



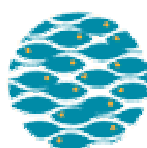
## **European Elasmobranch Association**

### **12<sup>th</sup> Annual Scientific Meeting**

**14 – 16 November 2008, Lisbon**

## **Program and abstracts**

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Theme	Date	Time	Title
	14-Nov	14:30	E.E.A. Board Meeting (Board members only)
		16:00	E.E.A. General Assembly Meeting (open to all E.E.A. Members)
		17:30	<b>Ice-breaker cocktail</b>
		19:00	Closing - free evening
	15-Nov		<b>Session moderator: João Correia</b>
		9:00	Welcome address
		9:10	Welcome address
		9:20	APECE: then and now
Conservation		9:40	Shared Ocean: Shared Motion
Conservation		10:00	Shark Conservation in Arabia
Conservation		10:20	Conservation and management of basking sharks <i>Cetorhinus maximus</i> in the Isle of Man, British Isles
		10:40	<b>Coffee break</b>
Conservation		11:10	Presentation of a collaborative research project on the French porbeagle ( <i>Lamna nasus</i> ) fishery
Conservation		11:30	Eleven Elasmobranchs on the OSPAR List: How, Why & What Next
Conservation	11:50	Background Document for <i>Cetorhinus maximus</i> (Basking Shark) OSPAR Convention	
Conservation	12:10	Community conservation of basking sharks: Is too much attention a bad thing?	
	12:30	<b>Lunch break</b>	
	15-Nov		<b>Session moderator: Ali Hood</b>
Conservation		14:00	Shark Alliance / E. U. Conservation initiatives and opportunities
Conservation		14:20	Behaviour and Local Movement of Silky Shark, <i>Charcharhinus falciformis</i> , in a Reef Area in the Central Red Sea
Conservation		14:40	Population Turnover and Long-Distance Migration in Whale Shark and Basking Shark
Ecology		15:00	Mercury composition and bioaccumulation in demersal sharks: using stable isotopes ( $\delta^{15}\text{N}$ , $\delta^{13}\text{C}$ )
Ecology	15:20	<b>Coffee break</b>	
Ecology	15:50	Trophic spectrum of smooth hammerhead shark <i>Sphyrna zygaena</i> (Linnaeus, 1758) using isotopes of carbon and nitrogen	
Ecology	16:10	Diel observations of white shark ( <i>Carcharodon carcharias</i> ) vertical migrations while patrolling Seal Island at Mossel Bay, South A	
Ecology	16:30	Ecology of <i>Dipturus batis</i> in the waters off the west coast of Scotland	
Ecology	16:50	Who, when, and how much: direct and indirect observation of bull sharks, <i>Carcharhinus leucas</i> , at a feeding site in Fiji	
Ecology	17:10	Elasmobranch cognitive ability: learning, habituation and memory effects upon electroreceptive foraging behaviour	
	17:30	Adoption of minutes put forward by E.E.A. During General Assembly held 14-11.	
	18:00	Closing - get ready for dinner!	
	19:30	<b>Dinner and auction - bring us your elasmo stuff to be auctioned off!</b>	



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**Date Time Title**

**Session moderator: Bernard Seret**

**16-Nov** 10:30 Shifts in behaviour of satellite tagged blue sharks in relation to habitats in the North-eastern Atlantic  
10:50 Impact of Climate change at *Potamotrygonidae* Life Cycle at Rio Negro Basin, Amazon State, Brazil  
11:10 ~~Preliminary results of fishing effort on mako shark and blue shark - cancelled~~  
11:40 National fishery boards: are they useful to infer elasmobranchs ecological and conservation status?  
12:00 Bycatch and discarding patterns of elasmobranchs taken in commercial fisheries around the British Isles

**12:20 Lunch break**

**Session moderator: Nuno Queiroz**

14:00 Species composition of skates (*Rajidae*) in commercial fisheries around the British Isles  
14:20 Shark and ray commercial landings in Portugal (1986 - 2006)  
14:40 Capture and transport of Mobulids  
15:00 Life history of the velvet belly lantern shark, *Etmopterus spinax*, in southern Portugal (NE Atlantic)  
15:20 Deep-sea Chondrichthyes of Macaronesian Islands (NE Atlantic Ocean)  
15:40 Adoption of minutes put forward by E.E.A. During General Assembly held 14-11.  
16:00 Closing remarks by APECE and E.E.A. President



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## **Oral presentations**

### **Shared Ocean: Shared Motion**

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There are a number of selachian species that make transatlantic journeys from Europe to America. In order to protect these species passing a motion in Europe to control over fishing and protect them against wasteful finning is only the beginning. It is necessary to protect them wherever their migratory paths take them. 'Marine trauma incident' capital of the world is on the East Coast of Florida in an area called New Smyrna. Despite the claim to fame being almost certainly an artefact of the International Shark Attack File also being situated in Florida, shark attack city is a badge of honour amongst the local surfers and a constant threat to tourism. In an ever decreasing economic climate- it seems that tourism may be in grave danger of being a metaphorical victim of 'marine traumas' which is bad news in terms of getting protection for the sharks in the area. A study was conducted amongst residents, patrons and tourists in the area to assess the level of fear regarding sharks and the general attitude towards them in order to ascertain whether protecting the animals there is currently on anybody's to-do list. The success story of the Florida Alligator demonstrates that with the right education and motivation, people are willing to take measure in order to protect dangerous species. The promotion of conservational issues and gaining signatures for the Shark Trusts' petition to the European Commission was achieved with humbling success.



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## **Shark Conservation in Arabia**

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Sharks have been harvested from the coastal waters of the Arabian Peninsula for centuries. Their flesh, both dried and fresh, is used in many local dishes, and oil from the liver is used to help waterproof wooden-hulled boats such as traditional dhows. Until relatively recently the exploitation of this resource has, evidently, been sustainable; however, landings have increased dramatically in recent years in order to satiate the export market for shark fins. Research in the Sultanate of Oman suggests that many shark stocks are now being exploited at unsustainable levels and are in need of serious attention. Furthermore, the migratory nature of many targeted species indicates that a cooperative regional management approach may be required.





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## **Conservation and management of basking sharks *Cetorhinus maximus* in the Isle of Man, British Isles**

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Basking sharks frequent the waters around the south and west of the Isle of Man from June to August each year. Under Isle of Man law the basking shark has been protected from capture, injury and disturbance since 1990. A recent amendment to the Wildlife Act increased the protection of basking sharks to include reckless disturbance as a potential offence. The Isle of Man Government has supported education initiatives to improve understanding of basking sharks and has implemented practical conservation measures, for example training courses for local boat operators to promote basking shark-friendly boating. Initiatives to promote public awareness of basking sharks and develop research have been led by the non-governmental organisation Manx Basking Shark Watch.

