



European Elasmobranch Association

Promoting Research and Conservation
for Sharks, Rays, Skates and Chimaeras

2006



10th EEA Science Conference

11th - 12th November 2006

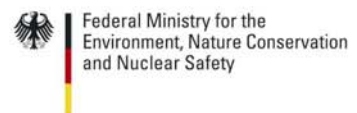
Zoological Institute & Museum

University of Hamburg

Programme & Abstracts



Hosted by the German Elasmobranch Society D.E.G.
and the University of Hamburg





Greeting

**by the parliamentary state secretary, Mrs. Astrid Klug,
of the German Federal Ministry for Environment, Nature Conservation and Nuclear Safety
on resuming the patronage over the 10th Annual Science Conference
of the European Elasmobranch Association EEA from 11.-12 November 2006 in Hamburg**

Dear Ladies and Gentlemen,

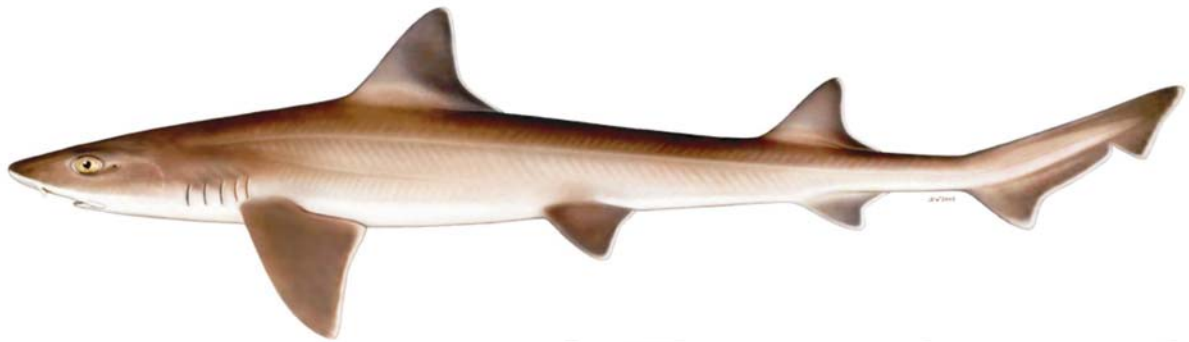
the relation between humans and sharks is marked equally by fear and fascination. News about bloodthirsty man-eaters are balanced by an increasing number of humans, who are touched by the elegance of these fishes.

Only few are aware, that these extraordinary animals already live for 400 million years in our seas. It is even more frightening then, that most species of sharks, skates and rays are meanwhile seriously threatened, long before a comprehensive picture of their biology and their important role in their ecosystem has been attained. Massive by-catches and overfishing have led to causing growing concern about the magnitude of decline of many species of sharks, skates and rays worldwide. Against this background, the Federal Government of Germany actively supports the protection of this group of animals. Gladly have I therefore accepted the patronage over your annual science conference and am pleased to invite you on behalf of the organisers to Hamburg in November 2006.

Protection measures can only be successful if they will be developed on a scientific basis. I appreciate very much that you will discuss during this conference, based on scientific knowledge of biological and ecological context, also aspects and options of conservation and fishery management measures. I am convinced that the results of your conference will not only contribute to important scientific knowledge but likewise will initiate important impetus on political discussions.

In this light, I hereby wish all participants and contributors productive discussions and enriching contacts in Hamburg.

Programme



Saturday, 11.11.2006

9:00 - 10:00	Registration
9:30 - 10:00	Opening of the Shark Exhibition / Meet the Press
10:00 - 10:15	Opening of Conference
	Opening address of University Host and Managing Director of Biocenter Grindel, Prof. Dr. Ganzhorn Opening address of EEA Vice-President, Boris Frentzel-Beyme Opening address of D.E.G. Chairman Frank Velte
10:20 - 11:00	Opening Key Note Adresses
10:20 - 11:00 O-1	Dr. Maurice Clarke: ICES Elasmobranch Working Group
11:00 - 11:40 O-2	Dr. Matthias Stehmann: What's up with taxonomy, systematics and biodiversity? - past and perspective

11:40 - 12:00 **Tea & Coffee Break**

12:00 - 13:00	Session 1: Elasmobranch Conservation & Fisheries Management
12:00 - 12:20 S1-1	Sarah Fowler The Draft European Shark Plan
12:20 - 12:40 S1-2	Sonja Fordham The Shark Alliance: A new coalition for science-based conservation of European elasmobranchs
12:40 - 13:00 S1-3	Ali Hood Skates and Rays in decline: the Shark Trust perspective

13:00 - 14:00 **Lunch Break**

Saturday, 11.11.2006

14:00 - 16:00 Session 2: Elasmobranch Conservation & Fisheries Management

14:00 - 14:20 **Sarah Valenti**

S2-1 The Conservation Status of Northeast Atlantic and Mediterranean chondrichthyans: assessing species for the IUCN Red List of Threatened Species™

14:20 - 14:40 **Alan Reeve**

S2-2 The Basking Shark: Photo-id and Public Engagement – The Shark Trust Approach

14:40 - 15:00 **Fabian Trinnie**

S2-3 Reproductive biology for ecological risk management of several urolophid species taken as bycatch in south-eastern Australia

15:00 - 15:20 **Tea & Coffee Break**

15:20 - 15:40 **Ken Collins**

S2-4 UK Shark Tagging Programme review 1999-2006

15:40 - 16:00 **Jessica Wiegand**

S2-5 Evaluating management strategies for the thornback ray *Raja clavata*:
Are marine protected areas better than traditional fisheries management?

**16:00 - 18:00 Poster Session, Guided Tour through the Ichthyological Collection,
Tea & Coffee**

Sunday, 12.11.2006

Opening Key Note Adress

10:00 - 10:40 **Dr. Rainer Froese**
O-3 Life-history Strategies of Elasmobranchii

10:40 - 12:40 Session 3: Morphology & Anatomy

10:40 - 11:00 **Corinna Enderes**
S3-1 Evolution of a novel lateral line system in pentanchin Scyliorhinids?

11:00 - 11:20 **Jonathan Whittamore**
S3-2 Ultrasound as a potential, non-invasive tool for assessing maturity in skates and rays (Family: Rajidae)

11:20 - 11:40 **Michèle Bruni**
S3-3 Description of near-term fetuses and juveniles of the Bluntnose sixgill shark, *Hexanchus griseus* (Bonnaterre, 1790), from the Ligurian Sea (Mediterranean Sea)

11:40 - 12:00 **Tea & Coffee Break**

12:00 - 12:20 **Anja Steinberg**
S3-4 Ecomorphological variations in the electrosensory system of *Dasyatis kuhlii* and *Dasyatis fluviorum*

12:20 - 12:40 **Massimiliano Bottaro**
S3-5 Electrosensory and olfactory systems in *Raja brachyura*: possible relations with a highly specialised predatory capability?

12:40 - 14:00 **Lunch Break**

Sunday, 12.11.2006

14:00 - 15:30 Session 4: Ecology & Behaviour

14:00 - 14:30 R. Aidan Martin

SO4-1 Behaviour: a Missing Component of Shark Conservation

14:30 - 14:50 Frank Velte

S4-2 Activity rhythms and resting behaviour in Brownbanded Bambooshark,
Chiloscyllium punctatum

14:50 - 15:10 Alexandra Barron

S4-3 Residency Patterns, Population Size, Growth Rates, Length and Sex
Distribution of White Sharks (*Carcharodon carcharias*) at Seal Island, South Africa

**15:10 - 18:00 Poster Session, Guided Tour through the Ichthyological Collection,
Tea & Coffee**

Posters (1/2)

- P-1 **Rachel Ball**
Electroreception in embryonic thornback rays *Raja clavata*.
- P-2 **Hélène Gadenne**
Distribution of basking sharks *Cetorhinus maximus* in french Brittany: influence of composition and abundance of zooplankton.
- P-3 **Armelle Jung**
Skate and ray egg cases in France, 2006 : preliminary report on distribution, inventory and collaborative project
- P-4 **Francesca Filieri**
Field study of a sandbar shark (*Carcharhinus plumbeus*) population in the Mediterranean: preliminary results after six years and evidence of a very strong female philopatry
- P-5 **Nicolas Pade**
Spatial ecology and population structure of the porbeagle (*Lamna nasus*) in the Atlantic: an integrated approach to shark conservation
- P-6 **Massimiliano Bottaro**
First observations on the electrosensory and olfactory systems in the basking shark *Cetorhinus maximus*
- P-7 **Diana Zaera**
Biological aspects of the African sawtail catshark, *Galeus polli* (Cadenat, 1959), in Angola

Posters (2/2)

