GENERAL FISHERIES COMMISSION FOR THE MEDITERRANEAN

COMMISSION GÉNÉRALE DES PÊCHES POUR LA MÉDITERRANÉE

Scientific Advisory Committee (SAC)

Subcommittee on Stock Assessment (SCSA)

Report of the Workshop on elasmobranch conservation in the Mediterranean and Black Sea

Sète, France, 10–12 December 2014

EXECUTIVE SUMMARY

This workshop was the fourth of a series initiated in 2010 by the GFCM with the aim of improving knowledge on elasmobranchs and proposing technical management measures for their conservation. The workshop was attended by 19 participants from Croatia, France, Greece, Israel, Italy, Spain, Tunisia and Turkey. The 20 presentations by experts greatly contributed to updating regional knowledge on elasmobranchs after the 2012 GFCM publication on the status of elasmobranchs. The topics presented included biology, fisheries, geographical distribution, data reporting and monitoring programmes and by-catch mitigation measures. Methodologies to estimate by-catch rates and to assess the stocks of these slow-growing, long-lived and data-limited species were proposed. A number of technical measures already tested in other parts of the world that were considered feasible by the experts in attendance were suggested for short-term implementation within the multiannual management plans currently under development in the Mediterranean and in the Black Sea.

OPENING AND ARRANGEMENTS OF THE MEETING

1. The workshop on elasmobranch conservation in the Mediterranean and Black Sea was held at the Ifremer research institute in Sète, France from 10–12 December 2014. Ifremer generously offered the venue and arranged the logistics for this meeting. The meeting agenda and list of participants are provided in Appendices A and B respectively.

2. Ms Pilar Hernández, GFCM Secretariat, presented background information on the meeting. She explained that this workshop was the fourth of a series initiated in 2010 by GFCM with the aim of improving knowledge on elasmobranchs and proposing management measures for the conservation of these endangered species. The terms of reference (ToRs) of this meeting, as agreed by the SAC at its sixteenth session, were introduced and the group was invited to contribute to fulfilling the objectives defined by the ToRs. These ToRs are reproduced in Appendix C of this report. Ms Hernández then introduced the chairman of the meeting, Mr François Poisson. The following rapporteurs were nominated: Ms Carlotta Mazzoldi, Mr Henri Farrugio, Mr Fulvio Garibaldi and Mr Bernard Séret for the various sections of the agenda.

OVERVIEW OF ELASMOBRANCHS AND FISHERIES IN THE MEDITERRANEAN AND BLACK SEA

3. The background document prepared by the GFCM Secretariat (Ms Aurora Nastasi and Ms Hernández) was introduced. This document gathers recent insights on the elasmobranch fisheries in the region, economic aspects of the elasmobranch products and their international trade. This presentation also summarized actions undertaken by the GFCM in the last five years in relation to elasmobranch conservation and introduced proposals for future measures to be adopted.

RECENT PROGRESS ON ELASMOBRANCH INFORMATION IN THE REGION

4. Six presentations (five oral and one poster) focused on the latest knowledge on elasmobranch biology were delivered. Four of them described the latest outcomes of biological and genetic studies in different areas; one provided insights on a monitoring programme in France; and the last one consisted of a literature review which highlighted the recent progresses in elasmobranch research. The abstracts associated with these presentations are provided in Appendix D.

- **The reproductive biology of the common stingray *Dasyatis pastinaca* from the Gulf of Gabès (Southern Tunisia)** (Abdesselem *et al.*)
  Reproductive parameters and season for *D. pastinaca* in the Gulf of Gabés were identified. Given that there is confusion between two species of *Dasyatis* in the area, this was the first study able to estimate the parameters specifically for *D. pastinaca*. The growth characteristics are different among *Dasyatis* species. It is quite abundant in the area, although the number recorded in the 1990s, of 300 specimens per ½ hour hauls are no longer observed.

- **First estimates of age and growth of the bull ray (*Pteromylaeus bovinus*) inhabiting the northeastern Mediterranean Sea** (Başusta *et al.*)
  This study was the first example of age determination for this species. Age and growth were estimated for bull ray inhabiting the northeastern Mediterranean coast of Turkey; sex ratio, length/weight relationship and Von Bertalanffy growth parameters were estimated. Age was determined by reading the growth rings of the twentieth vertebra.

5. The group welcomed this novel study on *P. bovinus* and highlighted the positive impact of the training workshop organized by the GFCM in 2012 on studies such as this on age determination. The group also noted dissimilarities in catches of this species using different gears since purse-seiners catch larger individuals than trawlers that catch benthic-dwelling smaller individuals.

- **Feeding habits of thornback skate *Raja clavata* (Chondrichthyes: Rajidae, L. 1758) from the southeastern Black Sea coast of Turkey** (Ak)
  The feeding habits of thornback skate *Raja clavata* from the eastern Black Sea were studied. The most important factor influencing the choice of diet is fish size. Crustaceans were found to be the main prey items of small specimens (≤ 50 cm TL) whereas larger-sized specimens (≥80 cm TL) fed primarily on teleost species. As a result, the thornback skate can be considered a generalist predator.

- **Genetic diversity and population structure of the longnose spurdog *Squalus blainville* in the Mediterranean Sea** (poster) (Kousteni *et al.*)
  The results of this study demonstrated high connectivity and genetic homogeneity for the longnose spurdog in various areas across the Ionian, Aegean and Libyan Seas and offshore from the Balearic Islands. This study suggests the presence of a single panmictic population, at least for the eastern Mediterranean Sea, where sufficient sampling was performed.

- **By-catch monitoring programme of the French bluefin tuna longline fishery** (Poisson *et al.*)

This programme that was funded by the fisheries industry (France Filière Pêche) used a multi-taxon approach to evaluate the potential impact of the domestic longline fishery on elasmobranchs, juvenile swordfish, sea birds and sea turtles. Logbooks have been distributed to fishermen in order to document gear specification and fishing techniques (fishing time and soaking duration), to identify fishing areas, to assess the number of fish caught, kept or released along with their status (alive or dead at gear retrieval). Few skippers filled in the logbooks in return for financial compensation. This programme also focuses on genetic study on blue shark (*Prionace glauca*) to determine whether there is migration between geographic areas of the Mediterranean Sea and between the Mediterranean Sea and the Atlantic Ocean. Several individuals of blue sharks, loggerheads and green turtles and one juvenile swordfish have been tagged with satellite telemetry tags. The first tracks can be seen on a dedicated website (http://www.amop-selpal.com/). The post-release mortality of blue sharks will be assessed using archival pop up tags.

6. Important outcomes of this project were commented and were praised by the group, including the distribution of hook-remover devices to fishermen with the aim to reduce post-release mortality of individuals that are mostly alive on deck. The presence of numerous juveniles (50-60 cm FL) and of a large gravid female (40 pups) this year suggests that the eastern part of the Gulf of Lions could potentially be a nursery ground for *P. glauca*.

- **State of the art on elasmobranch biology in the GFCM area** (Megalofonou)

A bibliographic review has been done in preparation of the workshop. The review highlighted a considerable progress regarding the biological studies on Chondrichthyan species. Out of 800 studies that have been examined, 153 were dealing with the reproductive biology and 121 with the feeding biology. Age, growth and migration studies were less represented while only few stock identification and molecular studies were undertaken, especially during the last three years. The main gaps in biological studies identified were for the large elasmobranch species and rare/endangered species. Instead, the most studied species were those that are most abundant in the catches, have a commercial value and generally have small size, such as *Raja clavata, Scyliorhinus canicula, Squalus blainville* and *Raja miraletus*. More than 50% of the studies were published during the latest decade. Besides, a large amount of the existing information was mainly obtained from areas in the western and central Mediterranean Sea and was found both in peer-reviewed articles and grey literature, i.e. technical reports, publications of local interest, abstracts of conferences and local databases.

7. In the discussion following the presentation, the importance of the effort to categorize the level of information by topic/area was highlighted. Participants agreed that the new platform based on SharePoint presented by the GFCM Secretariat could be a useful tool to host the bibliographic database provided by some experts to which several participants agreed to contribute on a regular basis. Additionally, it was noted that the GFCM workshop of 2012 in Antalya on elasmobranch ageing had an impact on the improvement of age and growth studies.

- **Review of the past and ongoing research projects on elasmobranchs in the GFCM area** (Poisson)

A draft table reviewing the past and ongoing programmes on elasmobranchs conducted in the Mediterranean and Black Sea was submitted to the group who welcomed the effort and agreed to distribute the table amongst the relevant experts in the hope of having it completed on a voluntary basis and making it available to the GFCM Secretariat.

