

**Telemetry for Conservation Physiology of Marine Fish:  
A hands-on workshop organised as part of the COST Action FA1004.**

**12th-16th May 2014**

**Venue:, Ifremer, Brittany Centre, Brest, France.**

**Organisers:**

Guy Claireaux (Université de Bretagne Occidental, France),  
Michael Axelsson (University of Gothenburg, Sweden)  
Julian Metcalfe (Cefas, UK)

**Introduction**

It remains a central problem to relate how marine fishes perform in laboratory experiments with knowledge of the habitats they choose to occupy and the conditions they experience in their natural environment. There are immense technical difficulties in following the movements of fish in the vast underwater realm, let alone in estimating how this relates to their physiological state, and whether they choose habitats that optimise their fitness.

Telemetry, using electronic devices attached to or implanted into the animal, is a key technology helping to resolve this problem by allowing scientists to gather information on the physiology, movements and behaviour of wild fish whilst responding to, and coping with, the variety of challenges they continually face in their natural environment. Telemetry technology is developing rapidly and there are now many different types of device incorporating both environmental and physiological sensors that are beginning to provide new understanding of how animals function in their environment.

The aim of this workshop is to provide early and mid career fish physiologists and ecologists who have little or no experience of telemetry a comprehensive view of the different technologies available and their past, current and potential applications in a marine fish context. Presentations and demonstrations will be given by internationally renowned experts and from leading device and system manufacturers. It is intended that participants should see how telemetry can enhance their research and, through dedicated hands-on training using acoustic, archival, and satellite telemetry systems, provide them with the knowledge and skills needed to start using telemetry to develop their research as it relates to marine fish ecology and conservation.

**Workshop Plan.**

The workshop will start at 09:00 on Monday 12<sup>th</sup> May and run until 17:00 on Friday 16<sup>th</sup> May.

Participants should travel to Brest during the weekend prior to the start so that we can start promptly on Monday morning. The session after lunch on Friday will largely be dedicated to discussion groups (we will encourage developing ideas for discussion groups during the workshop) so there will be scope for people to travel home on Friday afternoon if necessary.

Morning sessions will consist of two themed presentations (09:00-10:30 and 11:00 to 12:30) while the afternoon sessions (14:00-17:00) will involve practical, hands-on activities involving devices, systems and data, with either live data gathering and/or pre-gathered data sets. Evenings will be mostly left free but will be available for group discussions between attendees and presenters. Where live fish are used, demonstrations will be given by suitably authorised people, but there will be scope for participants to practice surgical attachment and implantation techniques on cadavers.

Coffee and Tea will be provided for the morning and afternoon breaks at no cost to participants.

The COST Action reimburses you at a flat rate of 20€ per meal. Lunches will be at the Ifremer cafeteria and will cost about 7.5 €. On Monday evening we will have a typical Breton dinner (crêpes/galettes/cider) which you will have to pay for yourselves. On Wednesday we will have a more classical dinner and local funding will take care of the bill.

**It is our intention that the workshop should be interactive and flexible so we can respond to your specific interests, so please feel free to identify things you would like us to pay specific attention to. I'm hoping the hands-on sessions should provide the scope to do this, but if you have ideas before that, please let us know.**

## PROGRAMME

### Monday 12<sup>th</sup> May: Kick Off

#### Morning

09.00 Presentation 1: Welcome, and housekeeping (**Guy**) and an Introduction to the COST Action (**Dave McKenzie**) followed by 5 minutes from each attendee.

#### 10:30 Coffee

11.00 Presentation 2: Julian Metcalfe “Why telemetry: find answers to questions you didn’t know you should have asked?”. An introduction and personal overview on fish telemetry with a selection of examples from my own experience to provide a context to the rest of the workshop.

#### 12:30 Lunch

#### Afternoon

##### 14.00 Hands-on session: Device attachment and implantation.

A short presentation on fish surgery and welfare, EU law, ethics and animal use in science, followed by a hands-on session covering external attachment and internal implantation and methods (demonstrations with live fish that will be used later in the workshop, fish cadavers will be available for participants to practice on should they wish). Lead by **Julian/Carl/Kim/Michael** and others with experience.

#### Evening: Workshop Dinner 1

## **Tuesday, 13<sup>th</sup> May: Physiological Telemetry**

### **Morning**

Although many biological parameters can be measured using biotelemetry today, simultaneous measurements of multiple channels of pressure and flow have not been commercially available. The EndoGear system allows simultaneous measurement of blood flow, blood pressure, ECG/EMG, 3D acceleration and temperature. It is a 3rd generation biotelemetry system with a bidirectional radiofrequency link that allows the implant to send data and accept commands to perform various tasks. The signal from the implant can be viewed online, and has a transmission range of around 10 meter in air. This is reduced in water, especially sea water, and in these situations a data storing unit can be attached and data stored until recovery of the implant.