- P-8 **Carolina Galván-Tirado**
Reproductive biology of the silky shark *Carcharhinus falciformis*
in the Gulf of Tehuantepec, Mexico
- P-9 **Alexei Orlov**
Some features of the ecology and biology of mud skate
Rhinoraja taranetzi Dolganov, 1985 in the northwestern Pacific
- P-10 **Andrea Dell’Apa**
Remarkable presence of Basking Sharks (*Cetorhinus maximus*)
around the waters of Sardinia Island
- P-11 **Krupskaya Narváez Romero**
Are juvenile angel sharks *Squatina squatina* a frequent prey
to the sea anemone *Telmatactis cricoides*?
- P-12 **Dr. Ralf Thiel**
The ichthyological collection of the University of Hamburg – biodiversity archive
of chondrichthian and osteichthian fishes and agnathans
- P-13 **Wolf Isbert**
“Shark-TV” as a tool for population assessment.
- P-14 **Krupskaya Narváez Romero**
Preliminary results of habitat use of the angel shark *Squatina squatina* and other
elasmobranchs on the northern coast of Gran Canaria

Abstracts Presentations



ICES Elasmobranch Working Group

Maurice Clarke

The Marine Institute Rinvilla, Oranmore, Co. Galway Ireland

Email: maurice.clarke@marine.ie

O-1

The results of four years of work of the ICES WGEF are presented, depicting trends in abundance of elasmobranch stocks throughout the NE Atlantic. Fisheries taking elasmobranchs as catch or bycatch were identified by the group and are described here. The status of the main elasmobranch stocks affected is elucidated and a resume of the ICES advice on sharks is concluded. The key feature of WGEF has been the active participation of members of NGOs and advocacy specialists along with scientific experts mainly from the fisheries biology field. The importance of developing and maintaining such links is highlighted. The role of the Conservation Movement in the work of ICES in general and WGEF in particular is described.

The ICES WGEF is the Working Group on Elasmobranch Fishes, researching fisheries data provided by member states to the International Council for the Exploration of the Seas ICES, the oldest multilateral international marine research and management organisation active in the Northeast Atlantic.

What's up with taxonomy, systematics and biodiversity? – past and perspective

Matthias F.W. Stehmann

ICHTHYS, Ichthyological Research Laboratory and Consultant
Hildesheimer Weg 13, D-22459 Hamburg, Germany
Email: stehmann@ichthys-fisch.info

O-2

Three commonly used terms seemingly appearing as synonyms and all too often used that way. Do they indeed have the same meaning? A clarification and definition of the three terms will be tried resulting in recommendations, how and when each will apply more correctly. As a matter of fact, taxonomists as such are an endangered “species”, and although few students still decide on going this way for their education, they have to face severe problems during education and thereafter. Less and less qualified professors/guides are available but particularly less and less professional positions at research institutions and specific natural history museums. As a consequence, less and less students decide on taking this education, or even worse, if some have done so, after they will hardly find a job and so get lost for the field with their qualification. Unfortunately, this also holds true especially for the group of chondrichthyan fishes. Only very few experts of advanced age, or being already retired, do still exist, who are overburdened due to their “rarity”. In our group of fishes, however, the need for taxonomic expertise is greater than ever, as we all know, because of their biological peculiarities and increasing endangerment. Effort by the IUCN, various NGOs and governmental authorities to implement effective conservation measure on different decision taking levels are severely hindered just by the problem, that we need to know what we are specifically talking about and how to correctly identify these fishes. In addition are we living an era, in which global databases are being created with a lot of work effort and financial investment for often not easily understandable purposes. Such kind of inventories of living organisms are sure important as the basis for monitoring developments leading to endangerment or even extinction – but how can such immense effort result in something reliable in view of the lack of taxonomists?

A critical overview and evaluation of the past, present time and perspectives will be tried.

The Draft European Shark Plan

Sarah Fowler

Naturebureau International
36 Kingfisher Court
Hambridge Road
Newbury RG14 5SJ
UK
Email: sarah@naturebureau.co.uk

S1-1

A draft EC Shark Plan has been commissioned by the Shark Alliance in furtherance of its mission to secure responsible, science based shark fishing limits for long-term sustainability and ecosystem health. The plan draws heavily upon the work and recommendations of professional bodies such as the ICES Working Group on Elasmobranch Fishes (WGEF), the Elasmobranch Subgroup of the Scientific, Technical and Economic Committee on Fisheries (STECF) and consultation with a panel of shark experts from ten EC Member States. Because of the influence of the EC in global fisheries and the importance of sharks in ocean ecosystems, European shark management efforts have the potential to enhance the health of the marine environment not only in Europe but also worldwide. It is essential that an effective Shark Plan be adopted if Europe is to fulfil its regional and international environmental and fisheries management commitments and enable shark populations to recover. Action is required at national level in Europe if these aims are to be achieved.

The Shark Alliance:
A new coalition for science-based conservation of European elasmobranchs

Sonja Fordham

The Shark Alliance
c/o Oceana
Rue Montoyer, 39 1000 Brussels
Belgium
T: +32 25 132242
Email: sonja@oceanconservancy.org

S1-2

Europeans are growing increasingly aware of the depletion of sharks and the European Union (EU) has both the mandate and the capacity to manage shark fishing. Yet, there is no overall EU shark management plan, the few existing shark measures rarely match scientific advice, and the EU prohibition on shark finning is one of the weakest in the world. Because of Europe's immense and wide-ranging fishing fleets and strong influence on international fisheries policy, the EU stance on shark conservation has far-reaching implications for the future of shark populations, not only around Europe, but across the globe.

The Shark Alliance is a new coalition of conservation, diving and scientific organisations formed to address this troublesome situation by promoting science-based conservation of sharks, skates and rays in a closely coordinated, high-profile manner. The three year campaign, convened by the Pew Charitable Trusts, officially launched in August 2006 and within a month member organizations turned a move in the European Parliament to weaken the EU shark finning regulation into a call for stronger, science-based restrictions and more technical studies. Shark Alliance members secured this victory through coordinated outreach, direct lobbying and successful media attention of an EU shark status report. The Shark Alliance will employ similar techniques in conjunction with future technical reports, targeted events in key Member States and increased interaction with the European Commission, in an effort to tighten the EU finning regulation and ensure implementation of a sound EU management plan for sharks, skates and rays. With the EEA as a founding member, the Shark Alliance seeks continued, close collaboration with elasmobranch scientists in work toward these goals.

Skates and Rays in decline: the Shark Trust perspective

Ali Hood

Shark Trust, 4 Creykes Court, 5 Craigie Drive, The Millfields, Plymouth, UK PL1 3JB
Email: ali@sharktrust.org

S1-3

The Shark Trust is concerned for the future of skate and ray stocks around the UK Coast and throughout European Waters. With all but two species demonstrating significant population declines, it is essential that species-specific management measures be adopted as a matter of urgency. Recovery plans must now be developed for Common, White and Long-nosed Skate, Thornback Ray and Blonde Ray. The Shark Trust proposes that species-specific landings, maximum landing sizes and realistic quotas be enforced across the entire European fleet. Skates occur over a variety of sea-floor habitats and are valued by both commercial and recreational anglers. Mostly long-lived animals, different species take between 5-10 years to mature and their large body size, slow growth, late maturity and low fecundity make them particularly vulnerable to over fishing. Skate and rays are oviparous and as such their nursery grounds are susceptible to physical disturbance. Although formerly supporting large UK and EU fisheries, and despite specific ICES recommendations, skate have been a low priority for both fisheries management and scientific survey. There is currently no EU minimum landing size for any species of skate or ray. The Shark Trust has an established record of skate and ray work, creating, supporting and managing a suite of programmes engaging a range of target audiences. The Trust is in favour of sustainably managed fisheries and endeavours to work with both commercial and recreational fishers and their representative organisations in a bid to secure a future for elasmobranch stocks.

Specifically this presentation will consider:

- Status of skate and ray fisheries: the response of industry to supermarket concern and public pressure (a UK perspective).
- Angler involvement: can angler reports aid skate and ray management?
- Public engagement: does an increased profile improve conservation awareness?

**The Conservation Status of Northeast Atlantic
and Mediterranean chondrichthyans: assessing species
for the IUCN *Red List of Threatened Species*TM**

Rachel D. Cavanagh¹, Claudine Gibson², Sarah V. Valenti³, Sarah L. Fowler⁴.

¹ British Antarctic Survey, High Cross, Madingley Road, Cambridge, CB3 0ET, United Kingdom, rachelmermaid@gmail.com; ² IUCN SSC Shark Specialist Group, 36 Kingfisher Court, Hambridge Road, Newbury, RG14 5SJ, United Kingdom, Claudine@naturebureau.co.uk; ³ IUCN SSC Shark Specialist Group, 36 Kingfisher Court, Hambridge Road, Newbury, RG14 5SJ, United Kingdom, Sarah2@naturebureau.co.uk; ⁴ IUCN SSC Shark Specialist Group, 36 Kingfisher Court, Hambridge Road, Newbury, RG14 5SJ, United Kingdom, sarah@naturebureau.co.uk.