IDENTIFICATION OF THE MAIN FISHERIES IMPACTING ELASMOBRANCHS AND BY-CATCH RATES

8. In this session, three presentations were delivered that dealt with fisheries impacting elasmobranch populations and by-catch rates. Two of them described elasmobranch by-catch in the Gulf of Gabès and the third one assessed the status of elasmobranch populations in the northern Adriatic Sea using long-term fishery data. The abstracts of these studies are provided in Appendix D.

- **The contribution of fishery data to assess the status of elasmobranch populations in the northern Adriatic Sea** (Mazzoldi *et al.*)
  Long-term fishery data from the major fishing fleet of the Adriatic Sea in Chioggia highlighted that the total landings of elasmobranchs at present represent less than 20% of the landings of the 1940s. Skates and catsharks exhibited the largest decline in landings, currently at 2.4% and 10.6% of the average 1940s levels, respectively. A large catch of new-born specimens of smooth-hound species in coastal waters suggests the presence of a nursery area in the western Adriatic Sea.

- **Elasmobranch by-catch in experimental trawl survey in the Gulf of Gabès (Central Mediterranean Sea)** (Samira *et al*)
  In the context of experimental trawl surveys in the Gulf of Gabès during April –May 2014, 15 elasmobranch species belonging to eight families were caught incidentally. Elasmobranch by-catch represented 12.6% of total commercial fish catch. The CPUE was estimated at 2.96 kg/haul.

9. The ensuing discussions inquired as to the condition of elasmobranchs that arrive on-deck alive and on the effectiveness of releasing them alive back to the sea. Moreover, it was questioned whether introducing size limits for new-borns and gravid females could be a measure to protect demersal elasmobranch species. It was suggested that the Gulf of Gabès could be an appropriate area for experimental fisheries to test different technical measures such as time windows for trawl nets, mesh size, bottom line of trawl nets, tow duration etc.

- **Elasmobranch by-catch in shrimp trammel net fishery of the Gulf of Gabès (Tunisia)** (Saidi *et al.*)
  In the Gulf of Gabès, *Mustelus mustelus* was the species most commonly captured by shrimp trammel nets (3.7 individuals per trip; 1.2 ind./1000 m net per day) followed by *M. punctulatus* (0.6 ind./ trips). For the other species, CPUE varied between 0.2 and 0.003 ind./1000 m net per day. *Carcharhinus brevispina*, a very common Lessepsian species, was found to be more abundant than in the past in the area. It was noted that all captured sharks were new-borns. About 50% of skates (*Torpedo torpedo* and *Dasyatis pastinaca*) were mature, while there were several newborns too. The occurrence of new-borns reflects the importance of the Gulf of Gabès as nurseries area for elasmobranch species.

10. The group noted that new-borns are all found dead because of the long duration of the soak, which is about 18 hours. Provided that size limits cannot be applied to trammel nets, it was suggested that closing nursery areas could be an alternative measure to reduce elasmobranch mortality.

IDENTIFICATION OF SENSITIVE AREAS FOR ELASMOBRANCHS IN THE REGION

11. In this session, two papers were presented: the first one on a nursery site for Squalidae in the Gulf of Gabès, and the other one on species identification and spatio-temporal distribution of requiem sharks (genus *Carcharhinus*) along the coast of Israel.

- **A nursery site of Squalidae in the Gulf of Gabès, Tunisia, central Mediterranean Sea** (Bradai)
  The Gulf of Gabès has already been identified as a sensitive area for Tunisian elasmobranchs. This study focuses on the sharks of the genus Squalus (*S. blainvillei* and *S. megalops*), free-swimming juveniles and gravid females which are regularly trawled in this area. The authors proposed a complete closure of the area.

12. Following this presentation, there was debate on the various possibilities of managing shark fisheries, including spatial closures. In this regard, participants were reminded that during the thirty-eighth session of the Commission (May 2014), a draft proposal for a three-month closure (July to September) of the trawl fisheries in this area was presented and discussed. Some remarks were made about the availability of information in reference to the lack of historical or long-term series of data. However, the present work and other previously published studies contribute to support actions towards the protection of the Gulf of Gabès, which can be considered as a nursery ground for elasmobranchs.

- **Species identification, phylogeography and spatio-temporal distribution of requiem sharks (genus *Carcharhinus*) along the Israeli Mediterranean coast** (Barash)
  This study showed that, in winter, requiem sharks (mainly *Carcharhinus plumbeus* and *C. obscurus*) aggregate in the vicinity of the discharged warm waters of power plants along the Israeli coasts. Genetic analysis showed that the population of *C. obscurus* along the Mediterranean coasts of Israel has an Indo-Pacific origin. This kind of regular aggregations around power plants discharges has never been reported anywhere in the world. The authors tested the different hypotheses: possible misidentification, Lessepsian migration, local refuge and bursting population.

13. The group discussed whether this area should be classified as "sensitive" since these observed shark aggregations are recent and are the result of an attraction effect (direct or indirect) of the warm waters discharged from the power plants and of the excess of food available around cages. Participants suggested continuing monitoring the area and the fishing activities undertaken by anglers in the vicinity.

PROPOSALS TO IMPROVE MONITORING AND ESTIMATION OF BY-CATCH AND DISCARD RATES

14. Six presentations on data acquisition and methodologies for estimation of by-catch rates were delivered.

- **MedLem database, a data collection on large elasmobranchs in the Mediterranean basin** (Serena *et al*.)
  The Mediterranean Large Elasmobranchs Monitoring (MEDLEM) database was introduced. This database is currently being fed information by scientists and interested citizens on a voluntary basis. Consequently, it can be considered an indicator of species presence more than a quantitative database. It currently contains over 2 700 records (>3 000 individuals) of large elasmobranch species ranging from first historical reports back in 1666 up until 2014. Thanks to the increased public awareness on the conservation status of sharks, and a consequent development of new monitoring programmes, the frequency of reporting has increased in the last decade. However, the geographical area covered by the reporting is not homogeneous throughout the Mediterranean; further efforts are needed in the south-eastern Mediterranean areas. A number of figures were presented on the frequency and spatial distribution of records, the size structure of the observed individuals of select species and the gears involved in the observations. Gillnet, trammel net, longline, tuna trap and bottom trawl fisheries, in this order, are the principal fisheries responsible for the by-catch of large elasmobranchs such as devil ray, basking shark and blue shark.

- **CIESM Sharks programme: a new tool for the assessment of Mediterranean Chondrichthyans** (Soldo *et al.*)
  The CIESM shark programme, established in 2013 is based on an interactive website which includes a detailed species description that can be used by the general public to easily identify a species and add the record. In the first phase, 21 species had been included, while during 2014, an additional 16 species were added. After publishing of the record, the data are available to all the interested persons and institutions. The focus of the programme is on the species with uncertain status (i.e., those for which it is unclear whether they are simply rare or locally- and regionally-extinct and species which share similar body characteristics thereby making them hard to identify by non-experts).

15. The group praised the work carried out and expressed continued support to the two initiatives described directly above. However, it was noted that both databases contain records of presence and as such could not be taken into account from a quantitative point of view. Furthermore, it was noted that the number of records can be misleading since fewer records in some areas do not imply their actual absence from those areas, but rather a lack of reporting.

16. Participants at the meeting were informed about the existence of a mobile application for the Apple iPhone "Sharkpulse", created by Francesco Ferretti. This application was designed to extend the possibility of collecting data to all at-sea persons (researchers, sailors, fishers, etc.), which would help in delineating the abundance and distribution of global shark populations.

- **Porbeagle shark trade in Europe: behind the curtain!** (Chabrol *et al.*)
  The analysis of trade data revealed that despite the prohibition of catch and retention of porbeagle sharks in EU waters since 2010, this vulnerable species is still being caught and traded in Europe. Investigations in some European fishing harbours indicated that these trade data on a forbidden species could result from: 1) a large misuse of the commodity codes by wholesalers in many EU countries; 2) potentially illegal fishing activities; and 3) the possibility of mako sharks being sold as porbeagle, for some unidentified commercial reason.

17. The ensuing discussion suggested alternative explanations for the apparent continuation in porbeagle shark trade, such as catches of EU vessels fishing in non-EU waters, possible data duplication in the ICCAT database and the use of different commodity codes to identify the species. Participants acknowledged the importance of trade data as an alternative source of information in the absence of fishery data or as complementary data to enable comparisons with landings data.

- **Elasmobranch data series from the Spanish fisheries in Western Mediterranean** (Ortiz de Urbina *et al.*)
  This presentation provided a summary of the information collected by the Spanish Institute of Oceanography on elasmobranch species from bottom trawl and longline fisheries in the Spanish Mediterranean. Data are collected from two regional organizations (the GFCM and ICCAT). The main Spanish fisheries that adversely affect elasmobranch populations are bottom otter trawl and both set and drifting longlines. Data emanate from bottom trawl surveys (MEDITS and MERSEL) as well as from on-board and landings observer programmes. The parameters of the data collected and the existing data series were described.

