



## El IEO presenta seis trabajos en XIII Conferencia de la Asociación Europea de Elasmobranquios

Hoy jueves 19 de noviembre y hasta el próximo día 22, se celebra en Palma de Mallorca la XIII Conferencia de la Asociación Europea de Elasmobranquios, durante la cual investigadores del Centro Oceanográfico de Baleares del IEO presentarán un total de seis trabajos.

La Sociedad de Historia Natural de las Islas Baleares será, con el apoyo del Gobierno Balear y la Universidad de las Islas Baleares, el anfitrión de la XIII Conferencia de esta asociación que, desde su fundación en 1996, se dedica a la investigación y conservación de tiburones y rayas.

La conferencia incluirá comunicaciones orales y póster, que serán publicados en una monografía en la revista *Scientia Marina*. Las contribuciones versarán sobre taxonomía, biología, ecología, gestión pesquera y conservación de los elasmobranquios.

Por parte del Instituto Español de Oceanografía, investigadores del Centro Oceanográfico de Baleares presentarán diversos trabajos, hasta un total de seis, la mayoría de ellos orientados al estudio de la ecología de especies de tiburones y rayas del mar Mediterráneo y a los efectos de la pesca en sus poblaciones.

Para más información se adjuntan los resúmenes de los seis trabajos:

**“Spatial and temporal segregation between four elasmobranch species related to biological and environmental factors”**. Adam Gouraguine, Manuel Hidalgo, Joan Moranta, Francesc Ordines, Beatriz Guijarro, Antoni Quetglas, Maria Valls, Carmen Barberá, Aina De Mesa and David Bailey.

Abstract: This study analyses 605 hauls performed during eight (from 2001 to 2009) bottom trawl fishing surveys developed between 36 and 755 m depth around the continental shelf and the upper slope of the Balearic Islands. The information obtained yielded a total of 28 chondrichthyan species belonging to 8 families. Cluster analysis and multi-dimensional scaling (MDS) ordination were applied to detect zonation pattern. The bathymetric, geographic and temporal variations of the species composition

was analysed by means of Redundancy Analysis. The spatial and temporal distribution of the community descriptors abundance, biomass, mean fish weight and diversity index were analysed by mean of General Additive Models (GAMs). The spatiotemporal information of density (abundance and biomass) and size of the most abundant species (*Galeus melastomus*, *Scyliorhinus canicula*, *Raja clavata* and *Raja miraletus*) were regressed against co-located covariates (geographic and bathymetric) using GAMs. We applied a modified and non-additive GAM formulation to test the hypothesis of potential changes of geographic and bathymetric covariates under years of low or high species abundance. This modelling approach was firstly applied in the whole dataset, and secondly on separated datasets divided based on size information (size of first maturity or small, medium and large individuals). Additionally, we investigated potential overlapping areas between the most abundant species by means of spatial correlation of species-specific ordinary kriging interpolations. Our results show, for all the species, areas with high abundance once the bathymetric effect was taken into account which evidences species-specific aggregation patterns. Moreover, the geographic and bathymetric effects were highly size dependent.

The results are discussed taking into account spatial heterogeneity of fishing activity, preferred benthic habitats for each species (i.e., trophic requirements) and oceanographic conditions. This study will shed new light on how elasmobranch species are spatially distributed and organized off the Balearic Islands, improving the understanding of underlying processes (biotic and abiotic) shaping their distribution, which is currently required for protecting marine organisms strategies along with their habitats.

**“Feeding ecology of elasmobranch species in the Western Mediterranean”.** *María Valls, Antoni Quetglas, Francesc Ordines and Joan Moranta.*

Abstract: The feeding ecology of 8 elasmobranchs (*Scyliorhinus canicula*, *Galeus melastomus*, *Etmopterus spinax*, *Raja clavata*, *Raja miraletus*, *Raja naevus*, *Raja polystigma* and *Myliobatis aquila*) was studied by analysing the stomach contents of specimens caught during three surveys, carried out in the Balearic Island in the summer from 2007 to 2009. Stomach contents were analysed to describe food habits and trophic interactions between the species studied. Food items were identified to the lowest identifiable taxon and were further assembled into major taxonomic groups. The following indices were used to determine the importance of each prey in the diet of these species: i) frequency of occurrence (F %); ii) percentage by number (N %); iii) percentage by volume (V %); and iv) index of relative importance (IRI %). Multivariate analyses were used to detect interspecific differences in diet and the effect of biological and environmental parameters in the most abundant species.