S2-1

The IUCN Shark Specialist Group (SSG) aims to promote the long-term conservation of the world's chondrichthyan fishes, effective management of their fisheries and habitats and, where necessary, the recovery of their populations. One of the roles central to the SSG's mission is the preparation of species assessments for the *IUCN Red List of Threatened Species*TM, which is widely recognised as the most comprehensive source of information on the global threatened status of plant and animal species. This 'Global Chondrichthyan Assessment' is primarily being undertaken through a series of regional Red List workshops in order to facilitate detailed discussions, pooling of resources and the formulation of regional recommendations. To date, nine workshops have been held; including workshops for both the Mediterranean (San Marino Republic, 2003), and Northeast Atlantic (Peterborough, UK, 2006) regions. Species are evaluated against the IUCN Red List Categories and Criteria; considering population trends, life history characteristics, geographic range, actual and potential threats, and conservation and management measures, to determine the likelihood of extinction occurring within a specified time period under past, current, and future conditions. Species are assigned to one of the following categories: Critically Endangered (CR), Endangered (EN) Vulnerable (VU), Near Threatened (NT), Least Concern (LC) or Data Deficient (DD). The results of the Mediterranean and Northeast Atlantic workshops will be presented to provide an overview of the threatened status of European chondrichthyans. The final outputs of these workshops will be a report on the Conservation Status of Chondrichthyans for each region and a regional 'Red List' of threatened chondrichthyan species. It is hoped that the information contained within these reports will contribute to the effective management and protection of European chondrichthyans.

The Basking Shark: Photo-id and Public Engagement – The Shark Trust Approach

Al Reeve

Shark Trust, 4 Creykes Court, 5 Craigie Drive, The Millfields, Plymouth, UK PL1 3JB
Email: whaleshark@sharktrust.org

S2-2

The Basking Shark in the UK's most positive, and encouraging, example of shark conservation. Through the efforts of NGO's and public participation the Basking Shark is listed under Appendix II of CITES and the Convention on Migratory Species, included on Schedule 5 of the Wildlife and Countryside Act 1981 and is a key BAP species. The Shark Trust has been heavily involved in work to protect and also further knowledge and understanding of Basking Sharks and the conservation issues surrounding them. The Shark Trust will continue to promote the Basking Shark and will be working with specific groups, such as the National Lifeguards, to encourage beachside awareness regarding Basking Sharks. The Shark Trust is also responsible for the maintenance and development of the European Basking Shark Photo – id Project (EBSPiP). This project was created to gain more insight into aspects of Basking Shark life history such as spatial and temporal philopatry, population estimates and the physical impacts of water users on sharks. The popularity of this fin matching project is such that after the first 5 years of photo submissions from the UK and other EEA groups the database now consists of over 4000 images and has 13 confirmed re-sightings, some of which take place years or hundreds of miles apart. With the latest 2 years worth of images to process, the static database has become unwieldy and manual matching has become too impractical. Work towards an online database is currently underway with the new system designed to facilitate searches and fin matching. Being internet based will allow multiple users to work collaboratively across distances, national and international, and easily confirm or discount suggested matches. It will also become an accessible tool, linked to the new Basking Shark website, that can be uploaded to and used by any member of the public.

The Trust hopes that the development of improved online facilities will encourage increased participation.

Reproductive biology for ecological risk assessment of several urolophid species taken as by-catch in South-Eastern Australia

Fabian I. Trinnie¹²³, Terence I. Walker¹, Paul Jones², and Laurie Laurenson²

¹Department of Primary Industries and Research Victoria. PO Box 114, Queenscliff, Vic 3225

²School of Life Sciences and Environment, Deakin University, Princes Highway, Warrnambool, Vic 3280 Australia

³Corresponding author: Fabian.Trinnie@dpi.vic.gov.au

S2-3

Stingarees (family *Urolophidae*) are one of the most abundant groups of demersal chondrichthyan species in south-eastern Australia and form a major component of the bycatch of commercial fisheries. There are six species in the region: *Urolophus paucimaculatus*, *U. viridis*, *U. cruciatus*, *U. bucculentus*, *U. gigas*, and *Trygonopectera sp B* (endemic to Victorian waters). Stingaree species have the reproductive mode of aplacental viviparity with trophonemata and uterine histrotroph. The species vary in maximum attainable length, length-at-maturity, length-at-maternity, litter size, and periods of gestation and ovarian cycle. *Urolophus bucculentus* is the largest species, reaching 90 cm TL, followed by *T. sp B* and *U. gigas* at 80 cm TL. *U. paucimaculatus* and *U. viridis* both reach 50 cm TL and *U. cruciatus* reaches 45 cm TL. In all species the females reach a larger maximum length than do males. Although several species show similar total lengths, length-at-maturity and length-at-maternity varies between species. *Urolophus bucculentus* and *T. sp B* exceed the one-year period of gestation and ovarian cycle; *U. paucimaculatus* and *U. viridis* have 10–12-month period of gestation and ovarian cycle, whereas *U. cruciatus* has a 6-month period of gestation. The information is presently preliminary for *U. gigas*. The most variable part of the reproductive biology between stingaree species is maximum litter size, which ranges 2–13 pups. Comparative reproductive biology is essential for determining the biological productivity of each of these species for ecological risk assessment.

UK Shark Tagging Programme review 1999-2006

Ken Collins*, John Mitchell and Leita Tschanz

School of Ocean and Earth Science, University of Southampton, National Oceanography Centre,
Southampton SO14 3ZH, UK
Email: [*kjc@noc.soton.ac.uk](mailto:kjc@noc.soton.ac.uk)

S2-4

The UK Shark Tagging Programme (www.ukshark.co.uk) first trialled in 1999, relies upon the enthusiasm of sport anglers and charter boat skippers to record, tag and release their catches of a range of sharks, principally tope (*Galeorhinus galeus*), blue (*Pironace glauca*) and smoothhound (*Mustelus asterias* and *M. mustelus*). Over 100 participants around the UK contribute records each year, totalling over 6000 records to date. The Tope captures have been analysed in terms of location, date and satellite derived sea surface temperature, showing a peak between 11-15°C. A seasonal progression north through the Irish Sea is evident. Some 80 sharks have been recaptured to date. Blues most widely dispersed then tope, with smoothhound showing the least movement. The programme has been largely supported by WWF, keen to encourage the conservation message promoted by the catch and release approach. Results are being used in local and national consultations concerning the prohibition the landing of tope and other elasmobranchs in UK inshore waters.

Evaluating management strategies for the thornback ray *Raja clavata*: Are marine protected areas better than traditional fisheries management?

Jessica Wiegand^{1,2}, Nick Dulvy² & Ewan Hunter²

¹Department of Biology, University of York, PO Box 373, York YO10 5YW

²CEFAS, Lowestoft Laboratory, Pakefield Road, Lowestoft, Suffolk, NR33 0HT, UK

Email: wiegand_j@yahoo.co.uk

S2-5

Globally many fisheries are in decline, resulting in calls for the development of marine protected areas to sustain fisheries and protect biodiversity. However, there is some resistance to the implementation of closed areas as they restrict the size of fishing grounds. The relative utility of closed areas for ensuring fisheries yield and biodiversity protection must therefore be considered alongside other management measures. Both yield and distribution of the thornback ray (*Raja clavata*) have declined substantially throughout the North Sea. The aim of this research was to assess the efficacy of management strategies for halting and reversing the current population decline, and to estimate the consequences for the fishery yield. Using parameters from recent research, a deterministic, density-independent matrix model was developed to evaluate the effect of introducing the management strategies of either a seasonal closure of the Thames Estuary or landing size restrictions. Using this model, both closed areas and specified length restrictions resulted in a sustained population, but the closed area also resulted in greater reductions in yield. A closed area would also restrict the sole fishery within the Estuary, and would involve greater cost for implementation and policing. A more traditional approach using existing frameworks to apply landing size restrictions may, therefore, be better suited to reverse the decline of the thornback ray population.

Life-history Strategies of Elasmobranchii

Dr. Rainer Froese

Leibniz-Institute for Marine Sciences IfM-GEOMAR Düsternbrooker Weg 20

24105 Kiel Germany

Email: rfroese@ifm-geomar.de

O-3

Life-history strategies of sharks and rays are analyzed and compared with that of other recent fishes. Trophic level, size and productivity are taken as key traits and proxies for many other closely related traits. Discrete classes of size, trophic level and productivity were used to define 80 life history strategies. Only sixteen of these strategies were used by elasmobranchs, compared to 49 strategies used by ray-finned fishes. The number of strategies used by phylogenetic, environmental, morphological or behavioural groupings of fishes was highly predictable from the number of species in these respective groups. There was evidence for a non-overlap of preferred life-history strategies between the two largest recent classes of fishes, with Elasmobranchii tending towards large size and low to very low productivity, and Actinopterygii tending towards medium size with medium to high productivity. Life history-strategies that combined large size and low productivity contained proportionally more threatened species than other strategies.