18. The group commented on the extensive data collection programmes in Spain and inquired as to the availability of this data. ICCAT databases and MEDITS surveys were identified as the main sources of public information at present.

- **Standard maturity scale for elasmobranchs under the EU-Data Collection Framework** (Serena *et al.*)
  In response to the request of the European Union to collect maturity data under the Data Collection Framework (DCF), the International Council for the Exploration of the Sea (ICES)

organized, in 2010 and in 2012, two workshops on the sexual maturity staging of elasmobranchs (WKMSEL). As there was no international agreement on the maturity scales to be applied to elasmobranchs (sharks, skates and rays), the main objective of these workshops was to establish a common maturity scale for elasmobranchs, across the laboratories involved in the DCF programme and in non-EU countries. The WKMSEL reviewed the scales in use and proposed two new maturity scales, one for oviparous and other for viviparous species.

19. The group endorsed the methodologies and scales proposed by the ICES WKMSEL and suggested adopting the same maturity scales for the new GFCM Data Collection Reference Framework.

- **Provision of scientific advice for the purpose of the implementation of the EUPOA sharks: catch estimates methodology** (Poisson)
  The shark by-catch estimation method proposed by the "EU project for the Provision of Scientific Advice for the Purpose of the implementation of the EUPOA sharks" based on ICCAT task I data was introduced. With this method, the annual average "potential" shark catches for major fleets had been estimated for the period 2000-2010 in the context of the EU Project. In order to do this, a ratio reference table (reference table of ratio shark by-catch/catch over target species catch) by *métier* (combination of gear and target species group) was prepared. For each *métier* the following parameters were defined: i. a ratio of shark (15 major shark/ray species) catch to target species group (in weight); and ii. shark species composition proportion (sum = 1; the project focuses on 15 major shark/ray species). The results showed that there are generally great discrepancies between the official declared elasmobranch catches and the total elasmobranch catches estimated in this way. This inductive method should allow for obtaining a more accurate picture of elasmobranch by-catch, avoiding all implications resulting from the official declarations of the different countries that could be affected by several factors, as previously highlighted for porbeagle. The ratios table (ratios of shark catch/by-catch over target species catch) generated for the Mediterranean Sea was presented to the group as a starting point to be improved upon by applying more stratified ratios and expert knowledge from the group. It was mentioned that all the methods and equations used for estimation were available in an Excel sheet and can be easily adapted and fine-tuned incorporating improved information for ratios by gear and fleet segment from observer programs and expert knowledge.

20. The group then agreed to widely disseminate the table through the GFCM SharePoint community of practice to the regional elasmobranch experts to be completed according to their own knowledge and once completed to be made available by the Secretariat.

ACTIONS FOR THE MANAGEMENT AND CONSERVATION OF ELASMOBRANCHS

21. Six presentations dealing with actions on data collection, stock assessment and technical measures to reduce by-catch were presented. Abstracts of these studies are available in Appendix D.

- **Data collection through the GFCM Data Collection Reference Framework (DCRF)** (GFCM Secretariat)
  The new data collection reference framework was presented with emphasis on the type of data to be collected on elasmobranch species. It was noted that the number of individuals caught of all the species included in Annexes II and III of the Barcelona Convention should be reported through Task II. In addition, for most commercial species, data on landings, effort, size and maturity stage should be reported.

22. The group supported the proposed scheme, and confirmed that methodologies and scales proposed by the ICES WKMSEL were well-suited to the new GFCM Data Collection Reference Framework.

23. Participants suggested alternative means of collecting data, particularly from the small-scale fisheries sector. Suggestions included self-reporting via mobile phone; case studies in other parts of the world and the group suggested developing a case study to test it at a pilot scale.

24. Participants unanimously agreed on the importance of establishing observer programmes as the only means of obtaining reliable datasets. Strong evidence for the effectiveness of observer programmes has been provided by the EU-DCF and ICES elasmobranch working group. These programmes should ideally be extended to all countries in the Mediterranean and Black Sea.

- **Considerations on the status of elasmobranchs in the Italian waters** (Serena *et al.*)
  Thirty years of data from the national and international demersal surveys (GRUND and MEDITS) have been studied in Italian GSAs. With regards to abundance indices (densities as n/km^2 and biomass as kg/km^2), a generally stable situation was observed for the most common species with quite low biomass levels in relation to pristine situations. Risk analysis suggested a general low level of productivity and variable levels of susceptibility regarding bottom trawling and set gears for 7 species: *Scyliorhinus canicula, Galeus melastomus, Mustelus mustelus, Raja clavata, Raja asterias, Raja miraletus and Dipturus oxyrhinchus*. 4 stocks have been assessed using both demographic (Leslie matrices) and Y/R analyses, resulting in three of them in sustainable status, *R. clavata, S. canicula and G. melastomus* in GSA 16, while *Raja asterias* is overexploited in GSA 9. It was also noted that there is an increasing trend or stability in abundance data of some species. The associated publication has been uploaded to the GFCM elasmobranch SharePoint portal.

25. Participants highlighted the importance of using survey data and alternative models to assess the status of elasmobranchs and recommended requesting these data from the public institutions that currently host them (e.g., in the case of MEDITS, the EU). Moreover, it was recommended carrying out new stock assessments within the framework of the GFCM Working Group on Stock Assessments.

- **Sharklife: urgent actions for the conservation of cartilaginous fish in Italy** (Clo *et al.*)
  Sharklife, the first European project within Life+ programme dedicated to the conservation of sharks in the Mediterranean Sea, co-financed by the Ministry of Environment and Parco Nazionale dell'Asinara was presented. The main objectives and results were outlined, highlighting: the reduction in catches of pelagic stingray *Pteroplatytrygon violacea*, through the diffusion of the use of wide dimension circle hooks (16/0 or wider), 0 catch of sharks and rays in the national fishing competitions through the implementation of a tag and release policy, the proposal of the Italian Action Plan for the management and conservation of cartilaginous fishes and guidelines to design legislation and regulations in Italy and the organisation of several training activities for identification of elasmobranch protected species to increase sea inspectors' (veterinarians in fish markets, port authorities) knowledge on the different elasmobranch species.

- **Elasmobranch by-catch of the swordfish longline fishery in the Ligurian Sea** (Garibaldi *et al.*)
  Data and CPUE time series on by-catch of pelagic shark species caught in the Ligurian Sea by swordfish longline were collected over a 25-year period. In the past, significant catches were recorded only for a few species, mainly blue shark, *Prionace glauca* and pelagic stingray, *Pteroplatytrigon violacea*. In the last 4 years, the introduction of the mesopelagic swordfish longline has led to a significant reduction in pelagic elasmobranch catches. On the other hand, monitoring of fishing activities has highlighted an unexpected abundance in the catches of little sleeper shark, *Somniosus rostratus*, so far considered a very rare, uncommon species.

The sampled specimens helped to deepen the knowledge on its biology and ecology. The impact of the new gear on elasmobranch populations and implications for their conservation are discussed.

26. Some comments were made about the comparison of CPUE estimates in a time series in which the soaking time has increased from some hours to 2 days. It was also noted that in recent years, the price of blue shark meat is higher than the price of swordfish, which could now create an incentive for fishers to target sharks. However, the reduction of catches due to the change of gear was noted and acknowledged by the group.

- **Overview of technical mitigation measures to reduce elasmobranch mortality** (Poisson)

In general, the management measures to reduce fishing mortality of elasmobranchs are directed to:

- Discouraging fisheries targeting cartilaginous fish
- Minimizing incidental interactions
- Maximizing the number of cartilaginous fish returned to the sea alive

An overview of the main considerations to be taken into account before the implementation of any mitigation measure was provided by highlighting the following nine elements:

- Spatial pattern of by-catch rates (more or less aggregated in space)
- Temporal stratification (more or less `aggregated in time')
- Level of control (controllable or uncontrollable by the fishers)
- Frequency of occurrences (rare or common)
- Degree of predictability (predictable or unpredictable)
- Ecological origin of the by-catch (species associated with the target or random encounters)
- Level and type of impact (level of mortality rate on board, level of the post-release mortality)
- Legal or economic considerations
- The potential impacts on other taxonomic groups.

27. Participants commented on a series of potential measures to be adopted focusing on three main categories: i) education and awareness of fishermen; ii) technical modification of fishing gears or fishing operations; and iii) size limits.