As our knowledge of basking sharks and their activity in the waters of the Isle of Man increases, so does the need to develop more active protection of the species. Seasonal protection of "hotspots" for basking sharks is one option. A new initiative to identify Marine Nature Reserves around the Isle of Man may also play a role. The results of recent tagging work have demonstrated that some basking sharks using Manx waters may migrate long distances through the waters of a number of jurisdictions. This emphasises the need for international collaboration in basking shark research, management and conservation. As research confirms the importance of Manx waters for basking sharks, the potential role of the Isle of Man in international basking shark conservation is emphasised. This paper reports on developments in basking shark conservation in the Isle of Man and discusses future options for national and international protection.



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## **Preliminary results on the French fishery targeted porbeagle shark *Lamna nasus* in the North-east Atlantic ocean: biology and catch statistics**

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A population of porbeagle sharks (*Lamna nasus*) from the North-east Atlantic Ocean bears a targeted fishery since the 60's. This seasonal and traditional drifting long line activity reveals decreasing landings for 15 years and decreasing number of fishing boat involved. The European Commission based on international scientific advice considering the life history of porbeagle shark and the lack of reliable information available introduced a first TAC last December. In 2008, a cooperative research program called EPPARTIY (Etude de la Pêche Palangrière de l'Île d'Yeu) was initiated by the French National Fishery Committee (CNPMM), the Association pour l'Etude et la Conservation des Sélaciens (APECS) and the commercial fishery in order to collect scientific data. EPPARTIY gather various data by on-board observers and fish market landings such as length-weight, sex maturation, geographical distribution as well as biological samples (stomach contents, gonads, muscle vertebrae and liver) in order to improve biological knowledge of the exploited population.. Long term series statistic of landings and logbooks were studied too. As a first results CPUE in kilogram per hook varies from 1.01 in 1994 to 0.73 in 2007. Proportion of porbeagle landed with a weight less than 50 kilos increases. Preliminary proposal to manage the fishery is presented.



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## **Eleven Elasmobranchs on the OSPAR List: How, Why & What Next**

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The OSPAR list of threatened and/or declining species and habitats was developed for the purpose of guiding the OSPAR Commission on setting priorities in its work on protection and conservation of marine biodiversity. This presentation reviews the nominations and criteria that shaped the list and the implications carried for the 11 elasmobranchs it contains, 8 of which are recent (June 2008) additions. The actions and measures envisaged for the 3 elasmobranchs which were included in 2003 will also be discussed, with the assessment for *Cetorhinus maximus* outlined as an example.



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## **Draft Background Document for *Cetorhinus maximus* (Basking Shark) OSPAR Convention**

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Within the framework of the OSPAR convention, France was in charge of the writing of the background document for the basking shark (*Cetorhinus maximus*).

This assessment aims to summarise the available information for this species in the OSPAR area. Some aspects are developed such as basking shark distribution, threats, existing management measures and recommended actions to be taken at an OSPAR level.

This compilation has been reread by a number of experts from several OSPAR contracting parties. The work that went into this assessment could potentially be used as a basis on which a more formal collaboration between basking shark research teams in different countries within the OSPAR zone could expand.



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## **Community conservation of basking sharks: Is too much attention a bad thing?**

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The basking shark, *Cetorhinus maximus*, is commonly seen in Manx waters from May to August. Manx Basking Shark Watch has been running a public information website, [www.manxbaskingsharkwatch.com](http://www.manxbaskingsharkwatch.com), and collecting public sighting data since 2005. This data, comprising 1924 sighting reports of 1- 40 sharks have identified inshore hotspots for basking shark feeding and putative courtship behaviour. A brief outline of this data is presented here. This information is readily accessible on our website. We have also deployed 8 archival satellite tags and commenced behavioural research. An 8m female we tagged in 2007 was the first tagged basking shark to cross the Atlantic.

Manx Basking Shark Watch has identified the Isle of Man as an ideal place to watch, study and film basking shark behaviour close inshore. Media interest has been intense, seven film crews visiting in 2008 alone. We also have an increasing number of visiting scientists. This has achieved our aim of raising public awareness but we are aware that care needs to be taken to ensure that we do not unduly disturb the sharks. All film and scientific work has to be licensed by the Manx Government. We hope that our results will contribute to improved protection of basking sharks, encouraging land-based basking shark tourism and clearer basking shark safety guidelines to all water users.



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## **Shark Alliance / E. U. Conservation initiatives and opportunities**

Sonja Fordham



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## **Behaviour and Local Movement of Silky Shark, *Charcharinus falciformis*, in a Reef Area of the Central Red Sea**

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The Silky Shark, *Charcharinus falciformis*, is a large pantropical species, yet has been rarely studied because of its normally epipelagic habits. As with many shark species declines in abundance of up to 90% have been reported, increasing the urgency of improving knowledge of their ecology and behaviour. Here we report on a population that was found to visit regularly mid-offshore Red Sea reefs in the vicinity of Jeddah, Saudi Arabia. Study of the population was initiated in 1994 following occasional sightings in two reef areas, and maintained through semi-regular baiting at two sites. Since that time about 130 different individuals have been recorded, being recognised by individual specific markings and / or tagging. Direct observations were made of their social and feeding behaviour, including of mating. Subsequently we have investigated short- and long-term variation in their movements and foraging through tagging of a subset of individuals with Vemco coded sonic tags, and installing up to 12 VR2W logging receivers at locations both near and far from the baiting stations. Data show that the sharks range widely and that frequency and extent of visits to different locations varies considerably with regularity of baiting and with seasonal and other environmental factors. Unfortunately recent illegal targeting of the population by fishermen has lead to a decline in the population and loss of known or tagged individuals.

\* presenting author



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## **Population Turnover and Long-Distance Migration in Whale Shark and Basking Shark**

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The whale shark and basking shark are the largest and second largest extant fish species, and both are planktivores. However they are not closely related, and whereas one has a circum-tropical distribution, the other occurs in temperate shelf waters in all oceans. Nevertheless our recent studies have indicated unexpected similarities in their foraging and migration behaviour. Conventional tagging and photo-identification of whale sharks on Mahe, Seychelles, has shown that different individuals are present at major feeding sites for only relatively short periods within the season when whale sharks visit the island, but may return in following years. A similar throughput of individuals has been revealed by photo-identification studies of basking sharks at sites on the west coast of Scotland, UK. Further, tracking of individuals of both species, using Pop-up Archival Telemetry (PAT) tags, has demonstrated firstly, that individuals present at the same feeding site may then disperse in quite different directions, and second that, for some individuals of both species, this may involve long-distance migration across ocean basins. The significance of these findings will be discussed.