Evolution of a novel lateral line system in pentanchin Scyliorhinids?

Corinna Enderes (1) & Peter Bartsch (2)

- (1) Universität Tübingen, Lehrstuhl für Spezielle Zoologie
Auf der Morgenstelle 28 72076 Tübingen Germany
Email: corinna.enderes@uni-tuebingen.de
- (2) Museum für Naturkunde der Humboldt-Universität
Invalidenstr. 43 10115 Berlin Germany
Email: peter.bartsch@museum.hu-berlin.de

S3-1

The heads of three scyliorhinid sharks (*Scyliorhinus canicula*, *Galeus melastomus*, *Apristurus aphyodes*) were investigated histologically in order to clarify the anatomy of the electroreceptive system (ampullae of Lorenzini). Clusters of ampullae of Lorenzini were digitally 3D-reconstructed according to section series and superficial pore patterns belonging to the clusters were mapped. These investigations revealed that not all pore fields on the heads' surface in *Galeus melastomus* and *Apristurus aphyodes* (Pentanchinae) are part of the electroreceptive system. Mediorostral pore fields dorsally and ventrally as well as preorbital pore fields in both species are part of a subdermal system of grooves, surrounded by the same dense connective tissue as the canalicular mechanoreceptive lateral line. Thus the system is of completely different structure as compared to the complexes of Lorenzian ampullae. Histological sections show digitiform protuberances and maculae similar to neuromast organs of the epithelia in the groove system in *Galeus melastomus*. Accordingly, histology rather indicates a mechanoreceptive function. The exact function or biological role of this elaborate system in pentanchin sharks is by no means clear yet. In *Apristurus aphyodes* and *Apristurus fedorovi* the groove system is also directly linked to the rostral commissure of the suborbital ventral lateral line canals. A similar groove system is found in *Apristurus berklotsi* and *Galeus murinus*. In *Scyliorhinus canicula* (Scyliorhininae) no comparable grooves or pores are found.

Ultrasound as a potential, non-invasive tool for assessing maturity in skates and rays (Family: Rajidae)

J. M. Whittamore¹, C. Bloomer² and I. D. McCarthy²

¹School of Biosciences, University of Exeter, Hatherly Laboratories, Prince of Wales Road, Exeter, EX4 4PS, U. K. (j.m.whittamore@ex.ac.uk).

²School of Ocean Sciences, University of Wales - Bangor, Menai Bridge, Anglesey LL59 5AB UK

S3-2

Skates and rays represent the most diverse elasmobranch fauna in British waters with life histories (slow growth, late maturation and extended gestation) that pose problems for effective conservation. Threatened by continued exploitation, future management strategies should be based on data derived from non-lethal measurements rather than data collected by destructive sampling. Maturity ogives (L_{50}) for males and females are one critical population parameter needed for effective management. Maturity assessment in males can be related to the size and condition of the claspers, however, females can only be assessed by dissection. Clearly, the sampling of large numbers of females in order to assess the reproductive characteristics of a population is not desirable, therefore a reliable and non-lethal form of maturity assessment needs to be developed. The aim of this work was to evaluate ultrasound as a potential tool in the assessment of maturity in female thornback rays *Raja clavata*. Two dimensional images of the reproductive organs were obtained by ultrasound in a small sample of 31 female rays and their appearance and size corroborated by dissection. The ovary could easily be identified on each sonogram, appearing more conspicuous in larger, mature individuals, associated with the presence of developing oocytes. Using built-in electronic callipers measurements of ovary diameter and height were made from each scan and these were compared with *in situ* measurements obtained by dissection. No significant difference was found in ovary diameter measured by these two methods. However, ovary height tended to be overestimated using ultrasound by an average of 20.9 % (1.2 ± 0.4 mm). On dissection it became apparent that ultrasound was unable to distinguish the shell gland, lying directly above the ovary. Thus, for more mature females where the gland was enlarged ultrasound tended to over-estimate ovary height. In summary, ultrasound is an accurate and reproducible method of non-invasively measuring the diameter of the ovary and may be potentially useful for the development of a non-lethal form of maturity assessment.

**Description of near-term embryos and juveniles
of the Bluntnose sixgill shark, *Hexanchus griseus* (Bonnaterre, 1790),
from the Ligurian Sea (Mediterranean Sea).**

Michèle Bruni (1)

Musée océanographique de Monaco, Avenue Saint-Martin, MC 98000 MONACO
Email: m.bruni@oceano.mc

In March 2001 and in February 2002, the Oceanographic Museum of Monaco retrieved two juvenile bluntnose sixgill sharks for its scientific collection. The specimens were freshly caught by a local fisherman from the region of Cannes, in the south of France (Ligurian Sea). The first one was about 150 cm TL and the second one was about 120 cm TL. Only the heads were kept. On the 26 August 2003, a pregnant female, about 400 cm long and 400 kg was taken in the same area by another fisherman. The female is lost but nine among some of its embryos were provided to the Monaco's Museum (MOM) and to the Paris' National Museum of Natural History (MNHN). A review of the historical and recent literature, makes it appearant that these embryos are the first described from the Mediterranean Sea. In order to find additional information on the morphology and development of the juveniles of this species, the present work gives the measurements (complete measurements are given for five embryos) and details of the teeth for the seven specimens. The average sizes of the embryos, 61 cm TL, indicate that they could have been near-term and the sexual dimorphism (position of the anal fin respectively to the pelvics and the caudal fin) is obvious. An almost complete set of the definitive dentition (serrations on the first mesial cusp and number of the dental cusps); appears on the biggest specimen with a total length of about 150 cm.

Ecomorphological Variations of the Electrosensory Systems of *Dasyatis kuhlii* and *Dasyatis fluviorum*

**Anja N Steinberg (presenter) Dr Ian R Tibbetts (Thesis supervisor)
Dr Darryl L Whitehead (Co-supervisor)**

Centre for Marine Studies, The University of Queensland, Brisbane Qld 4072
Email: anjasteinberg@web.de

S3-4

Surveys of ampullary pores, clusters and canals and electron microscopy, confocal microscopy and light microscopy for morphological studies were used to compare the electrosensory system of two dasyatids; one from a more marine environment (*Dasyatis kuhlii*) and one from a less marine (*D. fluviorum*) environment. In both species highest densities of pores are located around the mouth and three major clusters were found; however *D. fluviorum* possesses more ampullae, smaller pores, longer canals and more receptor cells per ampulla. The canals of *D. fluviorum* split into three sections each of which opens into four alveolar bulbs. The canals of *D. kuhlii* bifurcate and each bifurcation opens into six alveolar bulbs, which contain the sensory epithelium. The differences of the electrosensory systems of *D. kuhlii* and *D. fluviorum* might be explained by environmental conductivity, but could also be used to question their current phylogenetic assignment.

Electrosensory and olfactory systems in *Raja brachyura*: possible relations with a highly specialised predatory capability?

M. Bottaro^{1,2}, S. Ferrando², I. Consalvo³, M. Vacchi¹, L. Gallus², L. Girosi², P. N. Psomadakis³, C. J. L. Atkinson⁴, G. Tagliafierro²

¹ICRAM, c/o National Antarctic Museum (MNA), University of Genoa, Viale Benedetto XV, 5, I-16132 Genoa, Italy (e-mail: m.bottaro@unige.it)

²LIBiOM, Department of Biology, University of Genoa, Viale Benedetto XV, 5, I-16132 Genoa, Italy

³ICRAM, Via di Casalotti, 300, I-00166 Rome, Italy

⁴School of Ocean Sciences, University of Wales, Bangor, Menai Bridge, Anglesey UK

S3-5

The blonde ray *Raja brachyura* is a shallow water species living on sandy and sand-rock bottoms. Recent records of the blonde ray from the Mediterranean sea seemed to confirm a feeding preference for the teleosts belonging to the family of Ammodytidae, as already observed in specimens from the NE Atlantic. This could represent a very specialised predatory capability of *R. brachyura*. In fact, although most skates show an inefficient predation on eel-like fishes, the blonde ray seems to adopt high effective strategies to detect and successfully capture this kind of prey. Here we analysed the electrosensory (the ampullae of Lorenzini) and the olfactory systems, which play a very important role in elasmobranch prey detection. Individuals of *R. brachyura* were collected in the Mediterranean sea by trammel net. The ampullae of Lorenzini (AL) and the olfactory epithelium (OE) were prepared for histological and histochemical observations. PCNA and TUNEL reactions were also carried out to describe the renewal of the sensory epithelia. Antibody against Na⁺/K⁺ATPase was used for visualising sensory nerve terminals. In *R. brachyura* the AL were organized in clusters and they were dipped in a dense and abundant gel. AL were constituted by a canal and by a dilated terminal portion, the ampulla chamber, both filled with gel. The canal of the ampullary organs was formed by a single squamous epithelium which contained mucous flattened cells, showing Alcian positive gel protrusions. The ampulla chamber was organized in many alveoli lined by pseudostratified epithelium, formed by supporting and sensory cells. Na⁺/K⁺ATPase immunoreactive nerve terminals were observed at the base of the sensory cells. Histological observations of the OE of *R. brachyura* confirmed the presence of the six cell types already described in other cartilaginous fishes: basal cells, supporting cells, ionocytes, mucous cells and two types of receptor neuron. In particular crypt neurons, olfactory cells peculiar of fishes, seemed more numerous in *R. brachyura* than in other species of elasmobranchs. Alcian-PAS reaction showed mucous cells filled with both alcian- and PAS-positive mucus. PCNA immunoreactivity highlighted cell proliferation, more frequently localized in the basal layer of the OE. Our preliminary results provide more data for information on *R. brachyura* sensory biology. A more detailed picture of the trophic ecology of this species will be facilitated by other samplings and by further analyses.

