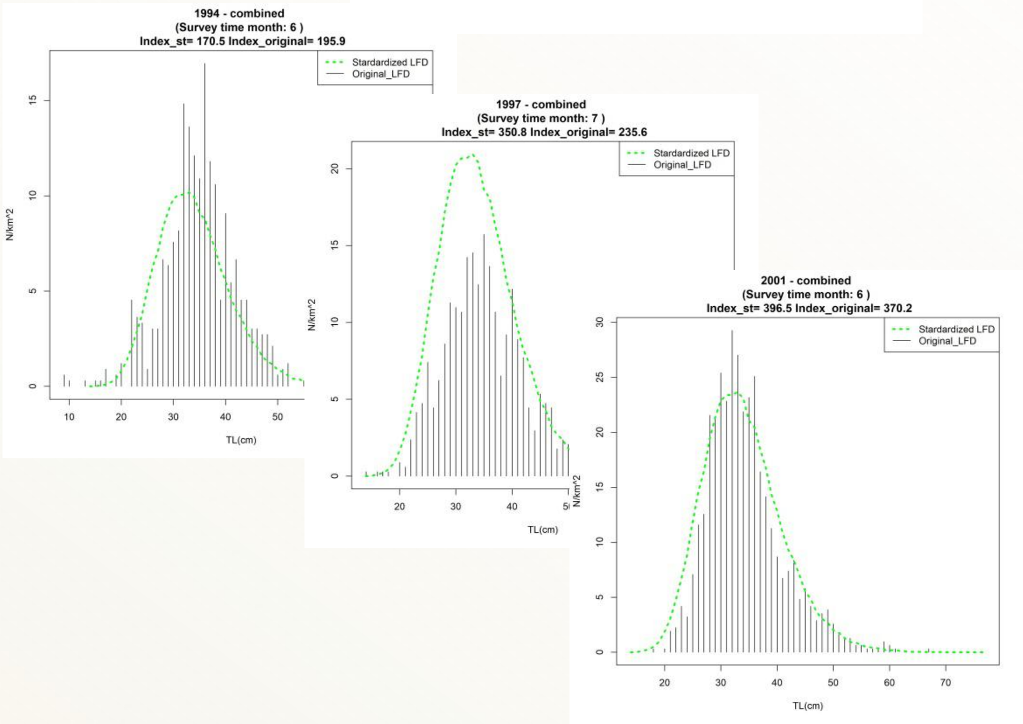




N. norvegicus GSA 9

- The annual standardized indices were estimated (as shown before) and split using the teoretical LFD previously obtained to derive the standardized LFDs.
- When the standardized indices approaches the original one, even the standardized LFDs are more similar to the original one.





Summary of results

Species	GSAs	Comments
1. Mullus barbatus	1	Medits biomass
2. Parapenaeus longirostris	1	Medits biomass
3. Mullus surmuletus	5	Medits biomass
4. Mullus barbatus	6	Medits biomass
5. Eledone cirrhosa	6	Medits biomass
6. Trisopterus capelanus	7	Medits biomass
7. Mullus barbatus	7	Medits biomass
8. Trachurus trachurus	7	Medits biomass
9. Parapenaeus longirostris	7	Medits biomass
10. Aristeus antennatus*	**9**	**Medits/Grund biomass**
11. Aristeus antennatus*	**11**	**Medits/Grund biomass /density**
12. Illex coindetii	**11**	**Medits biomass /density**
13. Trachurus mediterraneus	9	Medits biomass
14. Trachurus trachurus	9	Medits biomass
15. Engraulis encrasicolus	9	Medits biomass
16. Eledone cirrhosa	**9**	**Medits/Grund biomass**
17. Eledone cirrhosa	**10**	**Medits/Grund biomass**
18. Illex coindentii	10	Medits biomass
19. ***Nephrops norvegicus****	**9**	**Medits (biomass/density) Grund (density)**
20. Eledone moschata	16	Medits biomass
21. Mullus barbatus	16	Medits biomass
22. Parapenaeus longirostris	16	Medits biomass
23. Sardina pilchardus	16	Medits biomass
24. Eledone cirrhosa	**18**	**Medits (biomass/density)**
25. Lophius spp	17	Medits biomass
26. Trachurus spp	17	Medits biomass
27. Trisopterus capelanus	**18**	**Medits (biomass/density)**
28. Trisopterus capelanus	17	Medits biomass
29. Aristeus antennatus	18-19	Medits biomass
30. Aristaeomorpha foliacea	18-19	Medits biomass
31. Pagellus erythrinus	20	Medits biomass
32. Spicara smaris	20	Medits biomass
33. Pagellus erythrinus	22	Medits biomass
34. Spicara smaris	22	Medits biomass
35. Spicara smaris	23	Medits biomass
36. Spicara smaris	22+23	Medits biomass
37. Boops boops	23	Medits biomass
38. Mullus surmuletus	25	Medits density
39. Merluccius merluccius	25	Medits biomass
40. Scophthalmus maximus	29	biomass
41. Squalus acanthias	29	biomass

- 41 stocks;
- 52 survey indices standardized;
- 5 LFDs standardized.

Conclusions

- The results obtained in RECFISH project on standardization of MEDITS survey indices contributed to establish a **standardized procedure** to clarify the **influence of the different factors on the survey indices** (e.g. shift survey period, change of the vessel, etc…).
- The methodology developed and applied in Task 2.2 of RECFISH project for the standardization of density and abundance indices and LFD represents a **well documented procedure** (deliverable D2.2) to strengthen and validate the information from MEDITS survey data, especially in the cases of **not negligible deviations** from the protocol;
- The deliverable D2.2 of RECFISH represents a **wide collection of applications** of the agreed methodology on a **variety of species** of **different faunistic categories** distributed in **different GSAs**.

These outcomes are quite important, given that survey data are used in **many different contexts** (stock assessment, community indicators, estimation of mortality, sensitive habitats identification, etc…);

Consiglio Nazionale delle Ricerche

International bottom trawl survey MEDITS in the Mediterranean

TOWARDS A STANDARDIZATION OF MEDITS BENTHOS PROCESSING: SOME PROPOSALS FOR A COMMON PROTOCOL

by Daniela Massi, Antonino Titone, Cinzia Badalucco, Danilo Scannella, Fabio Falsone, Michele Geraci, Federico Di Maio
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National Research Council (CNR)
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MEDITS Coordination Meeting – Séte 16-17 April 2019

According to **the MEDITS PROTOCOL,** excluding the benthic organisms belonging to **A** “Fish”, **B** “ target Crustaceans”, and **C** “Cephalopods”, **benthos** is included into the following categories:

• From 1994 **D** “other commercial species” and **E** “other animal species but not commercial”;

• From 2012 all the subcategories with the addition of the categories “**G** portions or products of animal species”, “**H** …of vegetal species“ and “**V** plantae“.

The **MEDITS PROTOCOL** established that **benthos catch has to be processed as follows:**

• For each species the total weight and number of individuals should be collected, excluding the taxonomic category G, H, and V, for which only the total weight should be collected

• For taxonomic categories D and E the number of individuals is not mandatory

The sub-sample should be not less than 100 individuals.

PROCEDURES ADOPTED AT OUR LABORATORY

SAMPLING ON BOARD

• Samples of benthos are frozen at -40 °C and stored at -20 °C.

• Routinely the total catch is taken. In case of particularly abundant catches the total weight is recorded and a sub-sample of a maximum weight of 5000 g is taken, noting its weight.

• Species of sure taxonomic identification, such as some non target crustaceans (*Geryon, Bathynectes, Polycheles* and so on) can be directly processed on-board in terms of total number and total weight by species.

• Rare species or species under specific studies, are stored separately for more in depth analysis at Lab.

SUB-SAMPLING

- The samples may have been sub-sampled on board assigning a first-level raising factor (RF1°)

- Sometimes, in the laboratory, it may be necessary to further sub-sample in order to reduce the enumeration of the species so a second-level raising factor will be assigned (RF2°)

- Rarely it is possible that, at the species level, it is still necessary to sub-sample (for example in the case of abundant crinoids) and a third-level raising factor will be applied (RF3°)

PROCESSING AT THE LABORATORY

- Frozen sample thawing occurs gradually over a period of 12-24 hours at room temperature and can be facilitated by running cold water in a perforated container, which can facilitate the water spill.

- Sorting and identification of sampled organisms is carried out at the most detailed possible taxonomic level (species). If the identification is uncertain the collaboration of specialist taxonomists is asked.

- Before being weighed, all individuals who tend to absorb water (Porifera, Tunicati, etc ...) and/or sediment (for example the cnidarian *Actinauge richardi*), must be treated mechanically (by strizzing) in order to allow water to escape and/or sediment removal.

The procedures adopted in our Lab and some critical issues in samples processing are briefly summarized in the following Table.