28. The workshop discussed and agreed that **education** is a part of the by-catch mitigation solution. The scope of education for fishers needs to be expanded from a focus on purely boating and fishing skills to also include environmental issues associated with good fishing and handling practices. To this end, informative dissemination activities, including distributing information materials and organizing seminars on reducing by-catch of sharks (and other taxa) and safe handling of incidentally caught individual should be organized.

29. The group suggested the development of **handling/release guidelines** intended to promote good handling practices to avoid injuries to the crew when handling sharks and rays and to minimize physical trauma and stress experienced by captured animals. Moreover, the use of the proper tools and handling equipment to release elasmobranchs alive (bolt cutters, hook remover, long-nosed pliers) could drastically reduce the post-release mortality of elasmobranchs caught by longlines.

30. On the topic of using chemical **light-sticks** (made in plastic, containing harmful chemical products), it was noted that they have a negative impact on the environment and increase the probability of catching shark and sea turtles incidentally and therefore, they could be replaced by other types of light attractors instead (e.g., battery-powered light-emitting diodes [LEDs]) with a similar effectiveness in attracting swordfish but less impact on the environment if the used batteries are stored and discharged on the land in appropriate containers.

31. Regarding the use of **corrodible hooks –** fishing hooks composed of alloys and different coatings than stainless steel, thereby allowing a quick dissolution (from weeks to months) – it was noted that the economic impact of adopting corrodible hooks was relatively negligible since they cost less than stainless steel hooks. Moreover, the frequency of replacement is the same as for the stainless steel hooks that are currently used in fishing operations.

32. The group agreed that fish with powerful jaws and cutting dentition (e.g., sharks) are better able to bite and cut **nylon leaders** and therefore suggested that the use of wire leader should be prohibited in order to prevent the development of fisheries targeting pelagic sharks in the Mediterranean Sea.

33. **The group agreed that size limits** were a good option when post-release rates were demonstrated to be high. In particular, blue sharks *Prionace glauca* are the most frequently discarded fish species during commercial pelagic longline fishing operations and it is well known that the majority of sharks are alive at gear hauling. In cases like this, the potential discards due to size limitation would have a high rate of survival, provided that fishers use the most appropriate handling operations.

- **Minimum landing size (MLS)** could reduce mortality of young individuals giving the population the opportunity to grow in weight and to increase the spawning stock.
- **Maximum landing length (MLL)** can reduce the impact on large individuals, which are generally mature females that are the most fecund. It was noted that this measure has already been used for porbeagle and spurdog in EU waters.

34. The exact figure for the optimum landing size has to be determined on a case-by-case basis. It is assumed that all healthy sharks released alive could survive if the crew accurately use the appropriate procedures to release the animals.

35. The participatory approach with training workshops bringing together local fishers, fishery observers, and scientists aiming at reviewing current mitigation methods and best fishing practices protocols to reduce elasmobranch mortality could also help in improving the sustainability of the fisheries.

36. The group highlighted that the enforcement of existing regulations by the GFCM, ICCAT and the EU is also crucial to give cartilaginous fish populations a chance to recover. In addition, a higher level of protection should be given to species listed in Appendix III of the Barcelona convention which, at the moment, under Recommendation GFCM/36/2012/3 are only subject to reporting requirements by the GFCM members.

COMMUNITY OF PRACTICE FOR ELASMOBRANCHS HOSTED AT THE GFCM SECRETARIAT IT PLATFORM

- **Platform for the GFCM Community of Practice on Elasmobranchs based on SharePoint** (GFCM Secretariat)

Hosted by the GFCM Secretariat information system, a platform is being created to enhance the communication amongst elasmobranchs experts. This initiative is composed by two integrated environments.

1) The first is oriented towards knowledge management and is hosted on the GFCM Extranet on SharePoint: it aims to allow users to compile, consult and share a growing set of information on by-catch logs, pictures libraries witnessing accidental catches and document libraries to collect relevant publications. The system delivers a high level of flexibility allowing additional libraries and datasets to be added without requiring any system downtime. At the same time, additional columns can be added to existing information sets as appropriate.

2) The second is a fully-fledged social network based on the Yammer environment owned by the GFCM. This instrument is a secure environment where users can discuss specific topics related to publications/articles as well as discuss their studies addressing elasmobranchs. It is meant to serve as a forum for asking questions and finding answers rapidly. Creating connections with scientists with similar interests and relevant expertise will become easier, thus increasing the visibility of ongoing projects and emerging initiatives in this field. Staying connected to other users on-the-go is also possible with a dedicated mobile app running on Android, iPhone and Windows Phone.

37. The initiative was warmly welcomed and praised by the group that had been requesting this type of instrument since the first workshop held in Tunisia in 2010. The different-level access secured by a password was described and some participants started uploading documents and presentations. It was decided to use it to finalize the report and to complete some of the tables presented.

CONCLUSIONS AND RECOMMENDATIONS

Progress in updating elasmobranchs information

38. According to the analysis performed and to the presentations of the participants there has been significant progress on elasmobranch studies since the last overview document of 2010 (Bradai *et al*. 2012. FAO Studies and Reviews) particularly on the following topics:

- Molecular and genetic studies were published in peer-reviewed journals providing important information on stock structure and phylogeny of elasmobranch species. It was proposed that according to these studies *Squalus blainnvillei* could be treated as one stock in the eastern Mediterranean Sea. In contrary, strong genetic differentiation was revealed for the small-spotted catshark *Scyliorhinus canicula*. The genetic partitioning was mainly observed between the western and eastern Mediterranean (Kousteni *et al.*, 2014).
- Age and growth studies of species that were not studied previously have experienced a significant increase. One example: the case of bullray in Turkish Mediterranean coast was presented at the workshop. It was noted that the GFCM workshop of 2012 on age reading in Antalya, Turkey had had a positive impact on the improvement in this type of study.
- New studies on the reproductive biology and the diet composition of species that were not studied previously or in geographical areas that were not taken into consideration previously have been recorded.

39. Main gaps were identified in biological studies for large elasmobranch species, and also for those that are rare and endangered. Furthermore, there are very few articles pertaining to data on fisheries impact, on the migration and movements of some species or on stock identification and there is still a lack of basic knowledge on the biology and on abundance of a large number of elasmobranch species in many parts of the Mediterranean; in particular the eastern Mediterranean and the Black Sea.

40. In contrast, the most studied species are those that are most abundant in the catches, have a commercial value and generally have small size, such as *Raja clavata, Sciliorhinus canicula, Squalus blainvillei* and *Raja miraletus*.

41. The group acknowledged that the new platform based on SharePoint presented by the GFCM can be a useful tool to host the bibliographic database provided by some experts to which the group agreed to contribute on a regular basis and decided to make more effort to cover the gaps in the biological information. The group recommended that the GFCM Secretariat further develop and maintain this platform and associated services on the GFCM extranet as a tool to support cooperation and knowledge management within this community of practice. This would be in accordance with the access policies defined by the expert group and managed by the GFCM Secretariat.

Main fisheries impacting elasmobranchs

42. The fisheries identified as having a higher impact on elasmobranchs conservation vary depending on the species, the area and also on the life stage within the same species; therefore, generalizations must be made with caution. Nevertheless, a first rough analysis of the literature reviewed led to the conclusion that trawlers are the most harmful gears for demersal fisheries; set nets (trammel and gillnets) affect mainly coastal species and longlines have higher impact on pelagic species. Gillnets, trammel nets, longlines, tuna traps, purse seines and bottom trawls in this order are the main fisheries responsible for the by-catch of large elasmobranchs such as devil ray, basking shark and blue shark. (MEDLEM database).

Identification of sensitive areas for elasmobranchs in the region

43. Studies carried out during the last decade in the Gulf of Gabès provided evidence that this area represents high abundance of new-borns and pregnant females on a constant basis, thereby leading the group to consider it as an important nursery area for cartilaginous fish to be potentially protected.

44. Other dense aggregations of gravid females and recruits have also been recently identified; areas of the Adriatic and Gulf of Lion close to river estuaries. A different type of aggregation has been recently identified around fish cages and power plants in Israel during the last ten years. These areas can also be considered sensitive for large coastal sharks (*C. plumbeus* and *C. obscurus*).

Proposals to improve monitoring and estimation of by-catch and discard rates

45. The group acknowledged the methodology used for the EUPOA Sharks project to estimate potential shark by-catch rates based on estimation of ratios sharks/target species and recommended using it in the future.

46. The group recommended establishing a calendar of meetings (annual or biannual) in order to produce by-catch estimates with this methodology as well as to assess the status of stocks on a more regular basis. In order to minimize costs and to not increase the number of meetings, a proposal to hold dedicated session within the WG on stock assessment of demersal species (WGSAD) to perform some trials was agreed upon - if possible with the collaboration of an invited expert from ICCAT. A series of prerequisite steps were outlined and agreed upon by the group: participants will gather all the available information on by-catch related to their interest area in a standardized format that will be shared in the community of practice SharePoint portal hosted on the GFCM extranet, well in advance of the WG meeting. Stock assessments of selected species should also be integrated in the session of the Working Group on Stock Assessment of Demersal Species (WGSAD).