\* Presenting author





## **Mercury composition and bioaccumulation in demersal sharks:**

### **Using stable isotopes ( $\delta^{15}\text{N}$ , $\delta^{13}\text{C}$ )**

**Heidi Pethybridge** <sup>(1,3)</sup>, Daniel Cossa <sup>(2)</sup>, Edward Butler <sup>(3)</sup>, Alain Boudou <sup>(4)</sup>

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Total mercury (THg) levels were determined in 16 demersal shark species (227 individuals, from the Order Squaliformes and the Families: Chimaeridae, Rhinochimaeridae, Scyliorhinidae, and Hexanchidae) from continental slope waters off southeast Australia. Highest THg levels (up to 6.64 ppm w.w) were recorded in *Centrosymnus plunketi*, *Centrosymnus uyato* and *Etmopterus granulosus*. Mean levels for all species but four were above the regulatory threshold (>0.1 ppm). Speciation analysis demonstrated that  $\geq 91\%$  mercury was bound as monomethyl mercury with higher percentages (>95%) observed in sharks species occupying deeper environments. Squalid sharks occupying upper-continental slope waters showed higher mean mercury levels relative to their size than mid-slope species. Higher levels were generally observed in the muscle tissue which accounted for between 35-67% of the total body burden of mercury. High levels were also found in the kidney ( $0.93 \pm 0.14$  THg ppm w.w) and liver ( $0.61 \pm 0.25$ ) with lower levels observed in the skin and gills (>0.05 ppm). Embryos and juveniles of two ovoviviparous species, *E. granulosus* and *C. crepidater* allowed us to explore the maternal transfer and base-line levels of mercury in these two species. Embryos had average levels of 0.08 and 0.06 ppm ww, respectively and in juveniles levels ranged between 0.09 and 0.42. ANOVA results showed that sex significantly ( $p < 0.05$ ) influenced THg levels in most species, with females demonstrating higher levels of THg than males, however when THg levels were associated to size, males showed higher levels than females of a similar length. The relationship between THg level and shark size was explored in nine species with significant correlations ( $p < 0.01$ ) found in most species. Significant correlations were also found between maturity stage and THg levels but not between location, or collection period possibly attributed to the slow elimination and long



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term accumulation of mercury in these long-lived apex predators. Combined analysis of nitrogen ( $\delta^{15}\text{N}$ ) and carbon ( $\delta^{13}\text{C}$ ) isotopes of the muscle tissue of 66 individuals were undertaken to assess whether trophic position or carbon sources influenced Hg accumulation in sharks. Isotopic  $\delta^{15}\text{N}$  values ranged from 12.4 to 16.6 ‰ demonstrating a broad range of trophic positions. *C. uyato* fed at a higher trophic level ( $16.5 \pm 0.1$ ‰) than the other species, and lower values were observed in *Apristurus* sp.A and *E. granulosus* (12.88 ‰, and  $13.47 \pm 0.27$  ‰, respectively). Marginal variation in  $\delta^{13}\text{C}$  enrichment was observed between species ( $-18.7$  -  $-17.1$ ). In individual shark species, mercury concentrations increased with size and trophic position ( $\delta^{15}\text{N}$ ), whereas relationships with carbon source ( $\delta^{13}\text{C}$ ) were not consistent. As a community, demersal sharks demonstrated rates of THg biomagnification, as indicated by the regression slope of log-THg vs stable nitrogen isotope values (0.20), to be within the ranges of biomagnification rates observed in large marine fish communities. Surprisingly, some species (*Rhinochimaera pacifica* and *chimaera* sp D) have significant low mercury concentrations in relation to size and trophic position while other species (such as *E. granulosus* and *C. plunkeni*) have high mercury contamination, but relatively intermediate trophic positions suggesting that species-specific metabolism, migratory behaviour, or other physiology traits play an important role in mercury biomagnification.



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## **Trophic spectrum of smooth hammerhead shark *Sphyrna zygaena* (Linnaeus, 1758) using isotopes of carbon and nitrogen**

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*Sphyrna zygaena* is caught in the Mexican Pacific, mainly in oceanic waters. There is little information on the biology of this shark worldwide. The main objective of our study is to determine the food habits of this shark using stomach contents and isotope values of carbon ( $\delta^{13}\text{C}$ ) and nitrogen ( $\delta^{15}\text{N}$ ) in two areas off Baja California Sur, Mexico. Samples were collected from January 2000 to August 2004 in the Gulf of California and along the western coast of Baja California Sur, Mexico. The index of relative importance (IRI) was used to determine the importance of each prey in the shark's diet. The overlap method of the Morisita- Horn Index and the trophic niche width of Levin's index was used. With the IRI, the most important prey were the cephalopods; *Dosidicus gigas*, *Onychoteuthis banksii*, *Sthenoteuthis oualaniensis*, and *Ancistrocheirus lesueurii*. The shark *S. zygaena* was classified as a specialist predator based on the trophic niche width ( $B_i = 0.13$ ). We found an overlap between the diet of males and females ( $C\lambda = 0.51$ ), which would indicate that both sexes would swim together looking for the same food. For isotopic analysis, the values were found to be in the Gulf of California the  $\delta^{15}\text{N}$  was  $19.6 \pm 0.40$  and the  $\delta^{13}\text{C}$  was  $-15.1 \pm 0.25$ . Along the west coast of Baja California Sur the  $\delta^{15}\text{N}$  was  $17.8 \pm 0.26$  and  $\delta^{13}\text{C}$  was  $-15.8$ . We found differences in the  $\delta^{13}\text{C}$  between females and males, which would indicate they feed in different habitats, whereas for the  $\delta^{15}\text{N}$  there were no significant differences between gender. By maturity stage, using  $\delta^{15}\text{N}$ , we found differences between juveniles and adults because they are feeding at different depths. In the stomach content analysis, we found that *S. zygaena* feed mainly on



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cephalopods in oceanic waters, though using the Carbon isotope the results indicate that the smooth hammerhead at times feeds close to coastal areas, probably because of the habitat of the cephalopod prey. The nitrogen isotope results indicate that this shark feeds mostly in deep waters, which confirms the result of stomach contents, where the main prey were oceanic cephalopods.

\* Presenting author



## Diel observations of white shark (*Carcharodon carcharias*) vertical migrations while patrolling Seal Island at Mossel Bay, South Africa

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Condensed title : White shark vertical migration

**Abstract.** We acoustically tracked a 4.2 m female white shark (*Carcharodon carcharias*) as it patrolled an island occupied by Cape fur seals at Mossel Bay, South Africa. Data on position, swimming depth and water temperature was collected during the 28.8 hour track. The results illustrate the importance of newly described nocturnal hunting behaviour, and the ability of white sharks to adapt their behaviour to different environmental conditions. During the day the shark preferred to patrol close to the bottom at a depth >10 m whereas at night it patrolled closer to the surface at an average depth of 5 m. We present a hypothesis that white sharks vary their patrolling depth according to ambient light and that this may assist them to hunt Cape fur seals in all light conditions.

**Keywords:** White shark, pinniped, Cape fur seal, predation, acoustic telemetry, swimming depth



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## **Ecology of *Dipturus batis* in the waters off the west coast of Scotland**

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The Glasgow museum tagging program has collected tagging information on *Dipturus batis* caught by anglers in the waters around the Isle of Mull since 1975. This data, along with some collected by the author during a concentrated tagging study between June and September 2008, was used to look at the ecology of *D.batis* in the waters around the Isle of Mull. Growth rates, migration patterns, annual depth migrations and population segregation were all looked at and the key findings are presented here.