CATEGORY	N°	WEIGHT (g)	INPUTTING FORMAT
INTACT ORGANISMS			
• Animals *Taxa*: solitary or colonial (B,D,E)	X	X	1 record for each *Taxon* identified
• Plants *Taxa* (V)		X	1 record for each *Taxon* identified
BROKEN NON IDENTIFIABLE ORGANISMS			
Biological debris, if possible to split into:		X	1 record for the entire category
• "Debris of marine fauna" (G)		X	1 record for the entire category
• "Debris of marine flora" (H)		X	1 record for the entire category
BROKEN IDENTIFIABLE ORGANISMS			
Biological debris G or H: if few fragments		X	1 record for the entire category
Broken, but with almost the whole body. In particular the special cases:	X_{extr}	X	1 record for each *Taxon* identified. To be added to N. and W. of intact individuals of same *Taxon*.
• Colonial individuals: almost all the colony	X	X	1 record for each *Taxon* identified
• *Crustacea:* with at least cephalothorax or carapace	X	X	1 record for each *Taxon* identified
• *Echinoidea:* at least 50% of shell and digestive system	X	X	1 record for each *Taxon* identified
• *Ophiuroidea:* with nearly entire central disc	X	X	1 record for each *Taxon* identified
• *Asteroidea:* with central body and ½ + 1 whole arms	X	X	1 record for each *Taxon* identified
• *Crinoidea:* with nearly central chalice	X	X	1 record for each *Taxon* identified
EMPTY SHELLS			
"Shell Debris" (G), if possible to split into:		X	1 record for the entire category
• "*Gastropoda* Debris"		X	1 record for each *Taxon* identified
• "*Bivalvia* Debris"		X	1 record for each *Taxon* identified
AGGREGATIONS			
• Separable and identifiable aggregations	X	X	1 record for each *Taxon* identified
• Identifiable *Taxa* but not separable		X extrapolating the weight% of the *Taxon* on the total	1 record for each *Taxon* identified
• "Bioconstruction": non-identifiable and non-separable calcareous *Taxa*		X	1 record for the entire category
EGGS CAPSULES			
"Eggs capsules of *Scyliorhinus*"	X	X	1 record for every *Taxon* identified
"Eggs capsules of *Rajidae*"	X	X	1 record for every *Taxon* identified
"Eggs capsules of *Galeus*"	X	X	1 record for every *Taxon* identified
"Eggs capsules *Gastropoda*"		X	1 record for every *Taxon* identified
"Eggs capsules *Cephalopoda*"		X	1 record for every *Taxon* identified
OTHER DEBRIS			
"Terrestrial organic debris"		X	1 record for the entire category
"Inorganic debris"		X	1 record for the entire category
"Anthropogenic waste"	X	X	according to the Protocol for Monitoring of Marine Litter

CATEGORY	N°	WEIGHT (g)	INPUTTING FORMAT
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Broken, but with almost the whole body. In particular the special cases:	X_{extr}	X	1 record for each *Taxon* identified. To be added to N. and W. of intact individuals of same *Taxon*.
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• *Crustacea*: with at least cephalothorax or carapace	X	X	1 record for each *Taxon* identified
• *Echinoidea*: at least 50% of shell and digestive system	X	X	1 record for each *Taxon* identified
• *Ophiuroidea*: with nearly entire central disc	X	X	1 record for each *Taxon* identified
• *Asteroidea*: with central body and ½ + 1 whole arms	X	X	1 record for each *Taxon* identified
• *Crinoidea*: with nearly central chalice	X	X	1 record for each *Taxon* identified
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"Eggs capsules *Gastropoda*"		X	1 record for every *Taxon* identified
"Eggs capsules *Cephalopoda*"		X	1 record for every *Taxon* identified
OTHER DEBRIS			
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"Inorganic debris"		X	1 record for the entire category
"Anthropogenic waste"	X	X	according to the Protocol for Monitoring of Marine Litter

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INTACT ORGANISMS			
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• Plants *Taxa* (V)		X	1 record for each *Taxon* identified
BROKEN NON IDENTIFIABLE ORGANISMS			
Biological debris, if possible to split into:		X	1 record for the entire category
• **“Debris of marine fauna” (G)**		X	1 record for the entire category
• **“Debris of marine flora” (H)**		X	1 record for the entire category
• *Echinoidea:* at least 50% of shell and digestive system	X	X	1 record for each *Taxon* identified
• *Ophiuroidea:* with nearly entire central disc	X	X	1 record for each *Taxon* identified
• *Asteroidea:* with central body and ½ + 1 whole arms	X	X	1 record for each *Taxon* identified
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EMPTY SHELLS			
“Shell Debris” (G), if possible to split into:		X	1 record for the entire category
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• “*Bivalvia* Debris”		X	1 record for each *Taxon* identified
AGGREGATIONS			
• Separable and identifiable aggregations	X	X	1 record for each *Taxon* identified
• Identifiable *Taxa* but not separable		X extrapolating the weight% of the *Taxon* on the total	1 record for each *Taxon* identified
• “Bioconstruction”: non-identifiable and non-separable calcareous *Taxa*		X	1 record for the entire category
EGGS CAPSULES			
“Eggs capsules of *Scyliorhinus*”	X	X	1 record for every *Taxon* identified
“Eggs capsules of *Rajidae*”	X	X	1 record for every *Taxon* identified
“Eggs capsules of *Galeus*”	X	X	1 record for every *Taxon* identified
“Eggs capsules *Gastropoda*”		X	1 record for every *Taxon* identified
“Eggs capsules *Cephalopoda*”		X	1 record for every *Taxon* identified
OTHER DEBRIS			
“Terrestrial organic debris”		X	1 record for the entire category
“Inorganic debris”		X	1 record for the entire category
“Anthropogenic waste”	X	X	according to the Protocol for Monitoring of Marine Litter

CATEGORY	N°	WEIGHT (g)	INPUTTING FORMAT
INTACT ORGANISMS			
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• Plants *Taxa* (V)		X	1 record for each *Taxon* identified
BROKEN NON IDENTIFIABLE ORGANISMS			
Biological debris, if possible to split into:		X	1 record for the entire category
BROKEN IDENTIFIABLE ORGANISMS			
Biological debris G or H: if few fragments		X	1 record for the entire category
Broken, but with almost the whole body. In particular the special cases:	X_{extr}	X	1 record for each *Taxon* identified. To be added to N. and W. of intact individuals of same *Taxon*.
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BROKEN IDENTIFIABLE ORGANISMS			
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EMPTY SHELLS

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AGGREGATIONS			
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• Identifiable *Taxa* but not separable		X extrapolating the weight% of the *Taxon* on the total	1 record for each *Taxon* identified
• "Bioconstruction": non-identifiable and non-separable calcareous *Taxa*		X	1 record for the entire category
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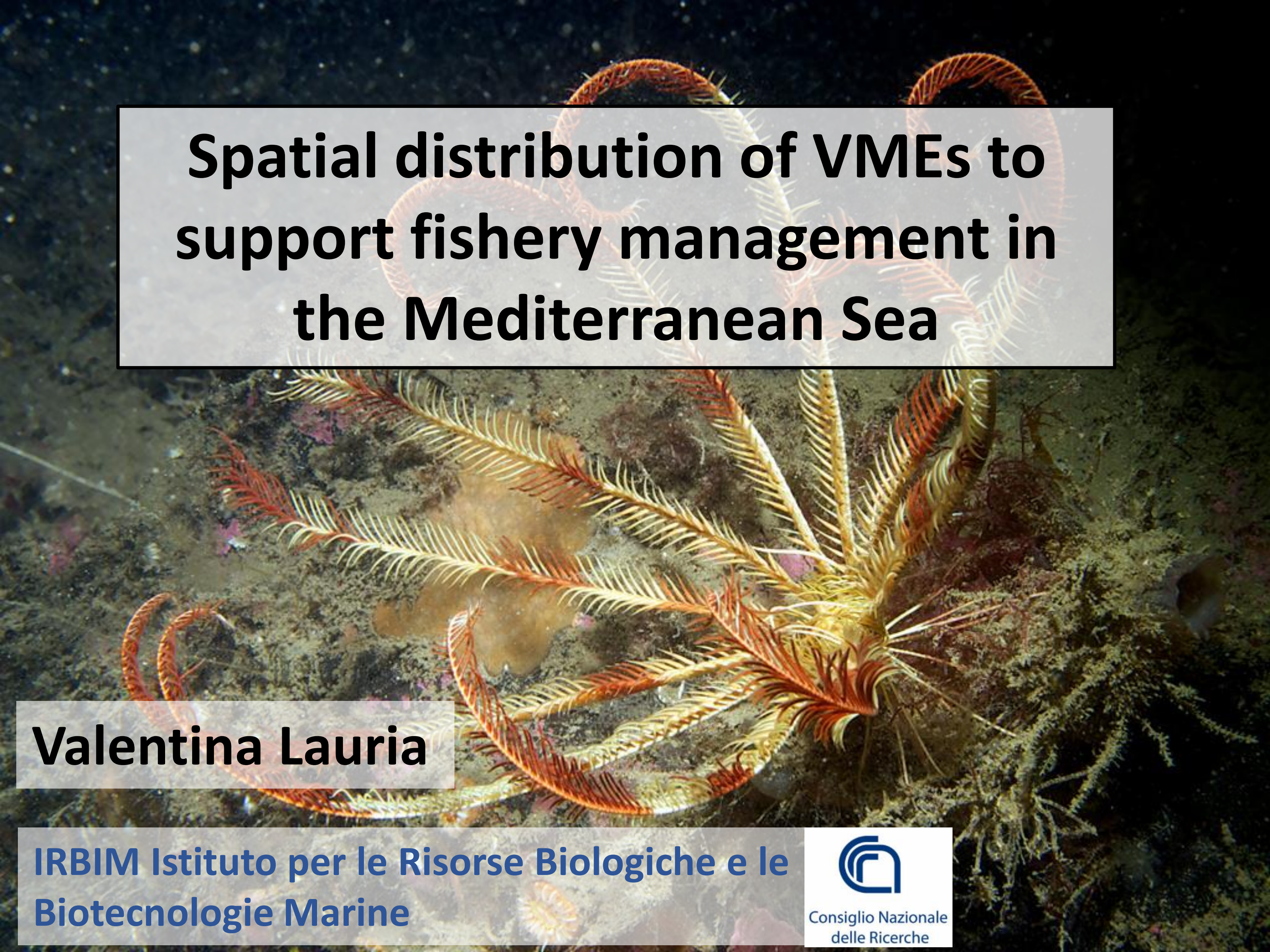
• “Debris of marine flora” (H)		X	1 record for the entire category
BROKEN IDENTIFIABLE ORGANISMS			
Biological debris G or H: if few fragments		X	1 record for the entire category
Broken, but with almost the whole body. In particular the special cases:	X_{extr}	X	1 record for each *Taxon* identified. To be added to N. and W. of intact individuals of same *Taxon*.
• Colonial individuals: almost all the colony	X	X	1 record for each *Taxon* identified
• *Crustacea*: with at least cephalothorax or carapace	X	X	1 record for each *Taxon* identified
• *Echinoidea*: at least 50% of shell and digestive system	X	X	1 record for each *Taxon* identified
• *Ophiuroidea*: with nearly entire central disc	X	X	1 record for each *Taxon* identified
• *Asteroidea*: with central body and ½ + 1 whole arms	X	X	1 record for each *Taxon* identified
• *Crinoidea*: with nearly central chalice	X	X	1 record for each *Taxon* identified
EMPTY SHELLS			
“Shell Debris” (G), if possible to split into:		X	1 record for the entire category
• “*Gastropoda* Debris”		X	1 record for each *Taxon* identified
“Anthropogenic waste”	X	X	Litter