Data collection

47. The group encouraged the prompt implementation of the new GFCM Data Collection Reference framework in order to have a complete geographical coverage of data on catch, effort, discards and by-catch by fleet segment and GSA in a systematic way. Alternative methods such as self-reporting via cell phone and on-board observer programmes were also recommended.

48. Trade data could also be considered as an alternative source of information in the absence of other more accurate fisheries data or to be compared with landings data. To improve traceability for the main commercial species, commodity codes and the correct identification of species are essential. In this regard, the use of currently existing identification guides (FAO pocket guides and others) is highly recommended at landing sites as well as on-board fishery vessels.

Stock assessment

49. Risk analysis through the ranking of productivity of species and susceptibility to gears is recommended in the absence of accurate biological and fisheries data. Demographic and a yield-per-recruit analysis have also been proposed as appropriate tools for data-limited stocks. The inclusion of these two types of methods in the future exercise of stock assessment within the next WGSAD was recommended by the workshop.

Proposals for technical measures to mitigate by-catch and/or reduce mortality

50. According to the revision of existing measures and the discussions held, the following specific measures are considered as effective and feasible. The group suggested considering them for potential integration in the multiannual management plans currently under development by the GFCM.

- Introduce minimum and/or maximum landing sizes for most elasmobranch species
- In longlines fisheries:
    - Prohibit the use of wire leaders
    - Prohibit the use of chemical lightsticks
    - Require the use of corrodible hooks
- In set nets, reduce the soak time from days to hours.
- Establish temporal closures in the Gulf of Gabès.
- Require the use of hook remover, bolt cutters, long-nosed pliers, line cutter with long handles and appropriate tools to release sharks.
- Develop guidelines and protocols for the safe handling and release of elasmobranchs (and protected species) for the fishing gears with major impact (i.e., longlines and trawlers) and train fishers in their use.
- Provide higher level of protection to the nine species of Annex III of the Barcelona Convention namely *Isurus oxyrinchus, Lamna nasus, Prionace glauca, Squatina squatina, Raja alba, Alopias vulpinus, Carcharinus plumbeus, Centrophorus granulosus, Heptanchias perlo, Squalus acanthias, Mustelus mustelus* and *M. punctulatus*. These should be released unharmed and alive to the extent possible as is already in force for the species of Annex II according to the GFCM Recommendation 36/2012/3.
- Enforce the existing regulations for the protection of sharks and rays in the region.

ADOPTION OF THE REPORT AND CLOSURE OF THE MEETING

51. The conclusions and recommendations were adopted by the workshop on 12 December 2014. The whole report was adopted after revisions and amendments by electronic correspondence.

52. The group expressed appreciation for all the arrangements and facilities provided by Ifremer which enabled the satisfactory development of the meeting. The hospitality provided was deeply appreciated.

Appendix A

Annotated agenda

1. **Arrangements of the Workshop and introduction of main objectives** (*Chair and GFCM Secretariat*)

2. **Overview of elasmobranchs and fisheries in the Mediterranean and Black sea** (*Chair and GFCM Secretariat*)

3. **Recent progress on elasmobranchs information (biological, fisheries, catches, etc.) including those from ongoing research programmes in the region**

   - The reproductive Biology of the common stingray *Dasyatis pastinaca* from the Gulf of Gabès (Southern Tunisia) (Abdesselem *et al.)*
   - First estimates of age and growth of the bull ray (*Pteromylaeus bovinus*) inhabiting north-eastern Mediterranean Sea (Başusta *et al.*)
   - Genetic diversity and population structure of the longnose spurdog *Squalus blainville* in the Mediterranean Sea (poster) (Kousteni *et al.*)
   - Feeding Habits of Thornback Skate Raja clavata (Chondrichthyes: Rajidae, L. 1758) from South Eastern Black Sea of Turkey (Ak)
   - By-catch monitoring programme of the French blue fin tuna longline fishery (Poisson et al.)
   - State of art on elasmobranch biology in the GFCM area (Poisson and Megalofonou)
   - Review of the past and ongoing research projects on elasmobranchs in the GFCM area (Poisson)

4. **Identification of main fisheries impacting elasmobranchs and by-catch rates**

   - The contribution of fishery data to assess the status of elasmobranch populations in the northern Adriatic Sea (Mazzoldi *et al.*)
   - Elasmobranchs by-catch in experimental trawl survey in the Gulf of Gabès (Central Mediterranean Sea) (Samira *et al.*)
   - Elasmobranch by-catch in shrimp trammel net fishery of the Gulf of Gabès (Tunisia) (Saidi *et al.*)

5. **Identification of sensitive areas for elasmobranchs in the region**

   - A nursery site of Squalidae in the Gulf of Gabès (Tunisia, Central Mediterranean Sea) (Marouani *et al.*)
   - Species identification, phylogeography and spatio-temporal distribution of requiem sharks (genus *Carcharhinus*) along the Israeli Mediterranean coast (Barash *et al.*)

6. **Proposals to improve monitoring and estimation of by-catch and discard rates**

   - MedLem database, a data collection on large elasmobranchs in the Mediterranean basin (Serena *et al*)
   - Porbeagle shark trade in Europe: behind the curtain! (Chabrol *et al.*)
   - CIESM Sharks programme: a new tool for the assessment of Mediterranean chondrichthyans (Soldo *et al.)*
   - Standard maturity scale for elasmobranchs under the EU data collection framework (Serena *et al.*)
   - Elasmobranchs data series from the Spanish Fisheries in the Western Mediterranean (Ortiz de Urbina *et al.*)
   - Provision of scientific advice for the purpose of the implementation of the EUPOA sharks: Catch estimates methodology (Poisson)
   - Threatened sharks and rays of the Mediterranean and Black Sea (Poster) (Serena *et al*.)

7. Actions for the management and conservation of elasmobranchs

7.1. Data collection through the GFCM Data Collection Reference Framework (DCRF) (*GFCM Secretariat*)

7.2. Stock Assessment

- Considerations on the status of elasmobranchs in the Italian waters (Serena *et al*.)

7.3. Proposals for technical measures to mitigate by-catch and/or reduce mortality

- Sharklife: urgent actions for the conservation of cartilaginous fish in Italy (Clo *et al.*)
- Elasmobranch by-catch of the swordfish longline fishery in the Ligurian Sea (Garibaldi *et al*.)
- Overview of technical mitigation measures to reduce elasmobranchs mortality (Poisson)

8. Presentation of a community of practice for elasmobranchs hosted by the GFCM Secretariat IT platform (*GFCM Secretariat*)

9. Conclusions and recommendations and closure of the meeting

Appendix B

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Appendix C

Draft terms of reference for the Workshop on elasmobranchs

1. Collate historical datasets and review all the ongoing research programs in the region to update previous 2010 publication
2. Identify main fisheries and other human activities impacting sharks in the Med and Black sea
3. Identify sensitive areas for elasmobranchs
4. Assess by-catch rates in selected fisheries and other mortality rates induced by human activities
5. Proposals for improvements for the monitoring of by-catch, stock assessments and for the control of illegal finning.
6. Proposals for a series of technical measures to mitigate by-catch in the identified fisheries to be included within multiannual management plans including time or area closures in identified sensitive areas.
7. Discuss on the best option for the creation of a Community of Practice for Elasmobranchs in the Mediterranean and Black sea hosted at the GFCM Secretariat

Appendix D

List of abstracts

The reproductive Biology of the common stingray *Dasyatis pastinaca* from the Gulf of Gabès (Southern Tunisia)

Saadaoui ABDESSELEM, Saidi BECHIR, Enajjar SAMIRA & Mohamed N. BRADAI

Morphometric, biologic, anatomic and genetic studies confirm the presence of two congener stingrays Dasyatis pastinaca and Dasyatis sp. in the Gulf of Gabès (Southern Tunisia).This work deals with first records of reproductive parameters of the common stingray Dasyatis pastinaca in the area.
Of 383 specimens (212 females, 171 males) collected from June 2011 to April 2014, the smallest mature male measured 31.4 cm DW and the largest immature specimen was 36 cm DW. The smallest mature female measured 39 cm DW and the largest immature one was 44 cm DW. The DW at which 50% of the population reached maturity was estimated to be 32.97cm and 39.93 cm respectively for males and females. The gonadosomatic index was maximum in June for females (0.33 ±0.02) and in April for males (2.83 ±0.22).Vitellogenesis and gestation occur simultaneously.Gestation was estimated at five months. The pupping season mostly occurred in theend of spring to the beginning of summer. Ovulation takes place after parturition. The common stingray, Dasyatis pastinaca, is a slightly prolific species, the fecundity not exceed 10 fetuses per litter.
Keywords: *Dasyatis pastinaca, maturity, fecundity, Gulf of Gabès, Southern Tunisia*