Behaviour: a Missing Component of Shark Conservation

R. Aidan Martin

Fish Museum, Zoology Department, University of British Columbia, Vancouver, Canada

Email: ram@elasmobranch-research.org

SO4-1

Shark populations are severely depleted in many parts of the globe and international concern for their conservation is growing. Conservation efforts are hampered by deficiency of basic life history and ecology data vital to effective management. Due to their longevity, vagility, and the concealing nature of their medium, sharks are difficult to study in the wild. A small but dedicated group of researchers from around the world is working to fill in critical knowledge gaps about shark life history and ecology, using primarily traditional fisheries methods (analyses of gut contents, sex ratio, gonadal maturity state, and litter size) augmented by newer technologies (sensory neurophysiology, population genetics, telemetry and satellite tracking). These methods address what are basically behavioural questions (feeding, reproduction, population structure and dynamics, habitat usage and movement patterns), but are hampered by limitations of these fundamentally indirect methods. Translating these indirect indicators into a cohesive understanding of what sharks do and why remains elusive. Ethology is a robust scientific discipline offering a well-developed “tool kit” for addressing unanswered questions about shark behavioural ecology and management. Unfortunately, most shark biologists have little or no background in ethology, while few ethologists have used sharks as a model organism in their studies. The basic goals and methods of ethology are reviewed and applied to four case histories (reducing fisheries bycatch, protecting critical habitat, managing shark ecotourism, and reducing shark attacks) as an illustration of how ethological tools can help solve current problems in shark management and conservation. It is concluded that 1) shark behaviour is important to understanding shark ecology but inadequately known and 2) ideas and methods from ethology are likely helpful toward solving behavioural ecological questions critical to shark management and conservation.

**Activity rhythms and resting behaviour
in brownbanded bambooshark, *Chiloscyllium punctatum***

Frank Velte

Institute for Cell Biology and Neurosciences of the Johann Wolfgang Goethe University,
Siesmayerstr. 70, D-60323 Frankfurt/M. Germany

S4-2

Activity rhythms are well studied and prominent in teleost fishes, but less is known for chondrichthyans. The activity rhythms of the brownbanded bambooshark, *Chiloscyllium punctatum*, have been continuously recorded for several weeks under different aquarium conditions. The activity patterns of brownbanded bamboosharks are principally organized in a circadian manner with main activity around begin of dark-phase. Light as well as timing of food supply affect the activity patterns. Food-searching behaviour was induced by food supply or by beginning of dark-phase. It continues with breaks throughout the rest of the day and night. Food-searching behaviour ends with begin of light-phase. Resting behaviour could be divided in short-term resting and long-term resting. Short-term resting is characterized by lying on substratum for several minutes on average. Long-term resting could be described as lying in a cave for some hours. The maximum duration of long-term resting amounts to 18 hours.

**Residency Patterns, Population Size, Growth Rates, Length
and Sex Distribution of White Sharks (*Carcharodon carcharias*)
at Seal Island, South Africa**

**R. Aidan Martin¹, Alexandra Barron², Neil Hammerschlag^{2,3}, Rob Lawrence⁴
and Chris Fallows⁴**

¹ Zoology Department, University of British Columbia, Vancouver, BC V6T 1Z4, Canada
ram@elasma-research.org

² ReefQuest Centre for Shark Research, P.O. Box 48561, 595 Burrard Street, Vancouver, BC
V7X 1A3, Canada

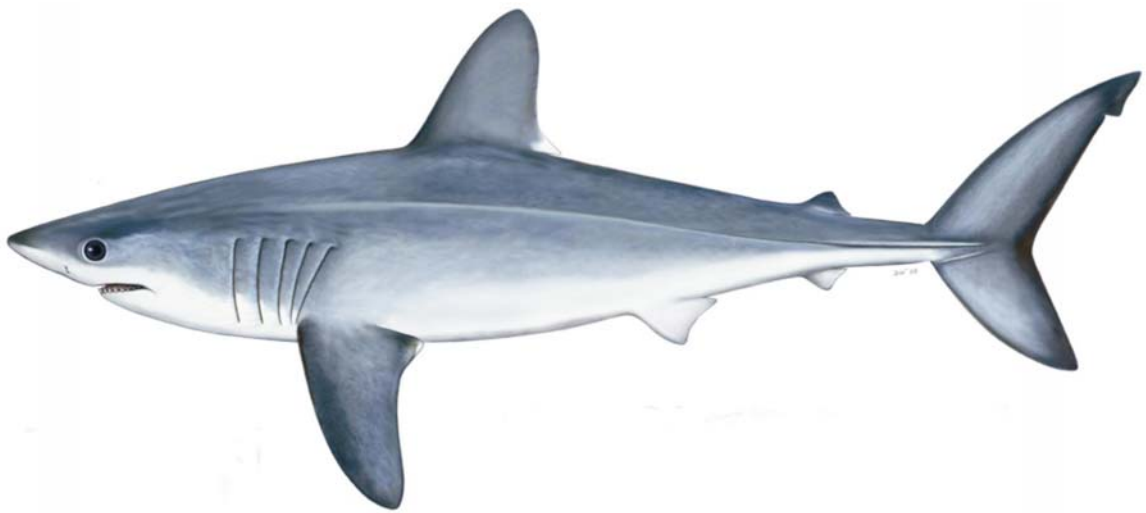
³ RSMAS, University of Miami, Miami FL 33149 USA

⁴ Apex Expeditions, 14 Theobault Walk, Marina Da Gama, 7945 Cape Town, South Africa

S4-3

Identification of individual animals is one of the cornerstones of any field study. White sharks aggregate at Seal Island, South Africa, between May and September each year, creating an opportunity to study changes in population size as well as patterns of individual variation in residency and habitat use over several years. Unfortunately, most techniques used for identifying individual sharks are not suitable for long-term studies. We describe a practical, non-invasive technique for identification of individual white sharks using natural markings and discuss the long-term reliability of these markings. Using this technique at Seal Island, we determined that residence times of individual white sharks ranged from <1 to 24 days ($n = 45$; mean 5.25, SD 6.06). Between 2002 and 2005, 45 individual white sharks were resighted a total of 145 times, indicating strong site fidelity in at least some individuals. Using resightings as “recaptures” and applying the Lincoln-Peterson Index, we calculated the population of white sharks visiting Seal Island consisted of 1540 ± 2584 (95% CL) individuals at the start of our study. Mean growth rates of 11 white sharks, ranging in length from 2.9-4.2 m, ranged from 2-35 cm/y (mean 16 cm/y, SD 11 cm/y), which is consistent with published estimates based on the Von Bertalanffy Growth Function. Lengths of white sharks recorded during the study period ranged from 2.5 to 4.5 m, of which only females reached lengths greater than 4 m, but mean length for both sexes was 3.6 m. Sex ratio of females to males was 1:1.73, however the operational sex ratio was 1:14, which suggests a polyandrous mating system. We also provide preliminary data on feeding periodicity in individual white sharks at Seal Island. The identification technique and applications we describe are likely applicable to long-term studies of white shark population and residency patterns at other sites.

Abstracts Poster



Electroreception in embryonic thornback rays, *Raja clavata*.

