

Interdisciplinary Approaches in Fish Skeletal Biology



Calçada Portuguesa – Portuguese sidewalk mosaic

**Second Meeting
26-28 April 2011
Tavira, Portugal**



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Welcome from the organisers

Tavira 2009 was a pioneer experience for the organizers, the scientific committee and the local organizing committee, as well as a daring challenge for all participants. The common interest in fish skeletal biology was the driving force to bring together, for the first time, scientist from different biological disciplines such as palaeontology, morphology, developmental, evolutionary biology, biomechanics, systematic, genomics, proteomics, biomedical research, nutrition and aquaculture. But the question remained: Would we be able to talk to each other? Would it be useful to meet and to discuss with colleagues that we usually do not meet in the frame of our regular congress schedule? The answer was yes. It was useful. We had fruitful discussions and we could learn from each other. We could also establish new collaborations about fish skeletal research across disciplines. By contributing with 45 articles to a regular issue of the Journal of Applied Ichthyology, which came out in 2010, we published the state of the art of fish skeletal research. Thus it is our great pleasure to organize the 2nd International Workshop on Interdisciplinary Approaches in Fish Skeletal Biology. We keep the format of the first meeting. We again put emphasis on discussions and exchanges during and after the sessions. And again we offer the possibility to publish your contributions to this workshop. We welcome all participants, we thank you for coming to Tavira and we hope you will not only find the meeting enjoyable but also scientifically stimulating.

The organizers, **M. Leonor Cancela** and **P. Eckhard Witten**

Scientific committee

Matthew Harris

Jean-Yves Sire

Marisol Izquierdo

Santosh P. Lall

Tom Hansen

Harald Rosenthal

Isabel Palmeirim

Stefan Schulte-Merker

Local organizing committee

Ricardo B. Leite

Vincent Laizé

Paulo J. Gavaia

Anabela Bensimon-Brito

Natércia Conceição

Detailed programme

DAY 1: TUESDAY APRIL 26

09.20 **WELCOME BY THE ORGANISERS**

OPENING LECTURE

Chair: Akimenko M-A

09.30 **500,000 fish phenotypes: the new informatics landscape of evolutionary and developmental skeletal biology**
Mabee P

10.40 Coffee break

ORAL SESSION 1. THE FISH SKELETON: PRINCIPLES OF EVOLUTION

Chair: Franz-Odenaal T

11.00 **Convergent evolution of a unique skeletal system in fishes: the grasping tail in syngnathids**
Adriaens D, Neutens C, Christiaens J, Van Loo D, De Kegel B, Boistel R, Van Hoorebeke L

11.25 **Comparison of structural, architectural and mechanical aspects of cellular vs. acellular fish bone**
Cohen L, Shipov A, Atkins A, Monsonigo-Ornan E, Shahar R

11.50 **Ontogenetic development of an exceptionally preserved Devonian cartilaginous skeleton**
Johanson Z, Kearsley A, den Blaauwen J, Newman M, Smith MM

12.15 **Teeth before jaws?**
Rücklin M, Donoghue PCJ, Giles S, Janvier P

12.40 Lunch break

ORAL SESSION 2. EVO-DEVO OF THE FISH SKELETON – PART I

Chair: Shahar R

14.00 **Zebrafish (*Danio rerio*) vertebrae mineralization patterns – correlation with fusion character?**
Bensimon-Brito A, Cancela ML, Cardeira J, Huisseune A, Witten PE

14.25 **Cartilage remodelling in the zebrafish pectoral fin: an ancient mechanism for a unique remodelling event?**
Dewit J, Witten PE, Huisseune A

14.50 **Alterations of thyroid hormone level in the early development of Cyprinidae (Teleostei): ontogenetic effects and phylogenetic implications**
Shkil FN, Borisov VB, Kapitanova DV, Abdissa B, Smirnov SV

15.15 **Vertebral bodies as developmental modules: Remodelling of vertebral centra and arches is not coupled**
Witten PE, Bensimon-Brito A, Huisseune A, To TT, Winkler C

15.40 Coffee break

ORAL SESSION 3. EVO-DEVO OF THE FISH SKELETON – PART II

Chair: Johanson Z

16.00 **Soft dentin results in unique, naturally bendable teeth in scraping catfish**
Geerinckx T, Huisseune A, Claeys M, Mast P, Verbeken K, Boone M, Van Hoorebeke L, Adriaens D

16.25 **Development, patterning and evolution of the chondrichthyan pharyngeal endoskeleton**
Gillis JA

16.50 **Ontogenetic mechanisms determining the number of scales in fish inferred from hormonal manipulation experience**
Levin BA

17.15 **The cranial lateral line canal system as a developmental module within the dermatocranium of bony fishes**
Webb JF

18.00 **Wine and olive oil tasting**

20.00 **Dinner**

Day 2. Wednesday April 27

ORAL SESSION 4. DEVELOPMENTAL GENOMICS OF THE FISH SKELETON

Chair: Palmeirim I

- 09.00 **A regulatory cascade including transcription factors Runx3, Egr1 and Sox9b modulates BMP-signaling during cranial cartilage development in *Danio rerio***
Dalcq J, Pasque V, Ghaye A, Larbuisson A, Martial JA, Muller M
- 09.25 **Tracking neural crest cells during craniofacial development and growth**
Harris N, Milligan B, Franz-Odenaal TA
- 09.50 **The cadherin-catenin complex during zebrafish tooth development**
Verstraeten B, Sanders E, D'Heuvaert T, van Hengel J, Huyseune A
- 10.15 **Multiple enhancers regulate *Runx2* transcription in skeletogenesis**
Weber C, Hu G, Fisher S