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## **Who, when, and how much: direct and indirect observation of bull sharks, *Carcharhinus leucas*, at a feeding site in Fiji**

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Feeding of elasmobranchs has become a popular means by which tourists and tourism operators can facilitate close observation and interaction with sharks and rays in the wild. Feeding wild sharks is a controversial issue and has received a lot of public and media attention. Impacts that can occur as a result of feeding wildlife include alteration of natural behaviour patterns and population, dependency and habituation, aggression, and health/disease/injury. In the case of sharks, an additional concern about organised feeding activities is that sharks are learning to associate humans with food and are therefore more likely to lose their fear of, or attack, people. This paper presents data from a shark feeding site in the South Pacific and addresses the above outlined concerns. Between 2004 and 2007, bull sharks, *Carcharhinus leucas*, were directly observed underwater. To date, more than 30 individual bull sharks have been identified based on unique external markings and some of these sharks have been regularly encountered at the site for several years. Individual identification allows to visually “track” individuals over time. Here, presence/absence data as well as feeding events of individual bull sharks are presented. Additionally, more than 50 bull sharks have been equipped with internal and external acoustic tags since 2004. These data give insight into when and how often individual bull sharks are present / absent at the site.



## **Elasmobranch cognitive ability: learning, habituation and memory effects upon electroreceptive foraging behaviour**

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Foraging theory predicts that behavioural flexibility enables adaptation to changing conditions and thereby maximizes ecological fitness. Learning, habituation and memory are crucial means with which to facilitate such adaptation.

In this context, we investigated whether the benthic elasmobranch, *Scyliorhinus canicula* (small-spotted catshark), is able to learn to alter its electroreceptive foraging behaviour and remember learned changes. To address these questions the behaviour of individual catsharks towards artificial, prey-type electric fields (E fields) following stimulation by food-scent was studied. Catsharks that were rewarded for responding to the E fields throughout a week were compared to those that were not. Trials were then repeated after a three week interval with previously rewarded catsharks receiving no rewards and vice versa.

Analysis of the data demonstrated significant differences in the behaviour of rewarded and unrewarded fish. Rewarded catsharks exhibited more intense foraging behaviour towards the E fields than unrewarded catsharks. Furthermore, rewarded catsharks improved their foraging efficiency throughout experimental weeks. Conversely, unrewarded catsharks reduced their interest in E fields throughout experimental weeks. These findings demonstrated learning and habituation occurring after very few foraging events and we suggest this electroreceptive foraging adaptability may play an important role in influencing their ecological fitness.

Altered behaviours were not, however, continued after the experimental interval and electroreceptive foraging behaviour was independent of whether rewards were offered before or after the interval. These findings suggest a memory window of less than three weeks which we suggest is beneficial in a variable, coastal environment.





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## **Shifts in behaviour of satellite tagged blue sharks in relation to habitats in the North-eastern Atlantic**

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The blue shark *Prionace glauca* is a common, cosmopolitan species with a widespread distribution in the pelagic realm of all oceans. To collect data on the movements and diving behaviour of blue sharks in the North-eastern Atlantic, 11 PAT tags were deployed in three tagging areas, off southwest England, southern Portugal and the Azores. Nine tags reported data for a total 256 days. In general, sharks exhibited southerly movements away from the tagging site, covering an estimated total of 11.432 kilometres. Sharks occupied a broad vertical, ranging from 0 to 696 m, and thermal range, 9.8 – 24.6 °C. Individual sharks displayed large variability in diving behaviour along the track, which seem to reflect changes in habitat (e.g. shelf and off-shelf) and environmental (e.g. fronts and upwelling) conditions. A split moving window analysis was performed in order to detect statistically significant shifts in both time-at-depth and time-at temperature data.

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## **Impact of Climate change at Potamotrygonidae Life Cycle at Rio Negro Basin, Amazon State, Brazil**

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In Amazon ecosystem the recent climate change has affected the dynamic of Amazon basin and duration of the dry season. The purpose of this study is to identify which species of freshwater stingrays are threatened by climate change. During 1996 to 2007, studies about population dynamic of freshwater stingrays were conducted at Rio Negro basin. The results show different scenarios for stingray species. *Potamotrygon motoro* and *P. sp C* biology has been altered by changes in precipitations level, mainly the reproductive cycle events. *Paratrygon aiereba*, *Potamotrygon orbignyi* and *P. schroederi* are affected on individual behavior by climate changes. The particular biological aspects of individual species must be considered in any future management plan for these species in Amazon Basin.

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## **National fishery boards?: are they useful to infer elasmobranchs ecological and conservation status?**

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Sharks and Ray-formes production data for Italy were taken from ISTAT, the national statistic board. Were analyzed data of 2005 and 2006, with 14 coastal regions divided in 6 areas. These data were pooled with those of fishes, sharks and ray-formes production as well for type of gear per region. This paper reports on the outcomes obtained from these comparisons for the period 2005-06. Either sharks and ray-formes production decreased, -24.1% and -24.7%, respectively. Sharks production decreased just in the Adriatic (-39.5%) and Ionian Areas (-13%), while ray-formes production decreased in all areas, but especially in the Sardinian (-45.4%) and Tyrrhenian (-32.3%) ones. Considering how production quantities decreased in relation with fishing gear types, we can say that the major risk area for sharks over the last two years along Italian coasts has been the Adriatic-Ionian area, especially due by small fishery. The major risk area for ray-formes over the same period has been the Tyrrhenian-Sardinian area, due especially by bottom trawl fishery. The authors suggest that concern has to be raised on elasmobranch population along Italian coasts, and this report could outline the need for different management action for different species in different areas, due by the impact that a specific gear can have on different species and where this particular gear is deployed. However, the procedure used need an analysis of a trend period longer than just two years, in order to have more reliable information on the actual elasmobranch stocks conservation status.

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## **Bycatch and discarding patterns of elasmobranchs taken in commercial fisheries around the British Isles**

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Elasmobranch discard and retentions patterns in UK commercial fisheries around the British Isles were examined. Two main ecoregions were analysed, the North Sea ecoregion (ICES Divisions IV a-c, VIId) and the Celtic Seas ecoregion (ICES Divisions Via, VIIa,b,e-j), with only limited data available for the deep-water ecoregion (ICES Divisions VIb, VIId,k). Analyses focused on those general gear types for which there were substantial records for the various species studied, including otter trawl, beam trawl, Nephrops trawl, gillnet and longline. Overall, 42 chondrichthyan species were recorded during observer trips, including skates (Rajidae, 11 species), squaliform sharks (11 species), scyliorhinid catsharks (5 species) and triakid sharks (3 species). The length-based discard/retention patterns of the main species are described by gear type and ecoregion. Spurdog was usually retained, whilst other dogfishes (e.g. lesser-spotted dogfish and smoothhounds) were often discarded, especially so for the smaller specimens. There were no clear size-based retention patterns for these species, and discard/retention may depend on a variety of factors. Length-based retention patterns were better defined for skates, with the length at 50% retention ranging from 45.2 cm (undulate ray) to 54.8 cm (common skate). Other batoids (stingrays and electric rays) were all discarded.