OTHER DEBRIS			
“Terrestrial organic debris”		X	1 record for the entire category
“Inorganic debris”		X	1 record for the entire category
“Anthropogenic waste”	X	X	according to the Protocol for Monitoring of Marine Litter

Thanks for the attention



Spatial distribution of VMEs to support fishery management in the Mediterranean Sea

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Consiglio Nazionale delle Ricerche

FAO criteria for VMEs identification

CHARACTERISTIC	DESCRIPTION OF AREA, ECOSYSTEM, OR HABITAT
UNIQUENESS OR RARITY	Unique or containing rare species whose loss could not be compensated for by similar areas or ecosystems. These include: – habitats that contain endemic species; – habitats of rare, threatened or endangered species that occur only in discrete areas; or – nurseries or discrete feeding, breeding, or spawning areas.
FUNCTIONAL SIGNIFICANCE OF THE HABITAT	Discrete areas or habitats that are necessary for the survival, function, spawning/reproduction or recovery of: – fish stocks; – particular life-history stages (e.g., nursery grounds or rearing areas); or – rare, threatened or endangered marine species.
FRAGILITY	Highly susceptible to degradation by anthropogenic activities.
LIFE-HISTORY TRAITS OF COMPONENT SPECIES THAT MAKE RECOVERY DIFFICULT	Characterised by populations or assemblages of species with one or more of the following characteristics: – slow growth rates; – late age of maturity; – low or unpredictable recruitment; or – long-lived.
STRUCTURAL COMPLEXITY	Characterised by complex physical structures created by significant concentrations of biotic and abiotic features. Often associated with high diversity. Both diversity and ecological processes are usually highly dependent on the structuring organisms.

Adapted from FAO (2009)

The protection of VMEs has been a legal obligation for states and Regional Fisheries Management Organizations (RFMOs) since 2008

Table 1 Overview of current RFMO protection measures and protocols for VMEs

	RFMO	VME indicator list	VME encounter protocol	Direct closure of fishing areas following encounters	Banning of bottom contact gears	Specific areas closed to protect VMEs	Onboard observers	Exploratory fishery protocol that includes potential impacts on VMEs	Requirements to collect information pertaining to bycatch of VMEs
Antartic Ocean	CCAMLR (2008, 2010, 2012, 2013, 2015)	Yes	Yes	Yes	Bottom trawling and gillnets are prohibited	Yes	Yes	Yes	Yes
Mediterranean Sea	GFCM (2005, 2006, 2016)	No	No	No	Towed dredges and trawl nets prohibited below 1000 m	Yes	No	No	No
Western Atlantic	NAFO (2016)	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Northeast Atlantic Ocean	NEAFC (2006, 2014)	Yes	Yes	Yes	Gillnets, entangling nets, and trammel nets are prohibited below 200 m	Yes	Yes, but only during exploratory fishing	Yes	Yes
Pacific Ocean	NPFC – NW (2016a) – NE (2016b)	Yes (NW) Yes (NE)	Yes (NW) Yes (NE)	No (NW) No (NE)	Below 1500 m in some areas, and bottom fisheries closure from Nov-Dec (NW) No (NE)	Only very small areas (NW) No (NE)	Yes, for all vessels authorized for bottom fishing (NW) Yes (NE)	Yes (NW) Yes (NE)	Yes (NW) Yes, but only when observers on board (NE)
Southeast Atlantic Ocean	SEAFO (2009, 2015)	Yes	Yes	Yes	Gillnets are recommended to be banned	Yes	Yes, but only during exploratory fishing	Yes	Yes
South Pacific Ocean	SPRFMO (2013, 2016)	No	Yes but there are no agreed thresholds	No	Deep water gillnets are prohibited	Only very small areas	Observers on 100% of trawlers, and 10% of other vessels	Yes	No

Aguilar et al 2017. Conservation and Management of Vulnerable and Benthic Ecosystems. Book chapter in Marine Animal Forest. 43pp

Proposed by Oceana

DRAFT LIST OF MEDITERRANEAN VME INDICATOR SPECIES

PROPOSED VME HABITAT TYPE	Representative Taxa	IUCN Red List*	References
COLD-WATER CORAL REEFS			
A. *Lophelia pertusa* reefs	*Lophelia pertusa*	EN	7, 8, 19, 28, 30, 31, 32, 38, 47, 57, 72, 73, 76, 90, 91, 101, 111
B. *Madrepora oculata* reefs	*Madrepora oculata*	EN	7, 8, 19, 28, 30, 31, 32, 38, 47, 57, 72, 76, 90, 101, 111
C. *Desmophyllum dianthus* reefs	*Desmophyllum dianthus*	EN	M. Fourt, pers. comm.
CORAL GARDENS			
A. Hard-bottom coral garden			
A.1. Hard-bottom gorgonians, black coral gardens and other corals			
A.1.1. **GORGONIANS** (Order Alcyonacea)			
ACANTHOGORGIIDAE	*Acanthogorgia hirsuta*		51, 76, 83, 81
CORALLIIDAE	*Corallium rubrum*	EN	19, 17, 30, 57, 84, 88, 101
DENDROBRACHIIDAE	*Dendrobrachia bonsai*		89
ELLISELLIDAE	*Ellisella paraplexauroides*	VU	4, 11, 51, 65, 101
	Viminella flagellum		45, 81
GORGONIIDAE	*Eunicella verrucosa*		11, 76
PLEXAURIDAE	*Bebryce mollis*		11, 17, 51, 81, 85
	Paramuricea macrospina		7, 19, 51
	Swiftia pallida		51, 71
	Villogorgia bebrycoides		17
PRIMNOIDAE	*Callogorgia verticillata*		7, 17, 29, 38, 45, 76, 81, 101
A.1.2. **BLACK CORALS** (Order Antipatharia)			
ANTIPATHIDAE	*Antipathes dichotoma*		71, 76
	Antipathes fragilis		
APHANIPATHIDAE			M. Bo, pers. comm.
MYRIOPATHIDAE	*Antipathella subpinnata*		13, 18, 17, 29
LEIOPATHIDAE	*Leiopathes glaberrima*	EN	7, 15, 19, 30, 71, 76, 81, 83, 90
SCHIZOPATHIDAE	*Parantipathes larix*		17, 76, 81, 83
A.1.3. **HEXACORALS** (Subclass Hexacorallia)			
CARYOPHYLLIIDAE - Solitary corals	*Caryophyllia calveri*		
	Desmophyllum dianthus	EN	30, 71, 90, 76
PARAZOANTHIDAE	*Savalia savaglia*		26, 76
A.1.4. SCLERACTINIANS (Order Scleractinia)			
DENDROPHYLLIDAE	*Dendrophyllia cornigera*	EN	28, 57, 61, 74, 101
A.2. Colonial scleractinians on hard rock outcrops and non-reefal scleractinian aggregations			
CARYOPHYLLIIDAE	*Lophelia pertusa*	EN	
	Anomocora fecunda		76
DENDROPHYLLIDAE	*Dendrophyllia cornigera*	EN	7, 31, 47, 57, 72, 76, 90, 101
OCULINIDAE	*Madrepora oculata*	EN	
A.3. Soft corals			
ALCYONIIDAE	*Alcyonium palmatum*		5
NIDALIIDAE	*Chironephthya mediterranea*		62
	Nidalia studeri		63, M. Fourt, pers. comm.
PARALCYONIIDAE	*Paralcyonium spinulosum*		11, 40
A.4. Hydrocorals			
STYLASTERIDAE	*Errina aspera*		4, 87
B. Soft-bottom coral gardens			
B.1. Soft-bottom gorgonian and other coral gardens			
GORGONIIDAE	*Eunicella filiformis*		
ISIDIDAE	*Isidella elongata*	CR	8, 12, 15, 23, 38, 64, 70, 71, 76, 79, 90
PLEXAURIDAE	*Spinimuricea atlantica*		24
	Spinimuricea klavereni		24
B.2. Cup-coral fields			
CARYOPHYLLIIDAE	*Caryophyllia smithii f. clavus*		29
B.3. Cauliflower coral fields			
NIDALIIDAE	*Nidalia studeri*		63, 81