Rachel BALL & Andrew B. GILL

Department of Natural Resources, School of Applied Sciences,
Cranfield University, Cranfield, MK43 0AL
Email: r.e.ball.s05@cranfield.ac.uk, a.b.gill@cranfield.ac.uk

P-1

Elasmobranchs are well known for their ability to detect bioelectric stimuli for the purpose of prey detection and mate location. Their electro-sense also functions in the relatively unknown behavioural context of predator avoidance. Embryos of oviparous elasmobranchs, which spend embryonic life encapsulated in an egg case on benthic substrata, are very vulnerable to predation, yet there is evidence to suggest that the electric sense of developing skates can efficiently mediate predator detection and avoidance. The relatively constant ventilatory movements of near hatching skate embryos have been shown to be interrupted by phasic electric stimuli of 1-2Hz which matches the frequency produced by large fish predators. This behaviour momentarily removes sensory cues which facilitate the embryo's detection by predators and thus may represent an important mechanism to enhance survival. Here we describe the results of an investigation which examined the behavioural responses of 3 different age groups of thornback ray *Raja clavata* embryos (1/3 developed, 2/3 developed and near hatching) to low frequency AC electric fields. Treatments were presented as continuous or intermittent E-fields in order to explore the likelihood of habituation to stimuli. Embryos of each age group were seen to perform 'freeze responses' at the onset of E-field stimulation, indicating the functionality of the electrosense very early in ontogeny. A continuous application of either stimulus (constant or intermittent) resulted in a significant reduction in overall ventilatory activity across all age groups. However, where habituation to the constant stimulus was clearly apparent, the 10 minute recovery period provided by the intermittent field proved sufficient for embryos to be re-stimulated, resulting in a further reduction in overall ventilatory behaviour. This is of particular significance when considering the electrosensory abilities of a crucial life history stage of a vulnerable elasmobranch species and their potential interactions with E-fields in the coastal environment such as those predicted to be produced by subsea cables of offshore renewable energy developments.

Distribution of basking shark *Cetorhinus maximus* in Brittany (France): influence of composition and abundance of zooplankton.

Gadenne, H.¹ & Stéphan, E.²

^{1&2} Association Pour l'Etude et la Conservation des Sélaciens (APECS)
Rue de Liège - BP 51151 29211 BREST CEDEX 1 FRANCE
Email : helene@asso-apecs.org eric.stephan@asso-apecs.org

P-2

The effects of zooplankton on basking shark surface sightings have been widely studied in England. In France there is only a single organization (the NGO *APECS* : Association for Study and Conservation of Elasmobranchs) which is currently studying this shark species. Since 2003, APECS has been investigating the occurrence of the basking shark in Brittany coastal waters, where individuals are observed every years.

From May to June 2005, a preliminary study has been performed in order to characterize the zooplankton of the coastal waters of south Brittany in relation to basking sharks.

During the study, 14 sharks were observed. For each shark observation, zooplankton samples were taken, both vertically (10-m depth) and horizontally (on the surface). In addition, 5 fixed locations within Glenan Islands archipelago have been chosen as controls, in which zooplankton vertical and horizontal samples were taken weekly. A total of 70 samples were collected.

Our preliminary results suggest that differences in mean zooplankton abundance in presence and in absence of sharks were not significant. Nevertheless, sharks were associated with zooplankton patches containing abundant Calanoid copepods. Basking sharks were observed feeding in areas where large *C. helgolandicus* predominated and where the relative abundance of smaller zooplankton species was lower.

But some aspects of the experimental design of this study could have introduced some bias. In particular, samples considered “in presence of basking sharks” were made only after the monitoring, when the shark was lost. It is possible that due to the follow-up duration and currents, a different area of water was sampled than the area in which sharks fed.

Like other studies from APECS, this preliminary study shows the importance to continue the follow-up of zooplankton to characterize the foraging behaviour of basking sharks *Cetorhinus maximus*, particularly at fine scales with very accurate zooplankton samplings.

Skate and ray egg cases in France, 2006: preliminary report on distribution, inventory and collaborative project.

Laurent N., Jung A.¹

¹APECS Rue de Liège BP 51 151 29211 BREST Cedex 1 – FRANCE
Email: armelle@asso-apecs.org

P-3

In recent years, landings of rays by French fisheries have regularly declined. In order to study rays population, APECS is starting to carry out an egg case programme collaborating to the Shark Trust's Great Eggcase Hunt. An identification guide and a data-form has been established and proposed to publish via website and APECS member list and acquaintance. A preliminary report of the data collected is presented to encourage European elasmobranch biologists to join and contribute to this programme. In 2006, 265 egg cases have been founded over 24 different locations of French western coasts. Five different species of rays have been identified: *Raya undulata*, *Raya brachyura*, *Raya montagui* and *Raya clavata* and *Dipturus batis*. *Raya undulata* is largely predominant with 73,6 % of the egg cases collected whereas only 4,9% of the egg cases were unable to determination due to their bad condition. To obtain ability in conservation managing, getting data on rays is an absolute necessity. These first results show an enthusiastic perspective for the project, which is planned to be officially started up in the next months.

Field study of a sandbar shark group in the Mediterranean sea. 2001-2006 photo-ID preliminary results: evidence of strong female philopatry

Eleonora de Sabata¹, Francesca Filieri¹ and Simona Clò²

¹MedSharks, via Ruggero Fauro 82, 00197 Roma, Italy Email: info@medsharks.org.

²CTS, via Albalonga 3, 00183 Roma Email: simshark@libero.it

P-4

A population of sandbar shark is known to congregate seasonally in a small bay on the Aegean coast of Turkey, Eastern Mediterranean sea. The MedSharks project initiated in 2001 a study of this population through UW observation, dart- and PAT tagging and photo-ID, which is still underway. UW photo-identification was performed consistently throughout 2001–2006. Some natural features have proved to be stable over a period of at least six years and thus provide a reliable way to re-identify individual sharks. Observations indicate the presence of a population composed exclusively of sexually mature sharks. Almost all individuals are females; only few males have been sighted. Here we present a catalogue of identified animals and data of re-sightings over the years. These re-sightings provide evidence for strong site-specific philopatry in this group of sandbar sharks.

Spatial ecology and population structure of the porbeagle (*Lamna nasus*) in the Atlantic: an integrated approach to shark conservation

Pade, N.,¹ Sarginson, J.,¹ Antsalo, M.,² Graham, S.,¹ Campana, S.,³ Francis, M.,⁴ Jones, C.,¹ Sims, D.⁵ & Noble, L.¹

¹Zoology Department, University of Aberdeen, Tillydrone Avenue, Aberdeen, AB24 2TZ, Scotland.

²Institute of Marine Research, PO Box 1870 Nordnes, 5817 Bergen, Norway

³Marine Fish Division, Bedford Institute of Oceanography, 1 Challenger Drive, P.O. Box 1006, Dartmouth, Nova Scotia, Canada B2Y 4A2

⁴National Institute of Water and Atmospheric Research, 301 Evans Bay Parade, Greta Point, Wellington, New Zealand

⁵Marine Biological Association, The Laboratory, Citadel Hill, Plymouth, PL1 2PB, UK.

P-5

The porbeagle shark, *Lamna nasus*, is a large pelagic shark of the family lamnidae. It exhibits a disjunct distribution throughout cold temperate seas (1-18°C) in the North Atlantic and in the southern hemisphere. Heavy exploitation in the North-East (NE) and North-West Atlantic (NW) has led to an estimated decline of 90% of virgin stocks in NW. No estimate is available for the NE stock, but it is considered depleted. *L. nasus* population ecology is poorly understood, rendering effective management difficult. Hence, a thorough study of the population structure and habitat preferences is necessary to complete our knowledge. To assess genetic population structure DNA was extracted from 220 porbeagles (NE $n=102$; NW $n=60$; Southern Hemisphere $n=58$). Following polymerase chain reaction (PCR) on the mitochondrial (mt) DNA D-loop, enzyme digestion was carried out to identify possible genetic stock structuring and differences in mtDNA composite haplotype frequencies. Preliminary PCR-RFLP analyses of 1049 bp of mtDNA control region indicates little population differentiation across the Atlantic ($F_{st}=-0.04$, $p>0.05$ between Canada and Scandinavia). Geographical distribution of 8 composite haplotypes suggests geneflow within the northern hemisphere as dominant haplotypes from NE are also present in NW Atlantic. In contrast, marked differences in haplotype frequencies between the northern and southern hemisphere populations were observed, implying little or no geneflow between them. In order to further increase the resolution of the RFLP study, more restriction sites will be identified from full mtDNA D-loop sequences. Furthermore, 6 microsatellite loci developed from *Carcharodon carcharias* and *Isurus oxyrinchus* will be employed to identify any sex-biased dispersal within *L. nasus*. Finally, we aim to deploy a number of satellite tags in the summer of 2007 in NE Atlantic. This will allow for determination of habitat utilisation and preference of this species, using spatial analysis software. This novel approach of combining molecular genetic tools and satellite telemetry will allow for a thorough investigation into the spatial ecology of *L. nasus* in the Northern Hemisphere on a seasonal basis and as well as over generations.