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## **Species composition of skates (Rajidae) in commercial fisheries around the British Isles**

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The lack of species-specific landings data for skates has hampered the assessment and management of the skate complex in northern Europe. Reported UK landings of skates (2002–2007) indicated that, overall, various types of otter trawl and gillnet were the main fisheries landing skates (58 and 24% of mean annual landings, respectively), with beam trawl (7%) and longlines (5%) of secondary importance. Over half of the average annual landings originated from four ICES Divisions (VIIa,e,f,j), with the majority of the remaining landings reported from Divisions VIIId,g,h, IVb,c and VIb. The present study analysed the skate bycatch as recorded during observer trips on commercial fishing vessels in order to estimate the species composition (biomass) of skates taken in the main ICES Divisions and gears around the British Isles. Data on the numbers of skates at length retained by fishermen during these trips were converted to biomass using length-weight relationships collected during scientific surveys. These data were then used to provide preliminary estimates of the species composition for the main fisheries (based on ICES Division-gear combinations) reporting landings of skates. Fisheries in the southern North Sea (ICES Division IVc) were dominated by *Raja clavata*, with smaller quantities of *R. brachyura* and *R. montagui* also taken. In contrast, fisheries in the south-west (ICES Divisions VIIg-h) contained up to nine species, with several species locally and/or seasonally important.

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## **Elasmobranch Commercial Landings in Portugal from 1986 to 2006, with Virtual Population Analysis and a Method for Evaluating “Supply and Demand”**

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Portuguese commercial elasmobranch landings were analyzed for the period 1986 - 2006 and totaled 108.671 ton. An average of 5.175 ton were landed yearly, representing 8 orders, 14 families and 44 species. Annual landings for the fishery generally decreased over time, with a corresponding increase in price per kilogram. The most landed group, Skates (*Raja* sp.), accounted for 33% of the landings, or 35.614 ton. They were followed by Catsharks (*Scyliorhinus* sp.), Portuguese dogfish (*Centroscymnus coelolepis*), Leafscale gulper shark (*Centrophorus squamosus*) and Gulper shark (*Centrophorus granulosus*) (accounting for 12%, 12%, 10%, and 9% of the landings, respectively). In the absence of CPUE data, the comparative trends of landings and price were employed as an indicator of the “status” of specific elasmobranch species. *Raja* sp., *Centrophorus granulosus*, Smoothhounds (*Mustelus* sp.), Torpedo rays (*Torpedo* sp.), Kitefin shark (*Dalatias licha*) and Angel sharks (*Squatina* sp.) displayed indications of possible overexploitation, and merit the focus of future research. The pattern shown by fishing effort over time (i.e. number of fishing vessels over time) displayed a marked decrease, although this was substantially lesser than the decrease shown by landings of the species mentioned earlier. It is unlikely, therefore, that such decrease in landings is justified solely by a decrease in number of fishing vessels. Similarly, the increase in price shown by all species was largely superior to the increase in inflation, which would suggest that the increase in inflation alone would not account for the increase in price. All the results and data seem to corroborate the notion that some species are, in fact, under over-exploitation and in need of immediate management. These findings were all substantiated by virtual population analysis, which yielded higher fishing mortalities to those species where previous methods suggested overfishing.



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## **Capture and transport of Mobulids**

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Between September 2006 and October 2008 the Flying Sharks team transported one *Mobula mobular* by road to L'Oceanogràfic (in Valencia, Spain), and collected some *Mobula tarapacana* in the Azores. This paper reports on the techniques used during the transport and collection of these animals. The authors largely followed a standard protocol used and published before, although the long duration of transport and specific needs of the aforementioned species required some special innovations. The techniques used yielded live and healthy animals at the end of all trips, with water quality parameters within the desired limits.

\* Presenting author





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## **Life history of the velvet belly lantern shark, *Etmopterus spinax*, in southern Portugal (NE Atlantic)**

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The velvet belly lantern shark, *Etmopterus spinax*, is commonly caught as by-catch in commercial fisheries that operate in southern Portuguese waters. Little is known about the biology of this species that has low or null commercial value and is usually discarded. The present study focused on several aspects of this species, including life history parameters such as age, growth, reproduction and distribution patterns. Males and females attained maximum ages of 8 and 11 years. Maturity was achieved relatively late, specifically at 76.5% (25.9cm) and 74.7% (30.7cm) of the maximum observed size and at 49.6% (3.9 yr) and 42.5% (4.7 yr) of the maximum observed age for males and females respectively. The mean fecundity was relatively low, specifically 9.94 pups in each reproductive cycle, and a direct relationship between female size and fecundity was observed. Size, age, sex and maturity were found to be correlated with depth, with the larger, older and mature specimens occurring predominantly at greater depths. There seems to be a reproductive related migration in terms of depth, with mating occurring in deeper waters and parturition occurring in shallower waters.

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## **Deep-sea Chondrichthyes of Macaronesian Islands (NE Atlantic Ocean)**

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In the framework of the PESCPROF projects, field work in the waters of Azores, Madeira and Canary islands was done in order to search for new species of potential commercial interest between 250 and 2500 m, using bottom fish traps and longlines (both bottom and mid-water).

Results of this research are given including a list of the sharks, rays and rabbit fishes collected by depth strata (mean depths at 250, 500, 750, 1000, 1500, 2000 and 2500 m), including new records for each area.

Several voucher specimens from all species found were deposited as reference collections in the Tenerife Museum of Natural History (TFMC) and the Municipal Museum of Funchal (Natural History) (MMF).

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## Poster presentations

### Rocking the Boat Over Raising Awareness

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The issue of public attitudes towards sharks is a constant battle against media dramatisation fuelled by the morbid fascination of *Homo sapiens*. A study conducted last Spring of Aquaria within the UK revealed surprising results in terms of the amount of education on offer to the general public. It was found that most aquariums offered hardly any unless the 'guest' was already interested enough in shark related issues to read long and frequently poorly lit paragraphs of text. The standard of course differed throughout the various companies. It was found that individual aquarists were in general disappointed with the level and standard of education on offer but were relatively powerless to do anything about it. The most successful aspect of raising awareness within Aquaria came from the petitions that were placed in house during 'shark year' in 2006. Aquaria within that year played a vital role in spreading the word of shark related conservation issues and gained a stupendous number of signatures for the Shark Trusts' petition to the European Commission, but the majority of it ended with the closing of the calendar year. It is felt that much more could be done in terms of education that is easily accessible by the public and Shark Research UK is currently working with a number of institutions to increase awareness of conservational issues.



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## **Notes on the reproduction of the oceanic whitetip shark, *Carcharhinus longimanus*, in the Southwest Equatorial Atlantic**

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Oceanic whitetip sharks, *Carcharhinus longimanus*, are regularly caught as by-catch by longliners targeting tuna and swordfish in the southwest equatorial Atlantic. Samples of these sharks have been collected since August 2007, and in this study we present preliminary data with regards to that species reproductive biology. So far, a total of 104 sharks have been examined, and preliminary data suggests that size at maturity is occurring from 160 to 196cm TL on males and from 181 to 203cm TL on females. A high proportion of the catch is composed by immature specimens, suggesting a spatial size-segregation of this population. Three pregnant females were caught, with litters varying from 1 to 14 embryos. Even though at this stage there is not enough data to propose a reproductive cycle for this population, we forward the hypothesis that in the southwest equatorial region mating may be occurring early in the year, around March, and parturition might be occurring 10 to 12 months later, around January. As more data becomes available in this ongoing study, we expect to define more clearly the reproductive parameters of the oceanic whitetip shark for the southwest equatorial region.