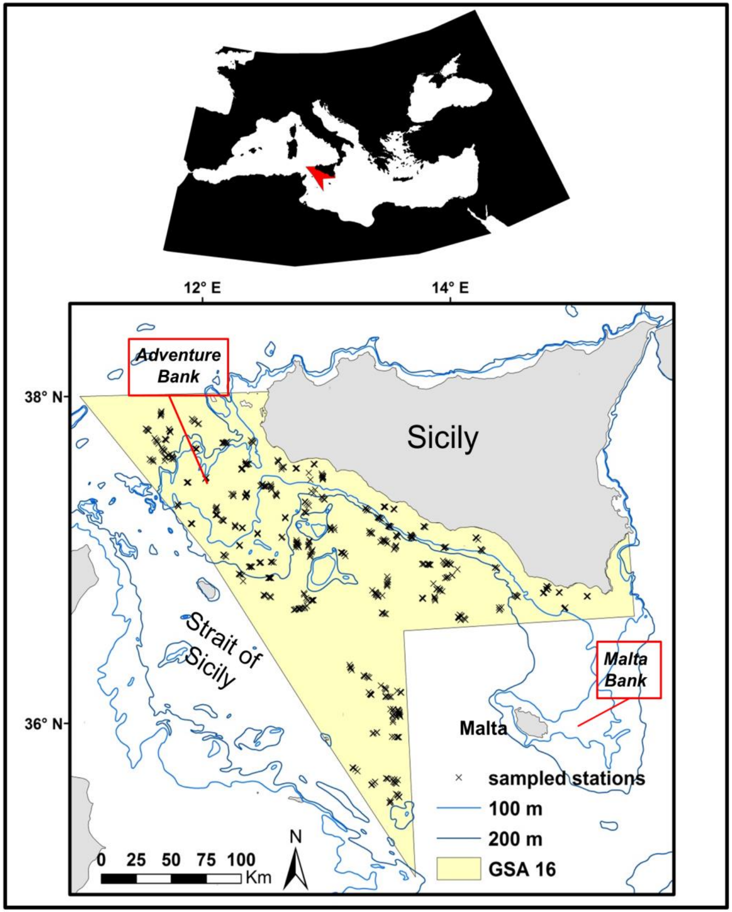
(*) IUCN Red List Categories: CR, Critically Endangered; EN, Endangered; VU, Vulnerable;

PROPOSED VME HABITAT TYPE (cont.)	Representative Taxa	IUCN Red List*	References
DEEP-SEA SPONGE AGGREGATIONS			
A. Ostur sponge aggregations			
GEODIIDAE	*Geodia conchilega*		
	Geodia nodastrella		
	Geodia barretti		23
PACHASTRELLIDAE	*Pachastrella monilifera*		7, 16, 31
B. Hard-bottom sponge gardens			
AXINELLIDAE	*Phakellia ventilabrum*		
	Phakellia robusta		31, 81
	Phakellia hirondellei		M. Fourt, pers. comm.
AZORICIDAE – Stone sponge reefs	*Leiodermatium lynceus*		
	Leiodermatium pfeifferae		64
CHALINIDAE	*Haliclona spp.*		21, 103
STYLOCORDYLIDAE	*Stylocordyla pellita*		
TETHYIDAE	*Tethya aurantium*		
	Tethya citrina		M. Bo, pers. comm.
VULCANELLIDAE	*Poecillastra compressa*		16, 31
	Vulcanella gracilis		
C. Glass sponge communities			
PHERONEMATIDAE	*Pheronema carpenteri*		
ROSSELLIDAE	*Asconema setubalense*		2, 76
D. Sponge aggregations on soft bottoms			
THENEIDAE	*Thenea muricata*		
CLADORHIZIDAE – Carnivorous sponges	*Cladorhiza abyssicola*		
	Lycopodina hypogea		2
STYLOCORDYLIDAE	*Stylocordyla pellita*		
SUBERITIDAE	*Rhizaxinella spp.*		55, 77
	Suberites spp.		77
SEA PEN FIELDS			
PENNATULIDAE	*Pennatula spp (e.g. P. phosphorea, P. rubra, P. aculeata)* *Pteroeides spp.*	VU (*P. phosphorea, P. rubra, Pteroeides spinosum*)	71, 76, 102
FUNICULINIDAE	*Funiculina quadrangularis*	VU	8, 38, 76, 79, 81, 90, 102
KOPHOBELEMNIDAE	*Kophobelemnon stelliferum*		69, 76, 79
PROTOPTILIDAE	*Protoptilum carpenteri*		68
VERETILLIDAE	*Veretillum cynomorium*		
VIRGULARIIDAE	*Virgularia mirabilis*		81, 102
TUBE-DWELLING ANEMONE PATCHES			
CERIANTHIDAE	*Cerianthus membranaceous*		
	Arachnanthus spp.		
MUD- AND SAND-EMERGENT FAUNA			
Echinodermata - Crinoidea			
ANTEDONIDAE	*Leptometra celtica*		10, 101
	Leptometra phalangium		1, 8, 27, 39, 46, 76, 81, 93
Brachiopoda			
TEREBRATULIDAE	*Gryphus vitreus*		8, 83, 81, 105
BRYOZOAN PATCHES			19, 57, 91, 95
BITECTIPORIDAE	*Pentapora fascialis*		101, M. Bo, pers. comm.
BUGULIDAE	*Kinetoskias spp.*		
HORNERIDAE	*Hornera lichenoides*		
MOLLUSCS (habitat forming)			
GRYPHAEIDAE	*Neopycnodonte cochlear*		
	Neopycnodonte zibrowii		28, 101
LUCINIDAE (cold seep communities)	*Lucinoma kazani*		86
MYTILIDAE (cold seep communities)	*Idas modiolaeformis*		75
PINNIDAE	*Atrina fragilis*		43
ANNELIDS			
SABELLIDAE			
SIBOGLINIDAE (cold seep communities)	*Lamellibrachia anaximandri*		74, 81, 96
	Siboglinum spp.		74
TEREBELLIDAE	*Lanice conchilega*		76, 81
CRUSTACEANS			
AMPELISCIDAE	*Haploops spp.*		
CALLIANASSIDAE (cold seep communities)	*Calliax sp.*		96

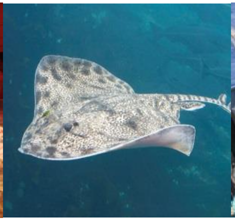
(*) IUCN Red List Categories: CR, Critically Endangered; EN, Endangered; VU, Vulnerable;

GFCM Working Group on Vulnerable Marine Ecosystems (WGVME). Málaga (Spain) 3-5 April 2017

Study area: the Strait of Sicily

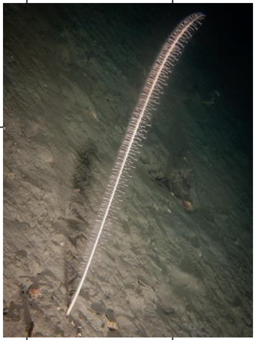


- wide range of depths and habitats
- high biodiversity
- It has been intensively exploited by many demersal fisheries since the 80s but the number of trawlers have halved since 1990s
- fisheries are formed by a fragmented fleet of which 85% are relatively small vessels (<24m TL)



Species distribution models were used to investigate the distribution of two critically endangered octocorals (*Funiculina quadrangularis* and *Isidella elongata*) in the Strait of Sicily