10.40 Coffee break

ORAL SESSION 5. DEVELOPMENTAL PROTEOMICS OF THE FISH SKELETON

Chair: Winkler C

- 11.00 **Altered skeletal formation in zebrafish larvae observed by repetitive calcein staining**
Haga Y, Masui S, Satoh S
- 11.25 **Retinoic acid induces two osteocalcin isoforms and inhibits markers of osteoclast activity in Atlantic cod (*Gadus morhua*) *ex vivo* cultured craniofacial tissues**
Lie KK, Moren M
- 11.50 **Fish overgrowth mutants reveal hidden potential for growth**
Perathoner S, Henrion U, Steinke K, Gehring I, Seebohm G, Nüsselein-Volhard C, Harris MP
- 12.15 **LC-MS/MS analysis is a powerful tool to identify noncollagenous proteins in the scale basal plate of the goldfish *Carassius auratus***
Takagi Y, Sekimoto H, Sugiyama A, Komatsu N, Ogawa N, Iimura K, Ura K

12.40 Lunch break

ORAL SESSION 6. FISH MODELS FOR BIOMEDICAL RESEARCH

Chair: Fisher S

- 14.00 **The zebrafish scale as a model in biomedical bone research**
de Vrieze E, Metz JR, Flik G
- 14.25 **Effect of an increased mechanical loading on *in vivo* osteogenesis and chondrogenesis in the zebrafish (*Danio rerio*) embryo**
Fiaz AW, Leon K, Schulte-Merker S, van Leeuwen JL, Kranenborg S
- 14.50 **The genetics of spinal curvature in model teleosts: potential biomedical and aquaculture applications**
Gorman KF
- 15.15 **RANKL induced osteoclastogenesis leads to bone loss in a transgenic medaka model for osteoporosis**
To TT, Renn J, Witten PE, Huyseune A, Winkler C

15.40 Coffee break

POSTER SESSION

20.00 Dinner

Day 3. Thursday April 28

ORAL SESSION 7. SKELETAL DEFORMITIES IN FARMED FISH: REACHING THE LIMITS

Chair: Darias M

- 09.00 **Bone tissue responsiveness to prolonged dietary phosphorus deficiency in rainbow trout, *Oncorhynchus mykiss***
Deschamps M-H, Poirier-Stewart N, Demanche A, Vandenberg GW
- 09.25 **Vitamin A dose and developmental timing dependent effects on Senegalese sole (*Solea senegalensis*) larvae skeletogenesis**
Fernández I, Ortiz-Delgado JB, Sarasquete C, Gisbert E
- 09.50 **Extra dietary phosphorous prevents vertebral deformities in triploid Atlantic salmon (*Salmo salar* L.) smolts**
Fjellidal PG, Lock EJ, Hansen T, Wargelius A, El-Mowafi A, Ørnstrud R
- 10.15 **Molecular characterization of pathological bone development in Atlantic salmon**
Ytteborg E, Torgersen J, Pedersen M, Ruyter B, Baeverfjord G, Takle H

10.40 Coffee break

ORAL SESSION 8. GROWTH, NUTRITION AND SKELETAL AGING IN FARMED FISH

Chair: Flik G

- 11.00 **Biom mineralization in marine fish intestine is hormone regulated**
Fuentes J, Campos do Mar A, Carvalho ES, Encarnaçao S, Gregorio SF, Power DM, Canário AVM
- 11.25 **Dietary arachidonic acid during the *Artemia* feeding period affects larval growth and skeletogenesis in Senegalese sole (*Solea senegalensis*)**
Boglino A, Darias MJ, Estévez A, Andree KB, Gisbert E
- 11.50 **Dietary lipid quality regulates bone composition and metabolism in gilthead seabream (*Sparus aurata*) juveniles**
Dias J, Rodrigues V, Colen R, Bandarra N, Rosa J, Viegas M, Carreira J, Cancela ML, Gavaia P, Laizé V
- 12.15 **Low EPA/ARA ratio and retinyl-esters (vitamin A) in the diet to Atlantic cod (*Gadus morhua*) alters the mineralization of cranio-facial structures**
Moren M, Kvalheim K, Harboe T, Nordgreen A, Lie KK

12.40 Lunch break

ORAL SESSION 9. TOWARDS AN INTEGRATED APPROACH IN SKELETAL RESEARCH

Chair: Webb J

- 14.00 ***Dragonfish* - a zebrafish model for ectopic mineralization**
Apschner A, Spooendonk KM, Schulte-Merker S
- 14.25 **Fish comparative genetics as a means to understand capacity and constraint in adult morphology, physiology and life history strategies**
Harris M
- 14.50 **Role of the sonic hedgehog-expressing cells in ray branching morphogenesis during caudal fin regeneration in zebrafish**
Zhang J, Jeradi S, Strähle U, Akimenko M-A
- 15.15 **The evolutionary role of notochord in vertebrate body segmentation**
Pais de Azevedo T, Palmeirim I

15.40 Coffee break

GENERAL DISCUSSION

Chairs: Witten PE & Cancela ML

16.00 Future Interdisciplinary Approaches in Fish Skeletal Biology

18.00 Sunset cocktail

20.00 Dinner (barbecue)