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## **Habenular Asymmetries In *Scyliorhinus canicula*: Morphological, Immunohistochemical And Connection Analysis**

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With this work we would like to explain the habenular asymmetries in the dogfish, with the help of three different methods: morphological, immunohistochemical and connections analysis. We first analysed brain macroscopically, then we have done some paraffin embedding and sections by microtome; we always found that the right habenula is normally the smaller one, the left one is larger and longer. About immunoreactivity, we investigated the presence of Calbindin-D 28k, a calcium-binding protein which protects neurons against apoptotic cell death. The protein has a distinct distribution in the brain and sensory system, is abundant in specific neuronal cell types, and also appears to be a useful marker to study the habenulo-interpeduncular system. In this case, we noticed an asymmetric distribution of this protein: immunopositive cells and fibres show a difference, with more fibres appearing on the left than on the right side.

Then, in the study of the central nervous system's connections, we used a carbocyanine: the 1,1-Dioctadecyl 3,3,3',3' tetramethylcarbocyanine - perchlorate (DiI), which produces a red fluorescence when observed with a rhodamine filter. This tracer becomes fastly incorporated in plasmatic membrane of the neurons and subsequently it diffuses through the membrane plan, anterograde or retrograde tracing the neurons. After the application of DiI to the left habenula, we have found the telencephalic and mesencephalic connections strongly labelled, evidencing how the habenular nuclei receives fibers from the telencephalon through the stria medullaris and project it to the interpeduncular nucleus (IPN) through the fasciculus retroflexus (FR), asymmetrically.



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Our results confirm data previously obtained by other authors, in which the left habenula is larger and longer than the right one, shows different neural connections and different immunoreactivity to Calbindin-D 28k (I. Rodriguez-Moldes *et al.*, 1990). We associated all three methods to have a clear picture about asymmetry of epithalamic region in this species; at the moment, we are investigating ultrastructural asymmetries, and we would like to have a comparison between *pars lateralis* and *pars medialis* in the habenula, how already studied by other authors in other species (*Scyliorhinus stellaris*).

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## **Economic importance of *Dipturus batis* to the west coast of Scotland**

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Between June and September 2008 socio-economic data was collected in Oban from charter boat anglers. This was used to report on the economic importance of *Dipturus batis* to Oban in terms of the amount of money anglers targeting the species brought to the area. The relative value of the fish was compared to the current commercial market value for skate, also, the value of the charter boat industry was compared to other water sports in the Highland and Island region. The results of this study are presented here.

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## **Isotopic analysis and stomach contents to know the trophic shift in pelagic thresher shark *Alopias pelagicus***

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The trophic spectrum of pelagic thresher shark *Alopias pelagicus* was analyzed using two methods: stomach content and stable isotopes of Carbon and Nitrogen. The sharks were caught in Manta, Ecuador by artisanal fishery between June-December 2003. Of 111 pelagic thresher shark stomachs analyzed, 53 were from mature sharks (36 females and 17 males), 26 from gravid females, and 32 from immature sharks (22 females and 10 males). Twenty-four prey species were identified, where jumbo squid (*Dosidicus gigas*; IRI = 33%), the lanternfish (*Benthosema panamense*; IRI = 15%), and oceanic squid (*Sthenoteuthis oualaniensis*; IRI = 1.5%), were the most important prey. The Levin index (trophic niche breadth) values indicated that *A. pelagicus* is a specialist predator which feeds mainly in oceanic waters. The main prey species consumed did not change between sexes and between mature and immature individuals. According to isotopic analysis in tissues of *A. pelagicus*, the  $\delta^{13}\text{C}$  was  $-16.0 \pm 0.05$  in muscle and  $-16.7 \pm 0.3$  in vertebrae; whereas in  $\delta^{15}\text{N}$  was  $13.7 \pm 0.2$  in muscle, and  $9.4 \pm 0.3$  in vertebrae. The habitat of the main prey of *A. pelagicus* indicated that it feed mainly in oceanic waters, which was corroborated with the isotopic values of  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  in both tissues analyzed.

Key words: Trophic, Ecuador, Stable isotopes analysis, Thresher shark.





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## **An integrated approach to study bull shark behaviour and ecology in the South Pacific: The Bull Shark Tagging Programme**

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Bull sharks (*Carcharhinus leucas*) are widespread along the continental coasts of all tropical and subtropical seas but also occur around remote island states far away from continental waters. They are often found close inshore in shallow water which makes them accessible for scientific study. In Fiji, bull sharks can be observed year-round on Shark Reef and surrounding reefs off the southern coast of Viti Levu. The number of bull sharks decreases over the course of a calendar year with fewer sightings between October and December each year. A likely explanation for their seasonal departure is reproductive activity. Bull shark behaviour and ecology has been investigated on Shark Reef and surrounding reefs since 2004 using direct and indirect observation techniques. To date, more than 30 individual male and female bull sharks have been identified visually using unique external markings to recognize them. Indirect observation techniques include acoustic and satellite telemetry. To date, more than 50 acoustic tags were either fed to the bull sharks or externally attached to monitor presence/absence and get insight into their small-scale movement patterns on Shark Reef and between neighbouring reefs. In addition, 12 pop-up satellite archival tags were deployed between 2004 and 2008 to monitor vertical habitat use and their movements away from Shark Reef.

\* Presenting author



## **Spiny dogfish *Squalus acanthias* of the Pacific waters off the Kuril Islands and Kamchatka**

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Spiny dogfish *Squalus acanthias* is widely distributed in temperate and warm waters of the Northern and Southern hemispheres from the Arctic to Sub Antarctic. The southern edge of its range in the North Pacific extends to the northern part of the East China Sea, Hawaii, and the southern tip of Baja California. Along the Asian coast, spiny dogfish is distributed as far north as Olyutorsky Cape in the western Bering Sea and in North American waters as far as Kotzebue Sound in the Chukchi Sea. This shark inhabits mostly coastal areas but occasionally occurs far from shore. It is considered a rare species in the Pacific waters off the Kuril Islands and Kamchatka and the data on its distribution and biology in this area are very scarce.

This paper summarizes data on spiny dogfish captures obtained in the Pacific waters off the Kuril Islands and Kamchatka (44°-53°N 145°-160°E) taken by different fishing gears (salmon drift nets, bottom trawls and stationary nets) in 1993-2006. Totally data on 512 specimens were sampled.

Data on spiny dogfish distribution show that the highest occurrence of this shark was observed off the southeastern Kamchatkan coast and opposite the First Kuril Strait. In these areas spiny dogfish occurred in July-November but most frequently in October-November during its northward feeding migrations. No relationship between total length and capture depth was found.