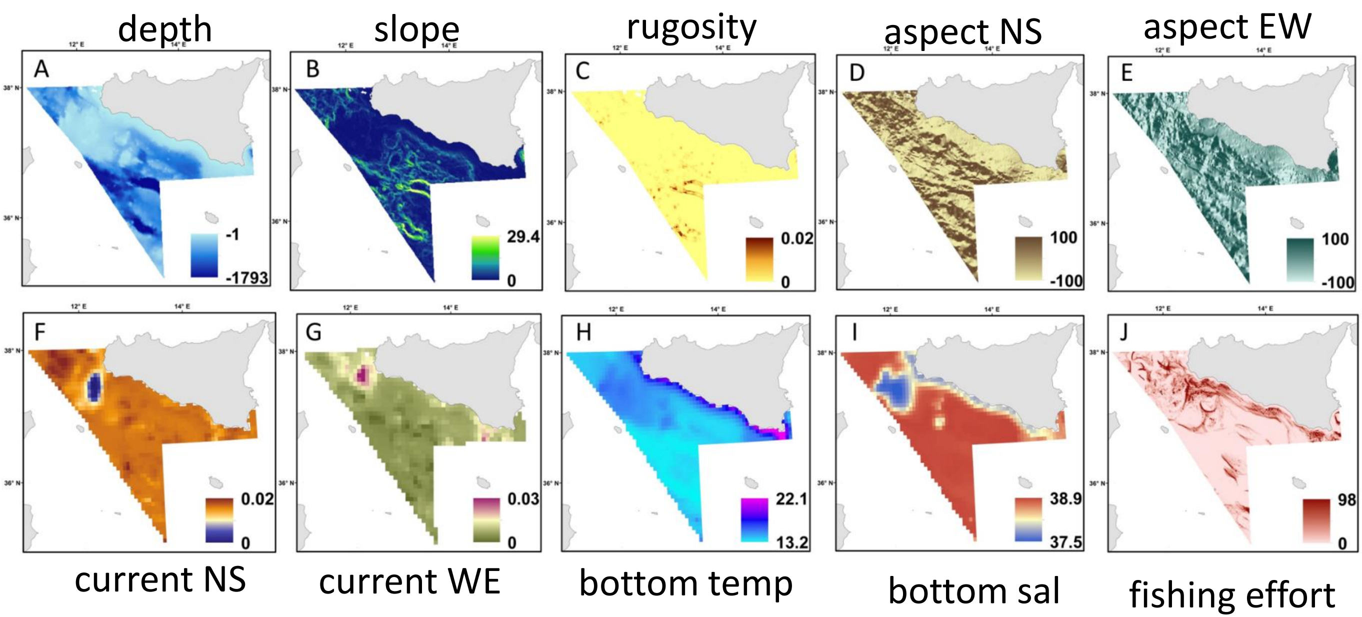
Species	Description	Anchoring structure	Body flexibility	Habitat type	Fisheries	References
VME: Sea-pen fields *Funiculina quadrangularis* (Pallas, 1766)	• It is a tall, narrow sea pen, often found in large populations • It can reach 2 m in height with the lower quarter embedded in the sediment and usually curved in the upper third • It has a calcareous white axis, typically square in section • Information on its longevity does not exist	• A bulb, or peduncle at the bottom of the modified axial polyp that may penetrates into the sediment down to about 50 cm	• It can lie flat under the pressure of wave of approaching gears	• It prefers soft muddy habitat at depths of between 20–2000 m • It is often found in moderately high energy environments characterised by a noticeable bottom current, necessary for procuring adequate food	• This is considered one of the most sensitive sea pen species to fisheries as it is unable to withdraw into the sediment. • In the northeast Atlantic and Mediterranean Sea is associated with *Nephrops norvegicus* fisheries	
VME: Soft-bottom Coral Gardens *Isidella elongata* (Esper, 1788)	• This species is a near-endemic deep-water gorgonian also known as bamboo coral • It can reach up to 3 m in height forming large single-species stands • It is a long-lived species (75–126 years)	• A lobed, root-like holdfast attached to small stones embedded in the surface sediment	• Not flexible due to its fan body shape	• It prefers compact mud • This species occurs mainly in intermediate and deep waters (200–1500 m depth) on moderately flat bottoms • This species characterises a facies of bathyal compact mud substrate on moderately flat bottoms (slope <5%)	• In the Mediterranean Sea it is usually associated with the high-value, deep-water red shrimps *Aristeus antennatus*, *Aristaeomorpha foliacea* and *Plesionika martia*	



Lauria V. et al., 2017. Species distribution models of two critically endangered deep-sea octocorals reveal fishing impacts on vulnerable marine ecosystems in central Mediterranean Sea. *Nature* Scientific Reports 7: 8049. DOI:10.1038/s41598-017-08386-z

Biotic, environmental and fisheries data

- Species density was calculated as the number of individuals per km^2 (Nkm^{-2}) for a total of 720 trawl hauls covering the period 2008-2013 (MEDITS survey)



Lauria V. et al., 2017. Species distribution models of two critically endangered deep-sea octocorals reveal fishing impacts on vulnerable marine ecosystems in central Mediterranean Sea. *Nature* Scientific Reports 7: 8049. DOI:10.1038/s41598-017-08386-z

Materials & Methods: habitat suitability models

Model building: preferential habitat model (also known as delta model)

Generalised additive models (GAMs) were used to construct habitat suitability models

Presence/absence model

Abundance only model

Species distribution prediction

Model selection: best models were selected using the wAICc

Models were evaluated by R2-adjusted coefficient and deviance. Only for the binomial model the Receiver Operating Characteristic (ROC) was calculated

Model mapping: maps of species predictions were constructed in R and then visualised in ArcGIS; model error was mapped by interpolation

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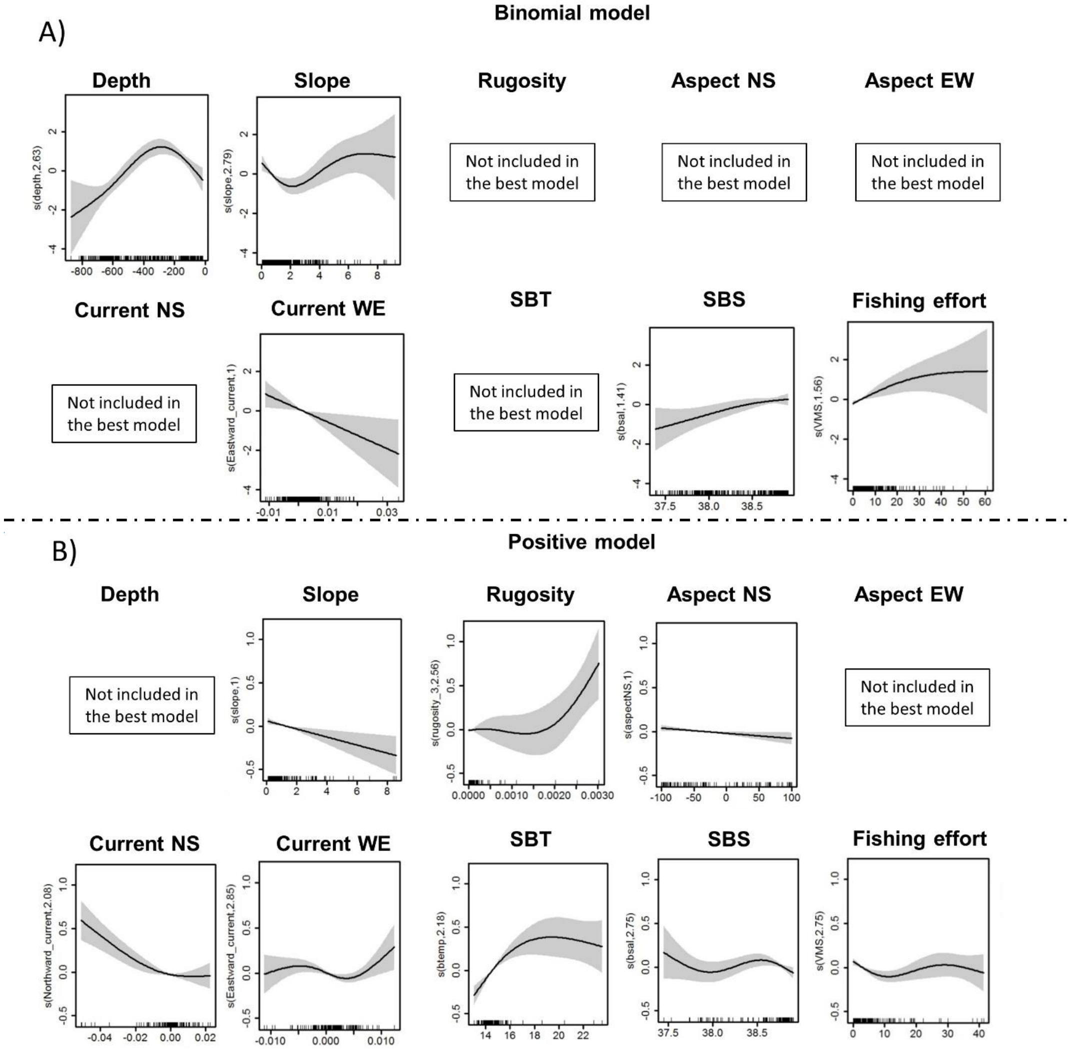
Funiculina quadrangularis