Feeding Habits of Thornback Skate *Raja clavata* (Chondrichthyes: Rajidae, L. 1758) from South Eastern Black Sea of Turkey (*poster*)

Orhan AK

The feeding habits of thorback skate Raja clavata from the Eastern Black Sea were studied. The stomach contents of specimens were collected from the south-eastern Black Sea in Turkey between January 2008 and December 2009. The stomach contents of 357 specimens with a total length of between 14.3 to 93 cm were analyzed. Twenty one taxonomic levels of prey items were identified: 14 teleost, 6 crustaceans and 1 mollusk. Crustaceans were the most important prey group (%IRI=80.43, N%=, O%=). Mud shrimp (Upogebia pusilla) were the dominant prey items with the number and frequency of occurrence. The most important factor influencing the choice of diet is fish size. Crustaceans was founded the main prey items of small fish (≤ 50 cm TL) whereas larger-sized specimens (≥80 cm TL) fed primarily teleost. Diet composition showed low seasonal variation: decapods were the most important ingested prey in all seasons. There was high dietary similarity between sampling locations. The percentage of empty stomachs did not differ significantly among size-classes and seasons. In terms of species composition, the diet of the brown ray was characterized by a variety of rare or less important prey. As a result, the brown ray could be considered to be a generalist predator.

Species identification, phylogeography and spatio-temporal distribution of requiem sharks (genus *Carcharhinus*) along the Israeli Mediterranean coast

Adi BARASH, Leon BLAUSTEIN, Yaron TOKOCHINSKI, Eliezer PICKHOLTZ, Renanel PICKHOLTZ and Gil RILOV

Globally, sharks are decreasing in numbers at an alarming rate. Their life history traits of slow maturity and low reproduction rate make them very susceptible to population crashes. Sharks in the Mediterranean are considered to be at the greatest risk. Large coastal predatory sharks have almost disappeared completely from the northwestern Mediterranean. In Israel however, coastal Carcharhinus sharks (family Carcharhinidae) are repeatedly reported to be seen close to coastal power plants, where warm water, resulting from cooling the plants' turbines, are discharged. The dominant shark in these waters is reported to be the dusky shark (*Carcharhinus obscurus*), a shark which, according to

literature, is rare elsewhere in the Mediterranean. If indeed Carcharhinus sharks are abundant, and observations are increasing with C. obscurus as the dominant species, there are four hypotheses that can explain these observations: a) C. plumbeus, a more common shark but very similar morpholog ically to C. obscurus, has been misidentified as C. obscurus; b) we are observing a relic population of a once much larger Mediterranean population, that survived in the Levant and disappeared elsewhere; c) Carcharhinus sharks are surging in numbers due to a change in conditions, most likely from anthropogenic factors; d) C. obscurus is a Lessepsian migrant. Lessepsian migration is the name given to a phenomenon describing the migration of Indo-Pacific species into the Mediterranean through the Suez Canal, which connected the Red Sea with the Mediterranean 150 years ago.
To assess the plausibility of these hypotheses, I conducted surveys interviewing shore fishermen in relation to past and present shark abundances, and I applied molecular tools in order to determine the shark species and their phylogeographic origin. Interview surveys were conducted at four power plant and four nearby marinas. During 2013, fishermen were asked regarding their observations of sharks, the change in frequency of observations between 1973 - 1993 and 1993 - 2013, and in what months where sharks observed. For species identification and geographic origin, I collected tissue samples from 58 Carcharhinus sharks that were caught by fishermen off the Israeli Mediterranean coast. Two regions on the mitochondrial DNA were used to determine and verify species identification and origin; The D-loop (control region) segment was compared to known haplotypes of both C. obscurus and C. plumbeus of Atlantic and Indo-Pacific origin. Sequences of NADH2 region were used to con struct a phylogenetic tree and in order to verify the results of the D-loop analysis.

First estimates of age and growth of the bull ray (*Pteromylaeus bovinus*) inhabiting northeastern Mediterranean Sea
Nuri BAŞUSTA and Ergun ASLAN

Age and growth estimates were determined for bull ray (Pteromylaeus bovinus) inhabiting northeastern Mediterranean coast of Turkey. Total 94 bull ray that are between the range 29.5 to 129.2 cm disc width and weighing between 272 and 33596 g were collected as by-catch by commercial fishermen using trawl and pursein net between September 2010 and December 2012. Of the population 50% was female and 50% was male. The length and weight relationship was determined as W = 0.05815×L2.9369. This study was the first example for the age determination for this species. The growth parameters of the von-Bertalanffy equation for this species were: DW∞=242,59 for females and 238 for males Disc Width and k=0.045 year-1, to=-1.127 year. DW was revealed as a better indicator of size since the tail may be broken accidentally and the total length can be misleading. In this way first age and growth parameters belonging to this species were found out.

Porbeagle shark trade in Europe: behind the curtain!
R. CHABROL and B. SÉRET

Since 2010, the catch and the retention of porbeagle sharks are forbidden in EU waters, however the analysis of trade data from European and national databases has shown than this vulnerable shark is still caught and traded in Europe. Indeed, Spain and Portugal declare exports of porbeagle shark to Italy. Other EU countries (e.g. UK, France, Norway) are also involved in this trade. Investigations in some European fishing harbours seem to show that these amazing trade data on a forbidden species could result from 1) a large misuse of the commodity codes by wholesalers in many EU countries, and 2) from potential illegal fishing activities.

Sharklife : urgent actions for the conservation of cartilaginous fish in italy
S. CLO, G. BASCIANO, F. SERENA, C. MANCUSI, A. TERLIZZI, M. BARONE, M. SBRANA AND M. SARTINI

Sharklife project, co-financed by the Ministry of Environment and Parco Nazionale dell'Asinara is the first European project within Life+ programme dedicated to the conservation of sharks in the Mediterranean Sea. The main objective of the project was to undertake concrete conservation action to safeguard these animals, mainly aiming at reducing mortality rate due to professional and sport fishing. The large number of qualified partners like CTS – an environmental association with large experience in conservation of marine species and in information and awareness actions – FIPSAS (the Italian federation of sport fishing and under water activities, Federazione Italiana Pesca e Attività Subacquee), AGCI Agrital (a National association of fishing cooperatives), CIBM (Italian Marine Biology Center), Fondazione Cetacea, Università della Clabria and La Maddalena National Park testifies the interest in ensuring adequate conservation measures to cartilaginous fishes through a systemi c approach capable to integrate the expertise and knowledge of the various stakeholders. The main results of the project are:
• the reduction in catches of pelagic stingray Pteroplatytrygon violacea, through the diffusion of the use of wide dimension circle hooks (16/0 or wider) within Sicily's functional marines in Sicily's Strait, Mediterranean Sea and the Ionian Sea, and Low Adriatic sea;
• an end to the catching of sharks and rays in the national fishing competitions through the implementation of a tag and release policy. Since 2012 more than 25000 fishermen have been involved in 600 competitions and in the conservation of these animals and about 100 sharks tagged.
• the proposal of the Italian Action Plan for the management and conservation of cartilaginous fishes and guidelines to design legislation and regulations in Italy;
• the training for identification elasmobranch protected species to increase sea inspectors' (veterinarians in fish markets, port authorities) knowledge on the different elasmobranch species. During the project were held 16 meetings involved about 200 Cost Guard personnel and fish markets veterinarians;
• the project was implemented the new MEDLEM protocol to collect data and to contribute to the assessment of the elasmobranch by-catch. The MEDLEM protocol was distributed to the training courses throughout Italy.

Elasmobranch by-catch of the swordfish longline fishery in the Ligurian Sea
Fulvio GARIBALDI and Luca LANTERI

Data and CPUE time series on by-catch of pelagic shark species caught in the Ligurian Sea by swordfish longline were collected over a 25 years period. In the past, significant catches were recorded only for a few species, mainly blue shark, Prionace glauca and pelagic stingray, Pteroplatytrigon violacea. In the last 4 years, the introduction of the mesopelagic swordfish longline has led to a significant reduction in pelagic elasmobranch catches. On the other hand, monitoring of fishing activities has highlighted an unexpected abundance in the catches of little sleeper shark, Somniosus rostratus, so far considered a very rare, uncommon species. The sampled specimens helped to deepen the knowledge on its biology and ecology. The impact of the new gear on elasmobranch populations and implications for their conservation are discussed.