The similarity percentage analysis (SIMPER) highlighted the generalized diet exhibited by all elasmobranchs species except for *Myliobatis aquila*. In terms of IRI % the diet of *Etmopterus spinax* consisted primarily of cephalopods. Euphausiids were the most

important prey for *Galeus melastomus*. *Scyliorhinus canicula* had the most diverse diet, showing preferences for polychaetes, bony fishes, and reptantian crustaceans. *Raja clavata* also feed on a wide variety of preys, being the main diet categories bony fishes, and both natantian and reptantian crustaceans. Brachyuran crabs and natantian crustaceans were the most important preys for *Raja miraletus*. *Raja naevus* mainly fed on natantian crustaceans. Natantian crustaceans were also important food items for *Raja polystigma*. *Myliobatis aquila* feed primarily on brachyuran crabs. The results are discussed taking into account the resource partitioning and dietary overlap among species related to environmental and biological factors.

**“Balearic Islands vs. Algeria: two nearby western Mediterranean elasmobranches populations with different oceanographic scenarios and fishing histories”**. Francesc Ordines, Joan Moranta, Beatriz Guijarro, Maria Valls and Enric Massutí.

Abstract: The Balearic Islands (north-western Mediterranean) and Algeria (south western Mediterranean) coasts show different oceanographic scenarios and bottom trawl fishing histories. The Archipelago is mainly influenced by Mediterranean originated waters, whereas Algeria coast is mainly influenced by the Atlantic inflow. It is also remarkable the high oligotrophy and the absence of river runoff in the former area. In the Archipelago, the slope red shrimp fishery has a long term history with an increasing fishing effort down to 750 m depth in the last decades. In Algeria the most important fishing activity is targeted at small pelagic species. The geo-morphological characteristics of Algeria have not facilitated the development of a demersal trawl fishery, which is mainly performed with small boats fishing down to 400 m depth.

The present work updates the analysis of the elasmobranches ecology in the Balearic Islands and is a first approach to the ecology of these species in Algerian waters. For both areas we applied: i) Generalized Linear Models (GLM) in order to analyse the species-specific bathymetric distribution models; ii) General Additive Models (GAM) to identify the trends of the community descriptors abundance (A), biomass (B), mean fish weight (MFW), species richness (S) and diversity ( $H'$ ); and cluster analysis in order to determine bathymetric assemblages. Moreover, the community descriptors were compared between areas for each assemblage.

The bathymetric distribution models for species common in both areas were similar, with the exception of *Etmopterus spinax*, more abundant at shallower waters in Algeria. MFW had a similar trend in both areas, however, the rest of indexes showed a very different trend, a general depth-decreasing trend predominate in Mallorca, whereas a depth-increasing trend predominates in Algeria. Cluster analyses identified the same bathymetric assemblages, with similar depth ranges in both areas: shelf, shelf break, upper slope and middle slope. However, the species composition of these assemblages differed between areas. It is remarkable the higher importance of Rajidae species on the shelf and shelf break bottoms off the Archipelago when compared to those in Algeria.

Most community descriptors also displayed differences when compared between areas and assemblages, with the exception of the upper slope.

The differences in species composition and community descriptors trends between Balearic Islands and Algeria coast are discussed in the context of distinct oceanographic conditions and fishing history between both areas.

**“An approach to the diagnosis of elasmobranches populations in the circa-littoral soft bottoms off the Balearic Islands (North-Western Mediterranean)”**. *Beatriz Guijarro, Enric Massutí, Antoni Quetglas, Joan Moranta, Francesc Ordines and Maria Valls.*