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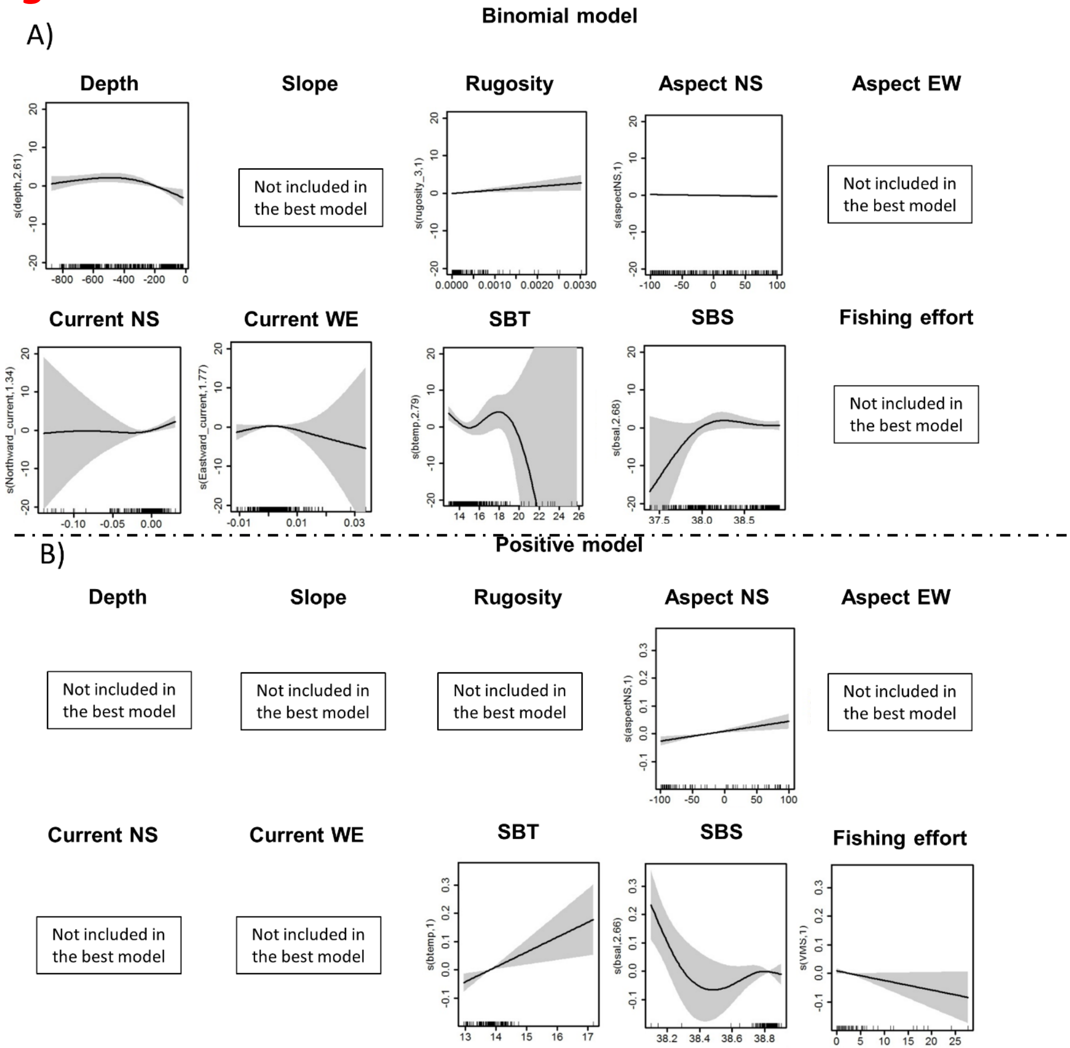
Isidella elongata



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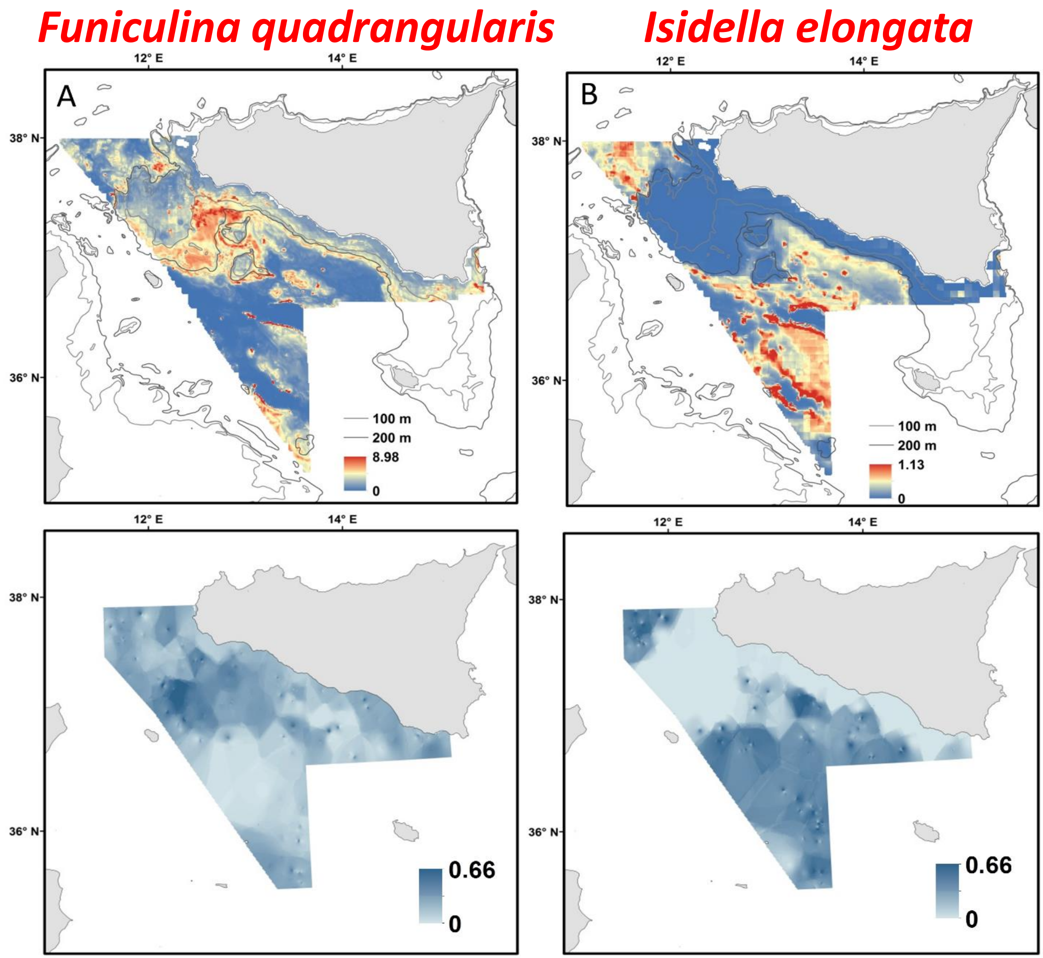
Results: prediction maps

Predicted population densities from delta model (Nkm^{-2})



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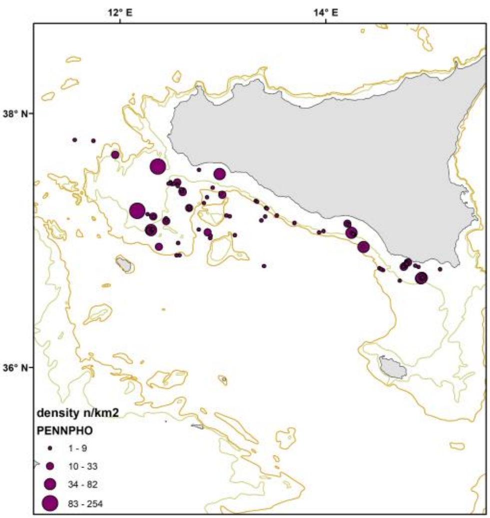
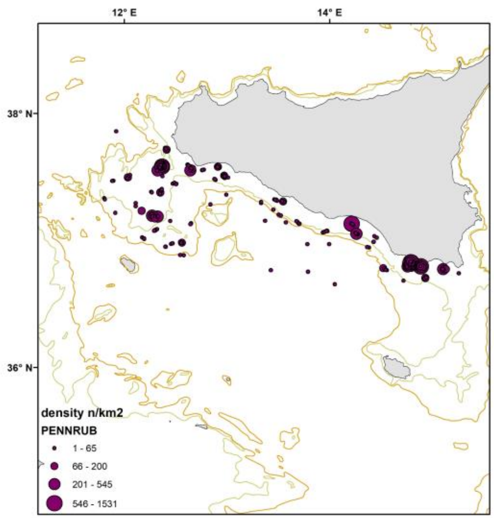
Pennatulacea VME: Sea-pen fields