Genetic diversity and population structure of the longnose spurdog *Squalus blainville* in the Mediterranean Sea (*poster*)
Vasiliki KOUSTENI, Panagiotis KASAPIDIS, Georgios KOTOULAS and Persefoni MEGALOFONOU

Quantifying genetic diversity and population structure provides insights into the evolutionary history of a species and helps develop appropriate management strategies. We provide the first assessment of genetic structure in Squalus blainville, a poorly studied shark, which is listed as 'data deficient' by the

IUCN. The analysis was based on a 590 bp fragment of the mitochondrial COI gene from 112 individuals and 6 nuclear microsatellite loci from 577 individuals. Samples were collected from various locations across the Ionian, Aegean and Libyan Seas and off the Balearic Islands. The overall haplotype (h) and nucleotide (π) diversities were 0.761 and 0.0029, respectively, while the mean number of nucleotide differences between haplotypes (k) was 1.69. The mean gene diversity (HE) was 0.72 and the total number of alleles per locus (A) was 12.59. Low and non-significant levels of pairwise ΦST and FST values indicated high connectivity and suggested genetic homogenei ty for the sample collections, at least for the eastern Mediterranean, where sufficient sampling was performed. This view was also supported by a Bayesian model based approach (STRUCTURE analysis). The historical demographic events were estimated by Tajima's D and Fu's FS tests, both confirming a recent population expansion for the species. It seems that at least one genetic stock of S. blainville exists in the eastern Mediterranean. Nevertheless, more sampling is required in other areas of the species' distribution in order to fully elucidate its genetic structure.
Keywords: population structure, phylogeography, squalids, COI gene, microsatellite DNA

Medlem database, a data collection on large elasmobranchs in the Mediterranean basin
Cecilia MANCUSI, Romano Teodosio BAINO, Fabrizio SERENA

The Mediterranean Large Elasmobranchs Monitoring (MEDLEM) database contains over 2700 records (>3000 individuals) of large elasmobranch species from 20 different countries around the Mediterranean basin included the Black Sea, observed from 1666 to 2014. The main species represented in the archive are the giant devil ray (236 individuals, plus about 500 captured in an exceptional event off the coast of Gaza in 2013), the basking shark (665 individuals), the blue shark (525 individuals) and the white shark (268 individuals). In the last decades other species such as the shortfin mako (137 individuals), the spiny butterfly ray (136) and the thresher shark (125 individuals) were reported with an increasing frequency. This was possibly due to an increased public awareness on the conservation status of sharks, and a consequent development of new monitoring programmes. MEDLEM does not have an homogeneous reporting coverage throughout the Mediterranean and it should be considered as a database of observed species presence. Scientific monitoring efforts in the south-eastern Mediterranean are generally lower than in the northern sectors and the absence in our database of some species from these regions does not imply their actual absence from those areas. Some considerations can be made on frequency and spatial distribution of records, size structure of the observed individuals for selected species. Moreover, MEDLEM programme is an useful tool to investigate the by-catch in which several elasmobran chs species are involved also in the Mediterranean area and the fishing gear mainly responsible for their accidental capture could be estimated. In Particular gillnets, trammel nets, longlines, tuna traps and bottom trawls in this order are the main responsible fisheries for the by-catch of large elasmobranchs such as devil ray, basking shark,blue shark and blue shark.

The contribution of fishery data to assess the status of elasmobranch populations in the northern Adriatic Sea
Carlotta MAZZOLDI, Alberto BARAUSSE, Licia FINOTTO, Ilaria A.M. MARINO, Emilio RIGINELLA, Lorenzo ZANE

The Adriatic Sea represents a peculiar area of the Mediterranean Sea. This basin is characterized by a long history of anthropogenic impacts and exploitation, sustained by the highest productivity recorded in the Mediterranean Sea. Moreover the Adriatic Sea represents the main Mediterranean area of distribution of smooth hounds (*Mustelus mustelus* and *M. punctulatus*). Using a combination of historical landing data and surveys at the fish market, we evaluated the status and fishery of commercial elasmobranch populations. Long term fishery data (1945-present) from the major fishing fleet of the Adriatic Sea (Chioggia) highlighted a dramatic decline of landings of Elasmobranch in the northern Adriatic, despite an increase in fishing capacity. The total landings of elasmobranchs represent at present less than 20% of the landings of the 1940s. Since landing data were registered in

multi-species categories, it is impossible to reconstruct time series of landing data of single species. Nonetheless, considering groups of species, skates (including most of the Rajiformes) and catsharks (*Scyliorhinus* spp.) were the categories presenting the highest decline in landing, being at present 2.4 and 10.6% of the average 1940s levels, respectively. The biomass of landed skates and catsharks showed regular temporal fluctuations that disappeared after the collapse of the landings (from 1980s-1990s). The landings data likely reflect abundance variations, as indicated by the analysis of catch-per unit-effor t time series. The time series of landings were analysed also in relation to local hydrography or climatic indices. Although some correlation between landings and environmental factors emerged, nonetheless the major driver of elasmobranch decline appears to be the fishing pressure. During periodic surveys at the fish market of Chioggia, from 2006-2013, a total of 11900 specimens were identified, their size measured and sex and sexual maturity attributed. A total of 14 species were identified. Two species, *Mustelus mustelus* and *M. punctulatus* represented more than 60% of the catch, while large-sized species were rarely present. The proportion of sexually immature individuals was generally very high, up to 83% of landed females and 71% of landed males, depending on the species. In particular, we recorded a high catch of newborn specimens of smooth hounds species in coastal waters, suggesting the occurrence of nursery area in the western Adriatic Sea, key aspect for the fishery management. In addition, exploiting fishery samples, the life history traits of the main species (*Mustelus* spp., *Scyliorhinus canicula*) were estimated. The analyses conducted on the smooth hounds revealed that only combining genetic and morphological analyses, it is possible t o unambiguously distinguish specimens belonging to the two species, that appear to be differently vulnerable to exploitation. The results of this study highlight the urgent need of management actions for elasmobranch in the study area.

Elasmobranchs Data Series from the Spanish Fisheries in the Western Mediterranean
D. MACÍAS, S. SABER, AND J. ORTIZ DE URBINA

It is presented a summary of the information on elasmobranch species available from the Spanish bottom trawl and longline fisheries with impact on those species in the Western Mediterranean. Data are collected from two regional organization (GFCM and ICCAT). The main Spanish fisheries that impact the elasmobranchs are bottom otter trawl and longlines

A nursery site of Squalidae in the Gulf of Gabès (Tunisia, Central Mediterranean Sea)
MAROUANI Sondes and BRADAI Mohamed Nejmeddine

Elasmobranchs nurseries are habitats where females give birth to their young and juveniles spend their early life history. Nursery areas offer the young a better source of food and protection against predation; overall, nurseries are located in coastal, shallow, protected and highly productive waters. The Gulf of Gabès (Tunisia, Central Mediterranean Sea), contributing by 62 % of national production of cartilaginous fish, is known to be a nursery for several elasmobranchs like *Carcharhinus plumbeus, Mustellus mustellus, Rhinobatos rhinobatos, Glaucostegus cemiculus, Gymnura altavela, Squalus blainvillei* and *S. megalops*, which its occurrence in the area was recently confirmed, seems to use the Gulf of Gabès as a nusery. In fact, monthly samples from landings in the main harbours of this zone and some observations onboard, from 2007 to 2009, show the presence of pregnancy females around the year. Pregnant females and their neonates (individuals showing an unhealed umbilical scar) are caught at depths of about 100 m by trawlers.

State of the art on elasmobranch biology in the GFCM area
POISSON Franços, MEGALOFONOU Persefoni

With the purpose to create a database with the literature, an analysis has been done.The most studied species is *Raja clavata*, followed by *S. canicula*, *S. blainvillei* and *R. miraletus*. For reproduction there good amounts of information for 37 species (*S. canicula, R. clavata, R. miraletus* and *S. blainvillei*).

Diets have been studied mainly for 51 species. Age and growth studies are less represented. Very few genetic studies (13 on 11 species).Most literature refers to grey literature, and are mainly concentrated in the western and central Mediterranean Sea.