Catches were represented by individuals of 54-121 cm total length with mean 81.79 cm. Sharks with total length of 76-90 cm were most numerous (62.3%) in catches. There were latitudinal changes of spiny dogfish total length detected. Thus, in southernmost area (44°-45°N)



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its TL varied 75 to 112 cm (mean 83.8 cm) while in northernmost area (52°-53°N) it was 91 to 63 cm with mean 71.7 cm.

There were a limited data on spiny dogfish maturity sampled since catches were represented mostly by immature individuals (97.6% of females and 83.7% of males). Maximum total length of immature female was 109 cm, while minimum mature female total length was 91 cm. Respective values of males were 82 and 80 cm. There were almost no significant differences detected in male and female average sizes: mean total length and body weight were 82.7 and 82.2 cm and 1758 and 1820 g respectively. No relationships between total length and maximum egg diameter and between total length and number of eggs were found.

Some characters of external morphology are provided, relationships between total, fork and standard lengths, body and eviscerated weights are presented. Data on gonado-somatic and hepato-somatic indexes, indexes of heart and spleen, and condition factor are given. Diet of spiny dogfish in different areas are described.

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## **Much more than one skate and two catsharks: the unreliability of official statistics from fish auctions in NE Spain**

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The accuracy of fishing statistics is central to the management and conservation of marine resources. In the case of cartilaginous fishes in the Mediterranean, one of the main data sources are the official statistics stemming from the fish auction sales. In order to study the reliability of this information, a pilot study was conducted at the artisanal and bottom trawl fish auctions of the Blanes harbour (Northeastern Spain), from February to April 2007. The study investigated accuracy of data collection along the different steps in the auction, from the primary treatment to the classification of the species, labelling, and the quality of the collected data. Fish auctions were monitored to check consistency between observed sales and declared sales. Although up to seven different species of skates were sold during the study period, only one denomination, *Raja asterias*, was used to label and identify all of them. In the case of sharks, despite the fact that 84% of the sold biomass came from non-cat sharks species, only two denominations were used and both referred to cat sharks species. Results from this study demonstrate strong discrepancies between declared and observed sales in terms of species determination and biomass, and question the reliability of official fishing statistics and their use in the management of elasmobranch populations. Statistics not only fail to account for by-catch, but they also misrepresent the actual composition of the commercialized cartilaginous fishes in the fish markets.

\* Presenting author



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## **Reproductive biology of Blue shark, *Prionace glauca*, in the western coast of Baja California Sur, Mexico**

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The blue shark *Prionace glauca* is the most abundant shark in the western coast of Baja California Sur; however, there is few information on reproduction of this shark in Mexico. Samples (reproductive organs) were obtained from commercial catches in the western coast of Baja California Sur, from August 2000 to March 2003. A number of 1033 blue sharks (631 males and 402 females) were sampled. The blue sharks caught included males juvenile and adults; whereas in females were juvenile, subadults, mature, gravid and postpartum. The sex ratio in embryos was 1F:1M; whereas the sex ratio in adults was 0.5F:1M. The size of maturity ( $L_{50}$ ) for males was 180 cm TL, and 200 cm for females. The litter size was 27 to 33 embryos. The smallest embryos were found during August- September and embryos in full term were recorded in May and July. The histological analysis showed spermatocysts with diametric development in testes of males; also was found sperm in epididymis, ductus deferens and compound or multilayered spermatozeugmata in seminal vesicle of mature males. There was found stored sperm in the oviducal glands of females with different maturity stages, which indicate a long-term sperm storage.

\* Presenting author



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## **Is post-feeding thermotaxis advantageous in elasmobranchs?**

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Thermoregulatory behavior has been suggested as a means for elasmobranch fishes to improve the efficiency of metabolic processes such as digestion. Recent telemetry and laboratory studies have shown that some rays and sharks will feed in warmer waters and rest in cooler waters. For shuttling to be effective, temperature mediated movements must affect absorption and evacuation rates differently. In this study, post-feeding thermotaxis hypothesis was tested in the laboratory at three temperatures using two species of elasmobranchs, the Atlantic stingrays, inhabiting thermally variable environments, and the whitespotted bamboo sharks, stenothermal fish that are unable to exploit such variability in the thermally stable environment in which they live. Evacuation rates were determined through serial x-radiography while apparent digestibility coefficients were obtained with the use of chromic oxide as the inert marker. Overall, absorption and evacuation rates supported the hypothesis that sharks inhabiting thermally stable environments lacked the ability to exploit temperature differences as a means to improve digestion efficiency. On the other hand, Atlantic stingrays showed a marked improvement in digestion efficiency when moved to a lower temperature.

\* Presenting author



## **Stable isotope ratios ( $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ ) of scalloped hammerhead sharks (*Sphyrna lewini*) captured in Mazatlan, Mexico**

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Stable isotopes of carbon and nitrogen are chemical tracers naturally present in animal tissues; their concentration depends on the organism's diet, accumulation and replacement rates of the analyzed tissues, and on growth. The objectives of this study were: (1) to confirm the relationship between the isotopic signature of *S. lewini*'s tissues and their prey in the Mazatlán area, (2) to establish the turnover rate of the analyzed tissues and (3) their isotopic variation throughout the season. Muscle and liver samples were collected in order to obtain information on *S. lewini*'s diet assimilated at different time scales. Muscle samples of the most abundant prey species in *S. lewini*'s diet were also collected. We analyzed 61 muscle samples from the shark's dorsal area and 31 liver samples. The average  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$  values ( $\pm$  standard deviation) for muscle were  $19.09 \pm 1.01\text{‰}$  and  $-14.89 \pm 0.44\text{‰}$ ; for liver they were  $17.21 \pm 1.03\text{‰}$  and  $-17.46 \pm 1.71\text{‰}$  respectively. When comparing the average  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$  values of *S. lewini* with those of their prey, we obtained an average enrichment of  $3\text{‰}$  for  $\delta^{15}\text{N}$  and  $0.45\text{‰}$  for  $\delta^{13}\text{C}$ . Monthly changes in diet amplitude showed a direct relationship with the standard deviation for  $\delta^{15}\text{N}$ , with a delay of one month. From  $\delta^{13}\text{C}$  values and  $\delta^{15}\text{N}$  monthly variation we propose that *S. lewini* is an opportunist predator, feeding near the coast in a non-selective manner, which is influenced by the abundance and availability of prey. Finally, from the relationship observed between the isotopic values of *S. lewini* and their prey, we consider that Mazatlán is a feeding and growth area for this shark species.