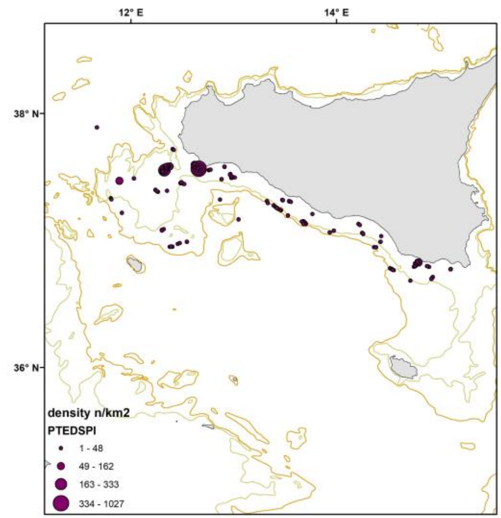
Pennatula phosphorea

Pennatula rubra

Pteroeides spinosum

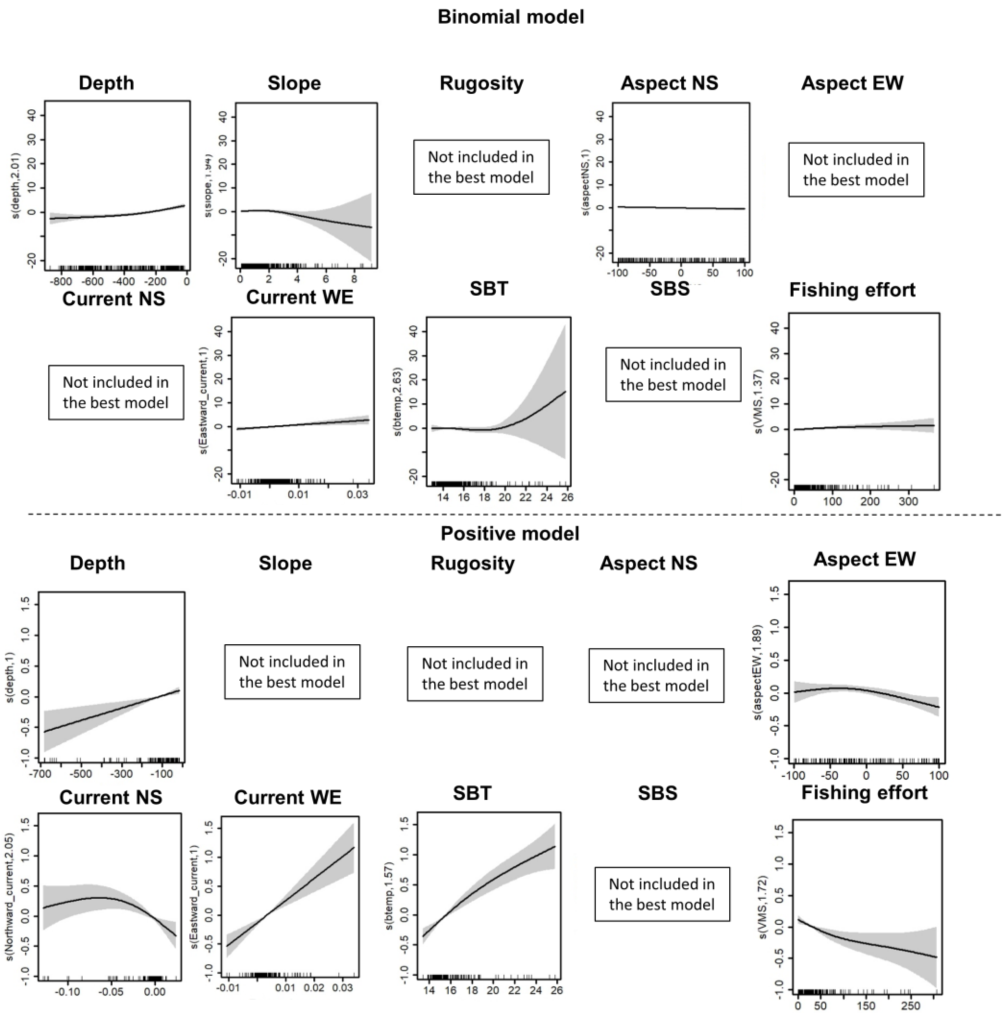






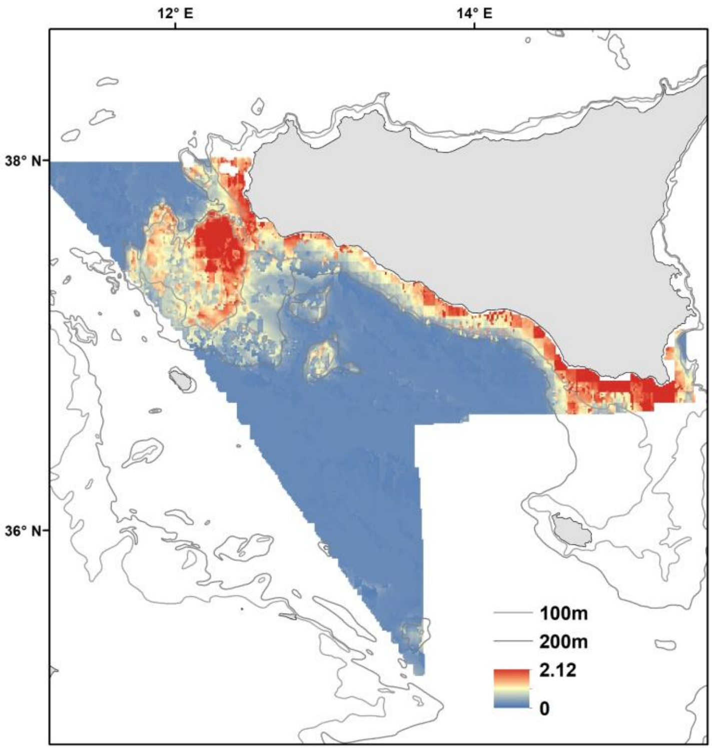
Pennatulacea

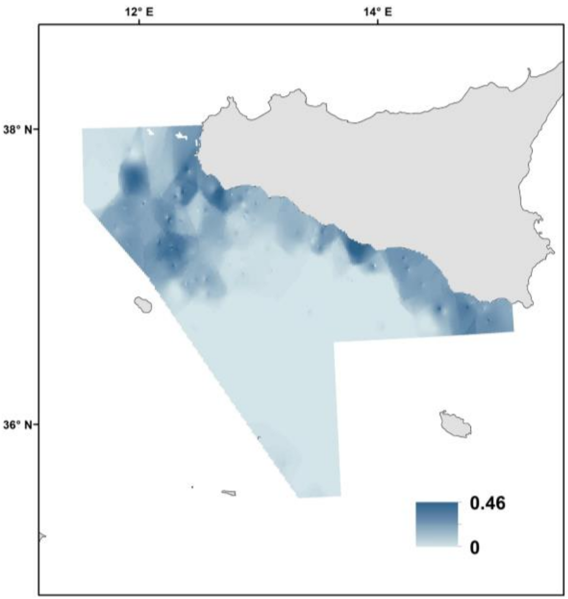
Preliminary Results: model behaviour



Pennatulacea VME: Sea-pen fields

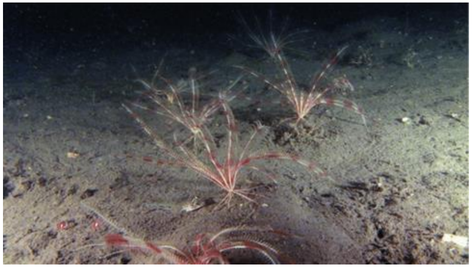
Preliminary Results: prediction maps

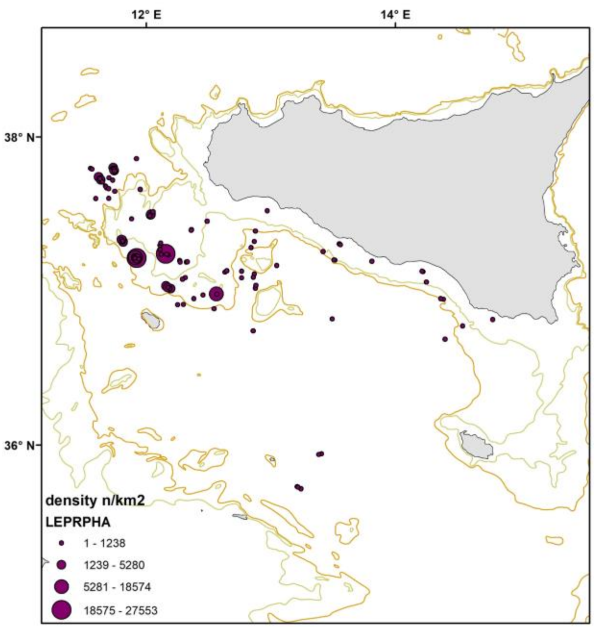


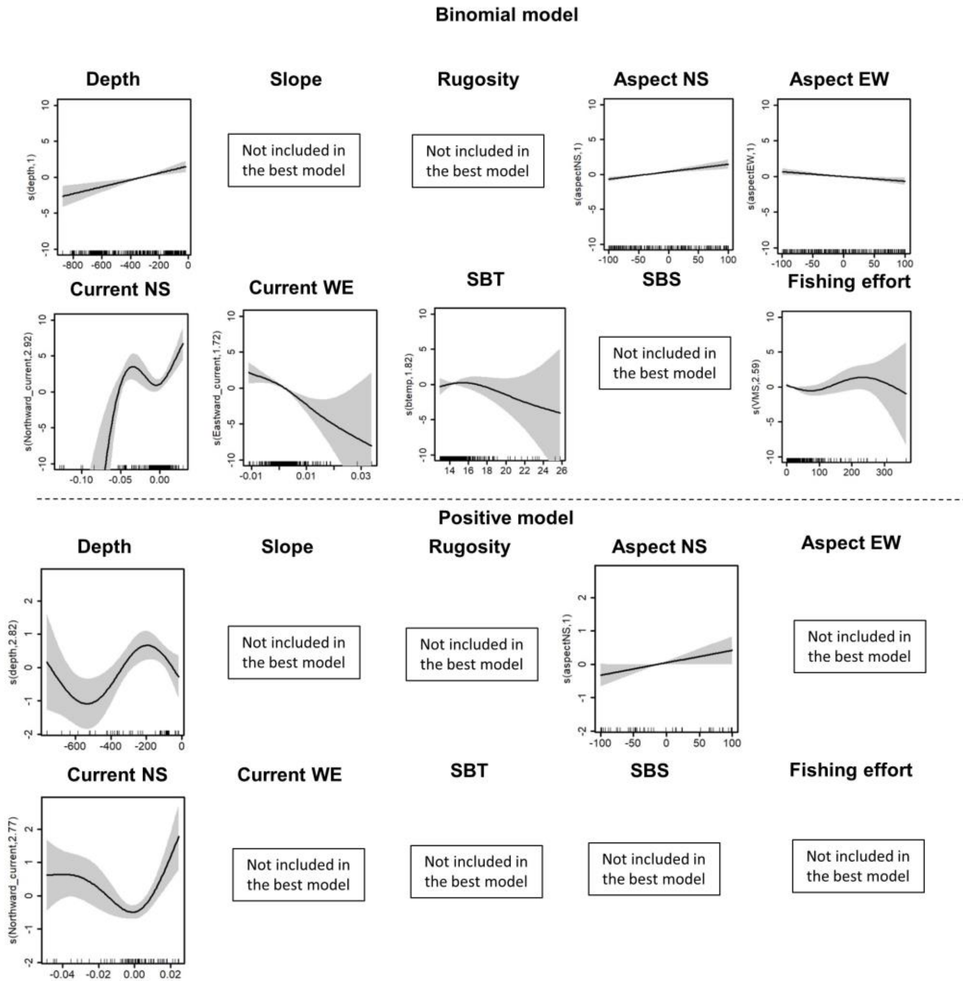


Leptometra phalangium **VME: Mud- and Sand-Emergent Fauna**

Preliminary Results: model behaviour

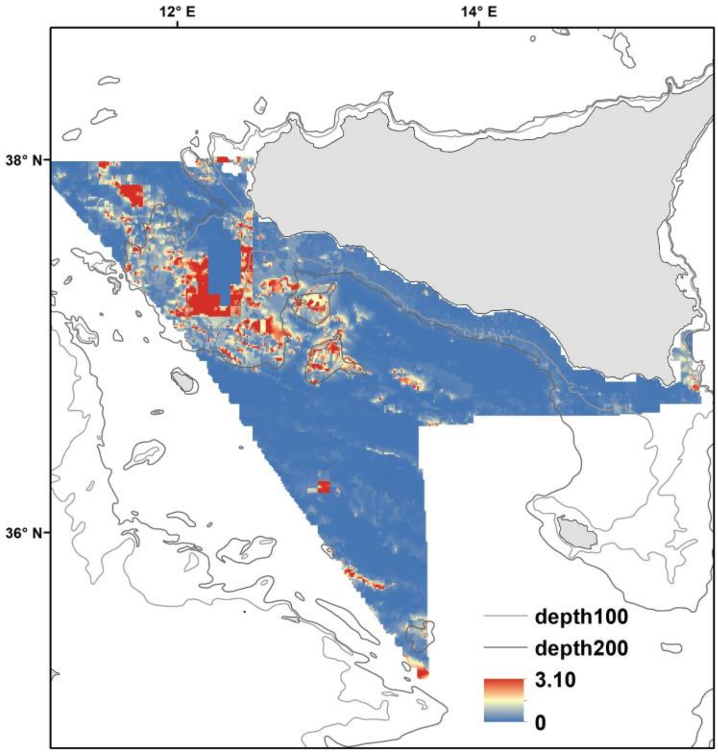


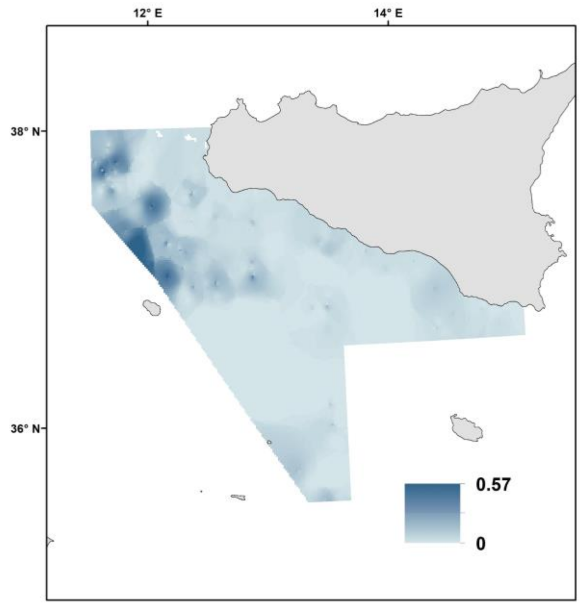




Leptometra phalangium VME: Mud- and Sand-Emergent Fauna

Preliminary Results: prediction maps





Conclusions and future work:

VME indicators have different spatial distribution in relation to environmental conditions

The effect of fisheries differs on the Strait of Sicily VMEs

Next step: to extend this study to the north Mediterranean Sea

Request MEDITS data for scientific publication:
TA and TB of VMEs indicator species:

- *Funiculina quadrangularis*
- *Isidella elongata*
- *Pennatula phosphorea*
- *Pennatula rubra*
- *Pteroeides spinosum*
- *Leptometra phalangium*
- Other species if available


Thank you
for your attention

Francesco Colloca francesco.colloca@cnr.it

Exploring compensation and compensatory dynamics in Mediterranean exploited fish communities

Abstract

Many studies have suggested that biodiversity reduces variability in ecosystem productivity through compensatory effects: i.e. a species increases in its abundance in response to the reduction of another in a fluctuating environment. Although longer-term compensatory dynamics are the basis of community stability and ecosystem resilience, they are difficult to detect in marine communities because population dynamics are governed by the direct effects of environmental change on demography and species interactions. Compensation can be viewed as the adjustment in densities of an entire community in response to a natural or anthropogenic perturbation. Compensatory dynamics involve fluctuations in population growth and decline among species in response to continuous environmental pulses.

Fishery - independent surveys, such as MEDITS, provide the longest and most comprehensive data sets on important functional groups (e.g. trophic guilds) of marine ecosystems. A common feature of trawl-survey data sets is the relative stability of biomass over several decades, despite overfishing of several commercial species and marked changes in the relative abundance of different species groups. This relative stability suggests a pattern of species replacements related to compensatory dynamics in the total production of fish biomass or within functional groups.