First observations on the electrosensory and olfactory systems in the basking shark *Cetorhinus maximus*

M. Bottaro^{1,2}, S. Ferrando², M. Vacchi¹, L. Gallus², L. Girosi², G. Tagliafierro²

¹ICRAM, c/o National Antarctic Museum (MNA), University of Genoa, Viale Benedetto XV, 5, I-16132 Genoa, Italy (e-mail: m.bottaro@unige.it)

²LIBiOM, Department of Biology, University of Genoa, Viale Benedetto XV, 5, I-16132 Genoa, Italy

P-6

The electrosensory and olfactory systems are highly specialized sensory organs used by the elasmobranchs for important biological functions such as prey detection, navigation and mate location. Here we studied, for the first time, these two sensory systems in the basking shark *Cetorhinus maximus*. On 2 June 2006 a basking shark was accidentally caught by trammel net off of Bordighera, NW Mediterranean sea. The individual was a young male of 3.5 m of fork length and 350 Kg of total weight. After landing and attesting the death of the animal, the ampullae of Lorenzini and the olfactory bulbs were removed and fixed in 4% p-formaldehyde solution. They were prepared for histological and histochemical observations. PCNA and TUNEL reactions were also carried out to describe the renewal of the sensory epithelia. Antibody against Na⁺/K⁺ATPase was used for visualising sensory nerve terminals. The ampullae of Lorenzini (AL) were located in the rostral part of the head, where they were dipped in a dense and very abundant gel, which filled all the nose of the shark, showing a configuration never seen in others studied cartilaginous fishes. The AL were constituted by a canal and by a dilated terminal portion, the ampulla chamber, both filled with a very dense gel, strongly Alcian positive. Histological observations of the AL in the basking shark evidenced the presence of squamous epithelium in the canal and pseudostratified epithelium in the ampulla chamber, as already observed in others species. *C. maximus* had a thick olfactory epithelium (OE), with ciliated supporting cells, lined at the apex by an alcianophilic layer. Alcian-PAS reaction showed mucous cells with an acidic mucus. PCNA immunoreactive nuclei were localized in two zones of the epithelium: they were abundant in the basal layer (the zone of basal cells, well known proliferative cells in the OE of vertebrates) and also present in the middle zone of the OE, suggesting a second proliferating cell population. As for others planktivorous animals also for the basking shark the foraging success is determinate by the detection of the prey concentrations. However this predatory capability and the foraging strategies with which basking shark can respond to changes in zooplankton abundances are poorly clear. Sensory systems could play a relevant role in detecting plankton heterogeneity in the open waters and our results may provide another brick in the understanding of the basking shark foraging behaviour.

Biological aspects of the African sawtail catshark, *Galeus polli* (Cadenat, 1959), in Angola

Diana Zaera

Institute of Marine Research, Nordnesgt. 50, POBox 1870 Nordnes, 5817 Bergen, Norway.
Email: diana@imr.no

P-7

The African sawtail catshark, *Galeus polli*, belongs to the order Carcharhiniformes, family Scyliorhinidae. It is characterized by being a relatively small shark with a dark mouth lining and usually eleven or less well-defined dark grey saddle blotches on a light background (Compagno, 1984). It lives in tropical and cold-temperate waters. In the eastern Atlantic it is found from southern Morocco to South Africa (west coast) (Compagno et al., 2005). The information on biology and bathymetric distribution of deep-sea sharks in Angolan waters is scarce, and therefore this paper attempts to contribute to a better knowledge of the species in the area. The material used for this study was collected during five demersal surveys conducted in Angola on board the R/V 'Dr. Fridtjof Nansen' between 2002 and 2006. During the surveys, length, sex, maturity stages, total body weight, liver weight and data on stomach content were collected. *G. polli* was caught throughout the entire survey area, with a mean length of 28.82 cm TL ($n=248$, $SD=11.12$, range 14-37 cm TL) with the bigger fish in deeper waters. The length-weight relationship for each sex was significantly different; females reached greater size than males and were slightly more numerous at lengths greater than 30 cm TL. The average total body weight was 83.74 g for females and 63.66 g for males. The majority of both females (56.21%) and males (70.53%) were mature (stages 1 to 3 for females and 1-2 for males). Length were 50% were mature was 28.2 cm TL for males and 30.50 cm TL for females. The average hepatosomatic index was 5.66% for both sexes. From the two hundred and eighty-three stomachs examined, 78 were empty (27.6%). The stomach content consisted of 11 different identifiable prey species belonging to three main groups: Cephalopoda, Crustacea and Teleostei. Crustaceans was the most important ingested prey groups, contributing with 20.4% to the total index of relative importance (IRI), followed by Cephalopods (19.7%) and Teleosts (9.5%). At the species level, *Nematocarcinus africanus* (9.6%), Euphasidae (7%), *Solenocera africana* (4.3%) and Myctophidae (3.5%) were the most frequent prey items.

Reproductive biology of the silky shark *Carcharhinus falciformis* in the Gulf of Tehuantepec, Mexico

Carolina Galván-Tirado¹ and Felipe Galván-Magaña²

1. Universidad Nacional Autónoma de México. Instituto de Ciencias del Mar y Limnología. Circuito Exterior s/n, Ciudad Universitaria. Ciudad de México, D.F. 04510. Mexico.
E-mail: carogati@gmail.com
2. Centro Interdisciplinario de Ciencias Marinas. Av. IPN s/n. Col. Playa Palo de Santa Rita.A.P. 592. La Paz, Baja California Sur, México. C.P. 23096.
E-mail: galvan.felipe@gmail.com

P-8

Silky sharks, *Carcharhinus falciformis*, are caught in large numbers in the traditional fisheries of the eastern Mexican Pacific Ocean. The objective of this study is to describe the reproductive biology of this shark, based on 258 specimens (117 females and 141 males) sampled from September 2004 to May 2006 in the Gulf of Tehuantepec, Mexico. Sizes of captured sharks ranged from 70 to 229 cm total length (TL) in females, and 69 to 220 TL in males. The sex ratio was 1:1 (F:M) with no statistical difference ($\chi^2=2.23$; $p>0.05$). Length at which 50% of the population reached maturity was 180 cm TL in males, and 190 cm in females. Comparing measurements of the reproductive organs to body length, we found a larger oviducal gland width of 19 to 45 mm in females from 175 to 190 cm TL. The uterus width ranged from 20 to 220 mm, including pregnant sharks. In twelve immature females the maximum oocyte diameter was between 2 and 15 mm. In four adult females that were not pregnant the mature oocytes were from 20 to 30 mm in diameter. Therefore ovulation occurs when oocytes reach this diameter. Testicle length between 184 and 282 mm, sperm in the seminal vesicles, and calcified claspers are the most reliable indicators of sexual maturity and activity in males. The number of mature oocytes in mature females ranged from 4 to 11. The number of embryos ranged from 2 to 14, with an average of 6. Size at birth was estimated at between 55-69 cm TL from January to March, after a gestation period of 11-12 months. There was no evidence of a seasonal reproductive cycle.

Some features of the ecology and biology of the mud skate *Rhinoraja taranetzi* (Dolganov, 1985) in the northwestern Pacific

Alexei M. Orlov¹ and Alexei M. Tokranov²

1 - Russian Federal Research Institute of Fisheries and Oceanography (VNIRO), 17, V. Krasnoselskaya, Moscow, 107140, RUSSIA (orlov@vniro.ru)

2 - Kamchatka Branch of Pacific Institute of Geography, Far East Branch of Russian Academy of Science (KB PIG FEB RAS), 6, Partizanskaya St., Petropavlovsk-Kamchatsky, 683000, RUSSIA (tok@mail.iks.ru)

P-9

The mud skate *Rhinoraja taranetzi* was described rather recently. This species is similar to *Bathyraja violacea* and *B. mariposa* in its appearance and moderate size and is considered as senior synonym of *Bathyraja hubbsi* and *Rhinoraja longi*. The mud skate is distributed from Central Kuril Islands (Kruzenshtern Strait) to Pribyloff Islands in the eastern Bering Sea and along the Commander and Aleutian Islands to the western Gulf of Alaska. This species is one of ten most abundant skates inhabiting Russian waters though the data on its ecology and biology are very limited. The mud skate during the whole year is most abundant in central part of study area from the coast of Onkotan Island to southern tip of Kamchatka peninsula. Proportion of this species in bottom trawl catches in different seasons has changed slightly. However its maximum catches occur in September-December. In April-May mud skates occupy shallower depths (mean 230-270 m) moving deeper in summer period (mean 340-390 m). In December-March this skate occurs at lower bottom temperatures (mean 0.8-1.6°C) while in the rest of the year it inhabits warmer waters with mean bottom temperatures 2.5 to 3.1°C. During the whole year decreasing of body weight with depth is observed indicating that adult and juvenile mud skates inhabit different depths. Total length of mud skates in catches ranged 17 to 70 cm with mean 51.71 cm. Relation between total length (TL, cm) and body weight (W, g) was as follow: $W = 0.0029TL^{3.1614}$ ($R^2=0.978$). Males were more abundant among small skates (<30 cm) only, while females predominated among larger skates (>30 cm) with the share about 70% in 60-70 cm length class. Female mud skates were longer and heavier than males (mean length 56.9 vs. 51.2 cm and mean weight 1206 vs. 807 g respectively). According to our data species considered is benthophage, consuming mostly amphipods (34.9% by weight), polychaet worms (27.6%), and decapod crustaceans (12.7%). Fishery discards (13.9%) also play considerable role in the diet. Small skates (20-40 cm) fed mostly on amphipods (85.4%); medium-sized (40-60 cm) ate amphipods (40.2%), polychaets (29.1%) and decapods (19.3%); largest individuals (>60 cm) consumed fishery offal (27.9%) and less amphipods (26.6%) and polychaets (27.7%). Preliminary data on maturation of species considered in the western Bering Sea showed that males become mature when reach about 61 cm TL while females become mature reaching TL about 62 cm.