Abstract: The Balearic archipelago, together with other insular areas, shows the most diverse and abundant elasmobranch communities in the western Mediterranean. The present contribution attempts to assess the elasmobranch populations in the circa-littoral soft bottoms off the Balearic Islands, exploited by the trawl fishery. For this purpose, the temporal variations of their communities and species have been analysed, from different sources of information: (i) time series of landings since 1965 from Mallorca; (ii) daily sale bills from the trawl fleet of Mallorca between 2000 and 2008; (iii) sampling of trawling catches carried out by on board observers in Mallorca from 2001 and 2008; and (iv) data obtained annually since 2001 in the MEDITS experimental bottom trawl surveys, carried out on the continental shelf and upper slope off Mallorca and Menorca. The diagnosis of elasmobranch populations has been done separately for the shelf and the slope using different ecological indicators estimated annually: e.g. standardised abundance and biomass, species richness and diversity, percentage of elasmobranches with respect to demersal assemblages, size and biomass spectra, catch per unit of effort and percentage of elasmobranches discarded by the trawl fishery. The temporal trends of these indicators have been explored by applying general additive models, with the aim to identify and discuss the status of elasmobranch populations in the Balearic Islands. The use of these ecological indicators based on elasmobranches could be very useful to assess the fishing impact on marine ecosystems, due to the special vulnerability shown by these species in front of fishing activity.

**Incidental catches and fishing impacts on elasmobranches in small-scale multigear, multispecies fisheries of the North-Western Mediterranean.** *Sandra Mallol, Gabriel Morey, Olga Reñones, Diego Álvarez and Raquel Goñi.*

Abstract: This study presents the first data on the impacts of Western Mediterranean small scale artisanal fisheries on elasmobranch species caught as bycatch. The objective was to document and quantify the incidental catches of elasmobranches and the degree of impact of the most typical small scale artisanal fisheries in the region. This was accomplished by recording the presence of sharks and batoids on the catch of the different fishing tactics (or métiers) carried out by small scale fisheries that seasonally rotate target species and gears. We also evaluate their fate - retained or discarded, and their vitality in the later case - and the relative impact of the métiers according to the vulnerability of each species. Data on species composition of the catch and their fate were obtained from a scientific observer program on board the artisanal fleets conducted

between 1998 and 2008 over all seasons and métiers, with a total of 2819 fishing sets sampled. Fishing was done at depths from 4 to 160 m depth in four different islands of the Balearic archipelago (Mallorca, Menorca, Cabrera and Formentera). A total of 8252 individuals of elasmobranchs belonging to 21 species were recorded (plus 31 individuals of unidentified *Raja* spp). The elasmobranch species most frequently caught by the artisanal fisheries were *Scyliorhinus canicula*, *Dasyatis pastinaca*, *Raja radula*, *Torpedo marmorata*, *Raja brachyura* and *Myliobatis aquila*, which accounted for 87% in number and 76% in weight of the total catch. The fraction of elasmobranchs species retained was 50% of the catch in number and the factors determining discarding practices were in order of declining importance: 1) species of no or low commercial value (61%), 2) individuals damaged or spoiled (25%), 3) individuals of small size to warrant commercial value (13%), and 4) species of commercial value caught in insufficient quantities for marketing (1%). A fishing impact index was developed based on the vulnerability, survival probability and frequency of occurrence for each species in the various fisheries. This index was used to assess the relative impact of each métier on the elasmobranchs species interacting with the artisanal fisheries in the region. This impact index provides a tool for the management and conservation of shark and batoid species.

**Distribution of coastal elasmobranchs in the Balearic Islands (NW Mediterranean) based on artisanal fisheries surveys.** *Gabriel Morey, Olga Reñones, Diego Álvarez, Sandra Mallol and Raquel Goñi.*

Abstract: Most of the data regarding distribution and fishing pressure on elasmobranchs in the Mediterranean Sea are based on trawl surveys, which are usually carried out at depths greater than 50 m. For this reason, the elasmobranch assemblage occurring in shallow waters has been traditionally underreported for management purposes, due to the scarcity of data coming from the monitoring of artisanal fisheries. This work provides an insight into the distribution of demersal species of elasmobranchs inhabiting over the continental shelf of the Balearic Islands. Data were obtained from both fishery-dependent and fishery-independent surveys using trammel nets (1758 samples) and bottom long lines (749 samples), at a depth range of 4-160 m between 1998 and 2008. Four shark species and 16 batoids species were recorded. For the most important species (*Scyliorhinus canicula*, *Torpedo marmorata*, *Raja brachyura*, *Raja clavata*, *Raja miraletus*, *Raja polystigma*, *Raja radula*, *Dasyatis pastinaca* and *Myliobatis aquila*), bathymetric and seasonal differences in abundance, biomass and length distribution were analysed, as well as species richness, diversity, abundance and biomass of the elasmobranch assemblage. The observed patterns of distribution for the whole assemblage and selected species were also analyzed in relation to the sampling method (gear and/or mesh size).