Different scenarios of compensation and compensatory dynamics will be tested at different spatial scale on North Mediterranean fish trophic guilds using a quantitative- analytical framework based on different methods. The objective is to elucidate the stability and resilience of Mediterranean fish community in response to overfishing and climate forcing.

Data required: TA,TB,TC of teleosteans and elasmobranchs

Spatial coverage: all the MEDITS Mediterranean GSAs

IRBIM Istituto per le Risorse Biologiche e le Biotecnologie Marine

Consiglio Nazionale delle Ricerche

MEDITS Monograph

Update April 2019

Maria Teresa Spedicato and Enric Massutí

MEDITS Monograph

20 POTENTIAL PAPERS

0. Introductory paper **1**

1. Key species **9**

Merluccius, *Mullus*, Cephalopods, *Nephrops* & *Parapenaeus*,
Aristeus & *Aristaeomorpha*, Triglidae, Chondrichthyes, Macrouridae, *Lophius*

2. Ecosystems indicators, assemblages and diversity **5**

Size indicators, Assemblages stability, Trophic level, Diversity,
Deep-sea megafauna communities

3. Miscellaneous **5**

Survival, Condition, Maturity, Age and Litter

MEDITS Monograph

Sections	Under completion	Under Review	Reviewed and pending decision	Published online
Introduction	1			
Species	1	1	2	5
Assemblages, indicators, diversity	1		2	2
Miscellaneous		3	1	1

MEDITS Monograph

Published on line in the Forthcoming Section of *Scientia Marina*:

http://scimar.icm.csic.es/scimar/index.php/secId/6/IdNum/197/

• Colloca et al. (2019)	
• Fernández de Arcaya et al. (2019)	Supplementary Material
• García-Ruiz et al. (2019)	Supplementary Material
• Hidalgo et al. (2019)	Supplementary Material
• Peristeraki et al. (2019)	Supplementary Material
• Quetglas et al. (2019)	Supplementary Material
• Sbrana et al. (2019)	Supplementary Material
• Tserpes et al. (2019)	Supplementary Material

Timeline

- Submission of pending manuscripts by the end of April or early May 2019
- Finish to send the last manuscripts to the reviewers by the end of May 2019
- Finishing all review process and Editors decision by early September 2019
- Monograph publication on November-December 2019

Publishing cost

Around 800 €/article. The first authors should receive (or have already received) three invoices: English review, Layout and Print. The bills for English revision and layout now and the third one at the end of the whole process.