\* Presenting author



## **Comparative investigation on the hematology and blood biochemistry of the Amazonian freshwater stingray, *Potamotrygon cf. hystrix* (Chondrichthyes, Potamotrygonidae) in different growth phases**

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The freshwater stingray *Potamotrygon cf. hystrix* is an endemic species of the middle Rio Negro basin and nowadays is in process of scientific description. This species is of the great importance for the international trade as ornamental fish. This work aimed to investigate comparative perspectives of the biochemical and hematological parameters among neonates, juveniles, subadults and adults of *P. cf. hystrix*, and possible interference on the pregnancy and sexual dimorphism of the evaluated parameters. The freshwater stingrays were caught in the Mariuá Archipelago (Barcelos, AM) using flashlights and "handnets". The blood was withdrawn with a syringe containing EDTA (10%) by branchial puncture, after the animals were anesthetized with buffered MS-222 (1g/5L). The animals were classified according to sex and females identified as pregnant or not. The class size was determined from the disc width / DW (neonates, DW < 9.0 cm; juveniles, 9.0 < DW ≤ 12.0 cm; subadults, 12.0 < DW < 16.0 cm; adults, DW ≥ 16.0 cm). The methods used for determining the plasma biochemistry and haematology were those used in routine hematology of fish. To statistically compare the effects of sex and the stages of growth (neonates, juveniles, subadults and adults) the Student *t* test and ANOVA were performed, respectively ( $p \leq 0.05$ ). The total number





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caught were six neonates, five juveniles, 36 subadults and 111 adults, and among the adults 63 were male and 40 were females, of which eight were pregnant. Neonates had higher concentrations of glucose and cholesterol than juveniles, subadults and adults, but lower hematocrit values. Hemoglobin levels were only significantly different in subadults and adults. Red blood cells count was higher in subadults than adults but lower than in juveniles. MCV was higher in adults than neonates and subadults, while MCH was lower in neonates than in adults. Juveniles showed lower heterophil number when compared with subadults and adults, while the monocyte percentage was lower than in adults. Subadults had the highest number of basophils compared to adults. Some parameters demonstrated to be influenced by stage of development but further studies are necessary. These results can contribute to a better understanding of the blood physiology of these interesting animals in the natural environment and as well as the elaboration of management protocols, especially in the earlier phases which is targeted for the international market.

\* Presenting author



## **Cartilage effect of enrofloxacin to *Scyliorhinus canicula* after intramuscular treatment**

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Quinolones are widely used due to their high efficacy against Gram-positive and anaerobic bacteria. Anyway, among adverse effects of these drugs chondrotoxicity has been observed and recorded, thus leading to a reduced use in pediatric age.

These drugs are also commonly used for the treatment of infectious diseases in chondrichthyes, but little or no information is at present available concerning potential adverse effect of these active principles on the cartilage of elasmobranchs.

Present work reports about the evaluation of chondrotoxicity to *Scyliorhinus canicula* following intramuscular treatment with a quinolone, enrofloxacin.

Three experimental groups were prepared: a control, a low dose and a high dose group, which were treated with saline, 5 mg/kg and 10 mg/kg enrofloxacin respectively, daily for a 14 days period, following normal therapeutic protocols (Smith et al., 2004).

Animals were fed daily *ad libitum* and weight was regularly recorded every 3 days in order to detect for any toxicity. Blood samples were taken at day 0 and 14 of treatment and at day 14 post-treatment.

Half of the animals were sacrificed at the end of the 14 days treatment period, while all other animals were killed at the end of the 14 days post-treatment period.

Ultrastructural or densitometric alteration in cartilage structure was detected, as well as any changing in hematological parameters.

Preliminary results are discussed in present work as well as the possibility to use small sharks as lab animals for this protocols.

\* Presenting author



## **Husbandry and show of *Sphyrna tiburo* (Linnaeus, 1758) at Cattolica Aquarium**

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The paper describes husbandry techniques for a new exposition of *Sphyrna tiburo* at Cattolica Aquarium. This species is the smaller of the Sphyrnidae family, the hammerheads.

All the passage from the arrivals of the animals to the final show to the public were followed in order to create a detailed dossier, a memory of the activities, and to provide the necessary information for a correct management of the species.

The 4 specimens were born in captivity in Florida. They arrived to Italy by fast flyigh and they were monitored for water temperature and quality since their landings. Then, with a series of steps, the young hammerheads were moved to the quarantine tanks. There, a day by day series of observations were planned in order to collect and record behavioural data, as well as hierarchy, their food intake and preferences, and their individual activity level.

Meanwhile a 40000 litres hexagonal tank was prepared and then enriched with rocks and sand bottom. All the constructions phases were video recorded to provide to the public, in a short motion, a singular review of what it's necessari to host this and similar species.

Behavioural diversity and hierarchy among the 4 sharks were observed. Increments in length and weight (apparent) were also recorded and after 3 months an enlargement of dorsal fin and correct behaviour in "search" and swimming phases as well as in targeting and swallowing food was observed.

The experience provide an important and interesting opportunity for the public to appreciate the charm and curiosity of this group of sharks and can be used to develop researches and point out the attention to the evolution of this special headed sharks.

\* Presenting author



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## **Husbandry of *Myliobatis aquila* (Linnaeus, 1758) at Cattolica Aquarium**

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Husbandry of *Myliobatis aquila* is still an uncertain target so we are trying to establish a complete protocol to avoid the loss of specimens in aquarium and to build up the ideal knowledge to improve also the presentation to the public. After a review of the information available on biology and ecology of this species, a protocol of husbandry was prepared and 9 *M. aquila* were provided by local fishermen. The transport to the Cattolica Aquarium was as short as possible in order to minimize stress factors as for example that one caused to Lorenzini's ampullae from metal contacts. The pH level, oxygen and toxic metabolites concentration were controlled. Sedative was used to minimize eagle's hyperactivity and to avoid physiological stresses. The quarantine period was carried out in isolated pools where the water was treated with physical, chemical, biological filters and U.V lamps. Beside that inspection and treatment for the presence of pathogens (especially metazoa and protozoa, but also fungi, bacteria and viruses) were performed following standard procedures. During the quarantine period the major problems arise from eagles feeding, because these animals often refuse food due to stress and the new "strange" environment, nevertheless the daily consume of crustaceans and small anchovies was recorded and any forced feeding was necessary. After the quarantine period was finished, the specimens were prepared to move to show tanks with a gradual acclimatation, modifying the chemical physical conditions as slow as possible, up to obtain the same parameters of the final habitat, focusing on temperature, pH, nutrients (ammonia shall be lower than 0.1mg/l), dissolved oxygen (percentage saturation around 95-100%) and light. Containers shall be big enough to guarantee animals swimming and shall be similar to natural habitat in terms of scenography, materials, light, temperature and water composition. The eagles must be constantly monitored also after their introduction, both in their behavioural, healthy status and in their feeding ability with



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other animals' presence. Eventually it can be necessary to individually feed some shy specimens.

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## **Identification: Aiding fisheries management**

Ali Hood and Al Reeve  
Shark Trust



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## **Using the public as a scientifically valuable source of data**

Al Reeve  
Shark Trust



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## **The Great Eggcase Hunt: harnessing the enthusiasm of volunteers – results to date**

Ali Hood and Al Reeve  
Shark Trust





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## **Characteristic Markings of British Basking Sharks**

Al Reeve, Dan Small and Colin Speedie  
Shark Trust and Wave-action



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## **The Internet as a Conservation Tool**

Nick Steel  
Shark Trust



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## **European Shark Week 2008**

Shark Trust  
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