**09.00 Presentation 3: Astrid Haegens** “EndoGear physiological telemetry systems: technology and methods”

### **10.30 Coffee**

**11.00 Presentation 4a: Michael Axelsson** “EndoGear physiological telemetry: from idea to field tests

**Presentation 4b Albin Gräns** “EndoGear physiological telemetry: applications with fish”

### **12.30 Lunch**

### **Afternoon**

**Hands-on session: the application and use of EndoGear Physiological Telemetry.** Lead by Michael, Astrid and Albin.

## **Wednesday, 14<sup>th</sup> May, Acoustic Telemetry**

### **Morning**

An introduction to active and passive acoustic tracking including costs/benefits of various approaches. Discussion will include various applications for acoustic telemetry and limitations of its use. Some time will be spent explaining data analysis approaches and showing examples of how data can be used and various sensor data can be integrated to learn more about fish behaviour and ecology. This will include discussion of 2D and 3D positioning as well as more complex (VPS) system approaches.

**09.00 Presentation 5: Dale Webber, Vemco** “Acoustic Telemetry: methods and approaches”

### **10.30 coffee**

**11.00 Presentation 6: Michelle Heupel** “Acoustic Telemetry: applications with fish”

### **12.30 Lunch**

## **14<sup>th</sup> May, Afternoon**

**Hands-on session: demonstrating the application and use of Acoustic Telemetry equipment and methods.** Lead by Dale and Michelle

### **Evening: Workshop Dinner 2**

**Thursday, 15<sup>th</sup> May, Archival telemetry**

**Morning**

**09.00 Presentation 7: Melinda Holland & Julian Metcalfe “Archival telemetry and geoposition”**

Melinda will present an overview of archival and satellite telemetry as it applies to marine studies, providing an explanation of track determination using Argos, Fastloc-GPS and light-based Geolocation. Julian will give a short presentation on the tidal-based geolocation methods.

**10.30 Coffee**

**11.00 Presentation 8: Carl Meyer/ Serena Wright “Advanced” sensor telemetry:**

Carl will present an overview of some of the more recent developments in tag technology and their application. This will include ingestion/digestion tags, inter-animal telemetry – “Business card” tags and Bioprobe (Vemco’s current mobile receiver version). Videography – new concepts (and cross-calibrating accelerometry with video). Serena will present an overview of the application of 3-axis accelerometer tags to monitor energy expenditure, activity and state.

**12.30 Lunch**

**15<sup>th</sup> May, Afternoon**

**Hands-on session:** Archival telemetry, setting up and downloading devices, geolocation methods, data handling and presentation. Lead by Serena, Carl and others

**Friday, 16<sup>th</sup> May, Telemetry and conservation**

**Morning**

**09.00 Presentation 9: Kim Holland – Telemetry & Conservation 1:**

This presentation will include: 1) The use of pressure sensitive tags (both acoustic and archival) to investigate ontogenetic changes in behaviour of pelagic species and to investigate options for selective fishing strategies; 2) Use of sonic telemetry (both active and passive) in evaluating the design and effectiveness of MPAs and in identifying potential spawning aggregations; 3) Combining telemetry with other assays (e.g. blood chemistry) to determine post-release survival of fish released during fishing operations; 4) Development of telemetry techniques to measure critical habitat parameters such as oxygen concentration and salinity.

**10.30 Coffee**

**11.00 Presentation 10: Esben Olson – Telemetry & Conservation 2: “Using acoustic telemetry to study behaviour and fate of coastal marine species”**

**Using acoustic telemetry to study behaviour and fate of coastal marine species:** Many coastal marine systems are under significant pressure from human activities such as fishing and development. Hence, understanding the behaviour and fate of coastal species is relevant for management and conservation. For instance, the usefulness and design of marine protected areas (MPAs) will depend on the spatial ecology of the species in need of protection. Networks of acoustic receivers potentially allow for continuous long-term monitoring of individual fish, revealing their habitat use, survival and dispersal. I will present experiences from ongoing studies on the Norwegian Skagerrak coast, where we use acoustic telemetry as a tool to quantify the behaviour and fate of harvested species such as the Atlantic cod and the European lobster.

**12.30 Lunch**

**16<sup>th</sup> May, Afternoon**

**Presentation 11: Hélène de Pontual. Migratory behaviour of sea bass in French waters**

Group discussion session (There is scope to leave early if you wish)

**17.00** (or earlier) Close and farewell