Elasmobranch by-catch in shrimp trammel net fishery of the Gulf of Gabès (Tunisia)
Béchir SAIDI and Mohamed Nejmeddine BRADAI

Elasmobranchs are extremely vulnerable to fishing mortality due to their life history traits, including slow growth, late ages at maturity and low fecundity. There are particular concerns regarding by-catch of elasmobranchs as numerous species around the world have suffered large declines in abundance. Elasmobranchs constitute an important by-catch component in Tunisian artisanal fisheries. This study analyzed incidental catches of elasmobranch in trammel net fishery targeting shrimps in the Gulf of Gabès. The fishery operates yearly from May to July. Stretched mesh size of the fishing gear was 44 mm. The length of nets varied from 950 to 5000 m. Set from sunset to sunrise at 10–35 m depths, the net soak time was about 8 h. A total of 191 trips were conducted aboard commercial artisanal fishing throughout May-July 2009. For each set, all elasmobranch species were identified and their sex, total length or disc width (to the nearest mm) and maturity stages were recorded. A total of 924 specimens belonging to six elasmobranch species were caught: *Mustelus mustelus, M. punctulatus, Carcharhinus plumbeus, C. bervipinna, Torpedo torpedo, Dasyatis pastinaca*. The smouth hound *M.mustelus* was the most commonly captured by this gear (3.7 ind per trip; 1.2 ind/1000 m of net/day) followed by M. punctulatus (0.6 ind/ trips). For the other species, CPUE (ind /1000 m net/day) varied between 0.2 and 0.003. All captured specimens of sharks were new born showing umbilical scars. About 50% of T. torpedo and Dasyatis pastinaca were mature, while there is several newborn. Considering the large fleet using trammel nets targeting shrimps several new born of these species were exterminate.
The occurrence of new born reflects the importance the Gulf of Gabès as nurseries area for these species. The fishery campaign coincides in fact with the parturition period of these species in the Gulf of Gabès. The delineation of nursery areas in the Gulf of Gabes should be a priority to protect these vulnerable species.
Key words: *Elasmobranch, by-catch, trammel net, Gulf of Gabès*

Elasmobranchs by-catch in experimental trawl survey in the Gulf of Gabès (Central Mediterranean Sea)
Enajjar SAMIRA, Saidi BECHIR, Saadaoui ABDESSELEM & Mohamed N. BRADAÏ

The effect of fishing on the marine ecosystem has become under increasing scrutiny in recent year. Trawling is the focus of attention because of the gear's low selectivity and impacts on the sea floor. One of the visible impacts of trawling is the capture of non-target species. In frame of a laboratory program on elasmobranchs, an experimental trawl survey was conducted in the Gulf of Gabès (southern Tunisia) aboard the research vessel "Hannibal" during April –May 2014. Trawling area extends from 20 to 100 m depth, 74 hauls were performed. Fifteen elasmobranchs species belonging to eight families were caught incidentally. Among them one species are critical endangered, two are endangered and three species are near threatened according to IUCN Red List. *Raja miraletus*, *Raja clavata*, *Dasyatis pastinaca*, *Mustelus mustelus* and *Squalus megalops* were the most fished species in the area Elasmobranchs by-catch represents 12.6 % of total commercial fish. The CPUE was estimated at 2.96 Kg/haul. Maps distribution of elasmobranchs species were also elaborated.
Key words: *Elasmobranchs, by-catch, trawl survey, Gulf of Gabès*

Standard maturity scale for elasmobranchs under the data collection framework
F. SERENA, M. BARONE, C. MANCUSI, and B. SERRA-PEREIRA

In response to the request of the European Union to collect maturity data under the Data Collection Framework (DCF), the International Council for the Exploration of the Sea (ICES) organized, in 2010

and in 2012, two workshops on the Sexual Maturity Staging of Elasmobranchs (WKMSEL). As there was no international agreement on the maturity scales to be applied to elasmobranchs (sharks, skates and rays), the main objective of these workshops was to grant a common maturity scale for elasmobranchs, across laboratories involved in the DCF programme and in non-EU countries. The WKMSEL reviewed the scales in use and proposed two new maturity scales, one for oviparous and other for viviparous species. These maturity scales were based on the knowledge on the maturity of a wide number of species with different life strategies. The WKMSEL also provided a summary with the main applications of the adopted scales for assessment and management purposes. Moreover, a photographic collection with species from the North-eastern Atlantic and Mediterranean areas was built up with contributions from the participants in the two workshops. The next step would be to produce in collaboration of ICES, an Atlas for the two areas. The Mediterranean part is already enforced by the MEDITS coordination.

Poster of threatened sharks and rays in the Mediterranean and Black Sea
Fabrizio SERENA, Nick DULVY,Monica BARONE, Cecilia MANCUSI and Rachel WALLS

The IUCN Red List is the most comprehensive source of information on the global conservation status of plant and animal species, used world-wide for focusing attention on species conservation status and for monitoring the long-term success of conservation and management initiatives. For this reason it is very important to communicate the results of IUCN actions also through easy tools, is the case for this poster. The Species Survival Commission (SSC), custodian of the IUCN Red List of threatened species, from a long time has set on a major effort to address many initiatives for determining the conservation status of most species. The chondrichthyan conservation status assessment is being undertaken primarily through a series of regional expert workshops to facilitate discussions and sharing of knowledge. This process is based on the distribution, life histories and other key parameters of the species assessed including trade and commercial fisheries information.
IUCN-SSG (Shark Specialist Group) in 2007 published the results of a ten-year program on the assessment of the state of conservation of elasmobranchs of the northeast Atlantic and the Mediterranean basin (Cavanagh and Gibson, 2007). These results, submitted to the Red List, state that approximately 46% of sharks and related species in the Mediterranean are threatened. However, other 30% are classified as “Data Deficient” which indicates a serious lack of scientific and fisheries information. Available information has been utilized to produce this poster taking into account the IUCN categories with particular attention to the species considered more in danger.
Recently, IUCN SSG started a new step to assess the chondrichthyans in the northeast Atlantic and Mediterranean basin. The main goal is to check the current conservation status of these species and compare them to the 2007 assessment. A meeting regarding the mentioned issues was held in Plymouth in June 2014.

CIESM Sharks programme: a new tool for the assessment of Mediterannean chondrichthyans
Alen SOLDO, Frederic BRIAND, Kaveh RASSOULZADEGAN

The Mediterranean Sea is an area known upon diversity of chondrichthyans and it is considered as their important habitat due to the lot of unique breeding and nursery areas for a many chondrichthyan species. As the Mediterranean fishery is characterized as a multispecies fishery many chondrichthyans constitute an important by-catch of commercial fisheries targeting teleost fishes. Hence, due to the overexploitation of the most important teleost fish, fisheries targeting sharks and rays also exist in many areas and even increasing recently. However, chondrichthyan landings are not usually reported, especially on a species level, while discards are not reported at all. Consequently, chondrichthyans are increasingly threatened with extinction as a result of fisheries and the conservative life history characteristics of these species. Latest investigations indicate that chondrichthyans in the Mediterranean are generally declining in abundance, diversity and range. Due to the high number of countries that surround the Mediterranean Sea, management measures on a regional level has not been enforced, so currently many chondrichthyan species are considered either rare or missing, i .e. not seen

anywhere in the region since at least a decade. Thus, the main goal of the CIESM shark programme, established in 2013, was to enrich the common knowledge on these species and to update their population status. At the beginning 21 species have been included, while during 2014 additional 16 species were added. The programme is based on an interactive website, which includes a detailed species description that can be used by a general public to easily identify a species and add the record. The record itself is consisted of uploaded evidence, such as photo or a published record, and data about time, exact position of the catch and other available informations. After publishing of the record, the data are available to all the interesting persons and institutions. The focus of the programme is on the species with uncertain status, e.g. it is unclear if they are simply rare or locally and regionally extinct. So, the programme has not included the common species that ar e usually not recorded by the general public due to their higher abundance and distribution, species of questionable taxonomic status and species which within the group share similar body characteristics that makes them hard to identify for non-experts.

Considerations on the status of elasmobranchs in the italian waters

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Over thirty years of scientific cruises carried out by bottom trawl nets and a catch assessment survey allowed us to collect important information and data necessary for a better knowledge of biological features and fisheries where elasmobranch species are involved. In the Italian seas, during the national and international surveys (GRUND and MEDITS), 42 species of elasmobranchs and one of chimera were found. Through the analysis of the collected data (densities as n/km^2 and biomass as kg/km^2), a generally stable situation was observed for the most common species in all the FAO Geographic SubAreas (GSAs), even though all the analysed resources seem to be at quite low biomass levels in relation to pristine situations. Risk analysis through the use of natural history traits and fisheries information about all the species taken into account suggests a general low level of productivity and variable levels of susceptibility regarding bottom trawling and set gears. A preliminary a ssessment of the status of the populations was feasible only for the 4 stocks which off the Italian coasts are those more widely distributed and with better known biological features. A demographic and a yield per recruit analysis were used for preliminary definition of the status of these stocks in relation to their capacity of self-renewal. Assessments of the exploitation status were performed for (*Raja asterias*, *R. clavata*, *S. canicula* and *G. melastomus*). The assessments were done using both demographic (Leslie matrices) and Y/R analyses.