Remarkable presence of basking sharks (*Cetorhinus maximus*) around the waters of Sardinia Island

Clò S.*, Dell'Apa A.* & E. De Sabata**

*CTS via Albalonga, 3 00166 Roma sclo@cts.it

**Medsharks info@medsharks.org

P-10

Recently important new records coming from the North Sardinia have been reported and gave a new distribution of basking shark in Italian waters. The presence of basking shark, *Cetorhinus maximus* (Gunnerus, 1765), throughout the Sardinia Island was investigated collecting information from military authorities, professional and recreational fishermen and from Marine Protected Areas. More than 50 records of information on basking sharks were collected, with older records coming from 1910 to 2006. Data revealed the presence of specimens of quite different sizes that ranged from very young (about 2 m TL) to large adults (8 m TL). Numerous records registered in the last two years are related to an increasing scientific and public interest on the species but also at variation in zooplankton abundance. The present study aims to compile data on the presence, distribution, seasonal changes in number, length frequency of basking sharks in the Sardinia Island. The knowledge on the distribution and population structure of basking shark in the Mediterranean basin plays an important role in the implementation of conservation measures of such protected species.

Are juvenile angel sharks *Squatina squatina* a frequent prey to the sea anemone *Telmatactis cricoides*?

Krupskaya Narvaez^{1,2,3}, Filip Osaer² y Ricardo Haroun¹

¹ **BIOGES** Centro de Investigación en Biodiversidad y Gestión Ambiental, de La Universidad de Las Palmas de Gran Canaria. Facultad de ciencias del mar. Campus de Tafira s/n, 35017, Las Palmas de G. C. España.

² Fundación colombiana para la investigación y conservación de tiburones y rayas, **SQUALUS**. Carrera 64 A No. 11 A-53, Cali, Colombia.

³**Fundación Malpelo y otros ecosistemas marinos**. Calle 11 No 87-32, Bogota, Colombia.
krupska@gmail.com, filiposaer@gmail.com y rharoundbio@ulpgc.es

P-11

The angel shark *Squatina squatina* and the sea anemone *Telmatactis cricoides* are common species along the coasts of the Canary Islands, (Central- East Atlantic ocean). *S. squatina* is a benthonic, nocturnal shark. It prefers mud or sandy bottom where it normally lies buried with only its eyes protruding. *T. cricoides* is a great solitary species of sea anemone of up to 40 cm of diameter. It lives normally in a dim light ambient, strongly attached to its substrate inside crevices and caves. Up to now, the interaction between these two species has not been reported in the literature. A recent event was observed in the northern coast of Gran Canary island, when a specimen of *T. cricoides* of 16 cm in diameter was sighted while devouring a young *S. squatina* of 28 cm length. This is probably a very isolated event caused by a unique opportunity for the *T. cricoides* rather than *S. squatina* being part of its regular diet.

The ichthyological collection of the University of Hamburg – biodiversity archive of chondrichthian and osteichthian fishes and agnathans

Ralf Thiel, Irina Eidus & Renate Neumann

University of Hamburg, Biocenter Grindel and Zoological Museum, Section Ichthyology
Martin-Luther-King-Platz 3, 20146 Hamburg, Germany
ralf.thiel@uni-hamburg.de

P-12

The origins of the ichthyological collection in the Zoological Museum Hamburg of the University of Hamburg trace to the first half of the 19th century. The Zoological Museum Hamburg (ZMH) is ranked among the 12 most important international reference archives of biodiversity in Germany. The ZMH continues in the tradition and is the successor of the Natural History Museum in Hamburg (Naturhistorisches Museum zu Hamburg), established in 1843. Later the Museum was renamed the Zoological State Institute and Zoological Museum (Zoologisches Staatsinstitut und Zoologisches Museum), which was incorporated into the University of Hamburg in 1969. Nowadays, the Section Ichthyology serves the research needs of scientists from all continents, both through their visits to the ichthyological collection and through outgoing loans. The scope of the ichthyological collection is worldwide. Its usefulness stems not only from historically specimens and types, but also from the continuous incorporation of new material into the collection. In the 1970s, more than 1,000 lots of freshwater and marine fishes were obtained from the University of Göttingen. Much of the growth of the collection was derived from the takeover of abundant marine material (more than 25,000 lots) from the former collection of the ISH (Institut für Seefischerei, Hamburg) in 1993. The collection now contains nearly 47,000 cataloged lots. There is a large backlog of uncatalogued fishes. However, much of the backlog is identified to species. At present, about 9,000 nominal species are represented in the ichthyological collection. The collection contains about 1,500 type specimens. More than 300 of them are holotypes. The contribution represents details regarding the systematic, temporal and geographic coverage of the ichthyological collection.

**“Shark-TV” as a tool for population assessment
Baited-Remote-Underwater-Video-Stations are a suitable technology for
shark population assessment in NW-Australia. Is it transferable to the
Mediterranean?**

Wolf Isbert¹, Mark Meekan², Mike Cappo³, John Carleton³ and Ross Marriott³

¹ watten&meer, Gösselstrasse 2, 28215 Bremen, wisbert@gmx.net

² Australian Institute of Marine Science PO Box 40197, Casuarina NT 0811,
m.meekan@aims.gov.au

³ Australian Institute of Marine Science PMB No 3, Townsville Qld 4810, m.cappo@aims.gov.au

P-13

Approximately 82 species of cartilaginous fishes occur regularly in the Mediterranean, representing about 8 % of species described worldwide. According to the IUCN categories 46 % of the Mediterranean species are assigned as threatened (data from 2004). Despite their importance as apex predators in the marine food web, for many species only insufficient data of ecology and fishery is available. Even though a couple of the approximately 47 sharks species in the Mediterranean are directly targeted by fisheries in a small scale so far, they are potentially threatened. It is caused by an increasing demand for shark products, by-catch in large amounts, and by modification of habitats. Regarding the necessity of stock management and sustainable fishery, the application of alternative and over all economic methods for abundance assessment and species identification would be advantageous. The **Baited Remote Underwater Video Station (BRUVS)** is an approved technology to determine and compare the distribution and abundances of shark species. This technique could provide data in areas with complex topographies or sensitive habitats, and in order to assist the analysis of insufficient fishery data. It is successfully applied in reef systems of different oceanic atolls in the Northwest of Australia. The BRUVS were deployed in open water and different habitats of fished, historically fished, and unfished reefs. Results obtained from this method allow scientists to detect differences in abundance and species richness between reefs. Could this be a useful tool to assess abundances of pelagic and demersal sharks in the Mediterranean where the biotic and abiotic conditions are basically different to the tropics?

Preliminary results of habitat use of the angel shark *Squatina squatina* and other elasmobranches on the northern coast of Gran Canaria

Krupskaya Narvaez^{1,2,3}, Filip Osaer² and Ricardo Haroun¹

¹BIOGES Centro de Investigación en Biodiversidad y Gestión Ambiental, de La Universidad de Las Palmas de Gran Canaria. Facultad de ciencias del mar. Campus de Tafira s/n, 35017, Las Palmas de G. C. España.

²Fundación colombiana para la investigación y conservación de tiburones y rayas, SQUALUS. Carrera 64 A No. 11 A-53, Cali, Colombia.

³Fundación Malpelo y otros ecosistemas marinos. Calle 11 No 87-32, Bogota, Colombia.
krupska@gmail.com, filiposaer@gmail.com, rharoundbio@ulpgc.es

P-14

From January until September 2006, 116 individuals of angel sharks *Squatina Squatina* (Linnaeus, 1758) were observed and in the Bay of Sardina, northern coast of Gran Canaria Island (Central-East Atlantic Ocean). Aggregations of maximum 22 female individuals were observed in a particular area at night time during the month of August. Also the Spiny butterfly ray *Gymnura altavela*, Spotted torpedo *Torpedo marmorata*, Roughtail stingray *Dasyatis centoura*, Round stingray *Taeniura grabata*, Common eagle ray *Myliobatis aquila*, Blonde ray *Raja brachyura* and Bottlenosed skate *Rostroraja alba* were observed during this period. Angel sharks and other species elasmobranchs use the Bay of Sardina as a nursery area and probably also for mating.

**10th Annual Science Conference
of the
European Elasmobranch Association**



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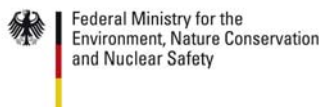
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