

Interdisciplinary Approaches in Fish Skeletal Biology



Tile work at the fish market in Olhão



5th Meeting
16-19 April 2018
Tavira, Portugal



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Welcome from the organizers

We thank all participants for joining us at IAFSB, thus making this conference possible. IAFSB conferences would also not be possible without many hours of volunteer work of the local organising committee.

IAFSB aims to be a little bit different from other established meetings in the field. It is a logical trend in the sciences that as a field grows, more specific areas of discussion are formed – however, it is helpful to step back and have the chance to talk across disciplines. Instead of disseminating discussion of work between often disparate fields of aquaculture, development, ichthyology, paleontology, or medicine, At IAFSB we focus to maintain a multidisciplinary focus to gain a deeper understanding of our broader field of interest – the skeleton. As we are all bony fishes ourselves the comparative approach can effectively bridge all disciplines from paleontology to biomedical research. However, This creates the need for discussion across disciplines. IAFSB aims at providing time, space and occasions for these discussions. We hope you will have a great and successful IAFSB conference.

P. Eckhard Witten, Matthew P. Harris, and M. Leonor Cancela

Scientific committee

Brian K. Hall

Ann Huysseune

Christoph Winkler

Gert Flik

Santosh P. Lall

Clara Boglione

Marc Muller

Per Gunnar Fjellidal

Stefan Schulte-Merker

Local organizing committee

Vincent Laizé

Ignacio Fernández

Paulo J. Gavaia

Joana T. Rosa

Natércia Conceição

Evi Desender

Detailed programme

Monday April 16

09.00	Welcome from the organizers <u>Witten PE, Harris MP, Cancela ML</u>	
	KEYNOTE LECTURE	Chair: Maisey JG
09.15	The vertebral column of actinopterygians, its evolutionary transformations and phylogenetic meaning <u>Arratia G</u>	
10.40	Coffee break	
	ORAL SESSION 1. Vertebral column	Chair: Cancela ML
11.20	A novel mechanism for segmenting the vertebrate body axis <u>Lleras-Forero L, Narayanan R, Morelli LG, Huitema LFA, VanBergen M, Apschner A, Peterson-Maduro J, et al.</u>	
11.45	Hox genes and the shaping of the teleostean caudal fin <u>Cumplido N, Muñoz-Sánchez S, Arratia G, Allende ML</u>	
12.10	Computed tomography data as a predictor of swimming kinematics in elongate fishes <u>Donatelli C, Porter M, Summers A, Tytell E</u>	
12.35	Vertebral column regionalisation in Chinook salmon, <i>Oncorhynchus tshawytscha</i> <u>De Clercq A, Perrott MR, Davie PS, Preece MA, Wybourne B, Ruff N, Huysseune A, Witten PE</u>	
13.00	Lunch	
	ORAL SESSION 2. Cartilage and joints	Chair: Coucke P
14.30	Rapid functional analysis of osteoarthritis susceptibility genes using zebrafish as a toolkit <u>Kague E, Lawrence E, Skinner REH, Roddy KA, Brunt LH, Yang Y, Turci F, Hammond CL</u>	
14.55	miR-214 is a novel regulator of chondrogenesis <u>Roberto VP, Gavaia PJ, Nunes MJ, Rodrigues E, Cancela ML, Tiago DM</u>	
15.20	Unusual structure-function relationships in the lower pharyngeal jaw of the black drum (<i>Pogonias cromis</i>) <u>Ziv E, Shahar R</u>	
15.45	Analysis of a novel zebrafish mutant linking cholesterol synthesis and skeleton formation <u>Anderson RA, Topczewska JM, Topczewski J</u>	
16.10	Coffee break	
	ORAL SESSION 3. Evo-devo teeth and odontodes	Chair: Burrow C
16.40	Structure function relationships of a heavy load bearing teeth of Black drum (<i>Pogonias cromis</i>) <u>Thangadurai S, Milgram J, Shahar R</u>	
17.05	Mixed peridermal-endodermal character of the zebrafish pharyngeal epithelium <u>Oralová V, Rosa JT, Larionova D, Witten PE, Huysseune A</u>	
17.30	Contribution of the germ layers to the zebrafish pharyngeal teeth <u>Rosa JT, Oralová V, Larionova D, Witten PE, Huysseune A</u>	
17.55	Osteogenesis and bone remodeling in the development of the cranial lateral line canals: Genesis of phenotypic differences <u>Webb JF, Johnstone JW, Lauren C</u>	
18.20	Free	
	Evening lecture 1	Chair: Huysseune A
20.00	The evolution of tessellated calcified cartilage in chondrichthyan fishes <u>Maisey JG, Burrow C, Pradel A, Denton JSS, Bronson A</u>	
20.30	Dinner	

Tuesday April 17

	ORAL SESSION 4. Genetic regulation of skeletogenesis	Chair: Ekker M
09.00	A novel perspective on zebrafish fin ray formation and bifurcation Cardeira J, Gavaia PJ, Tarasco M, Bensimon-Brito A, Caetano-Lopes J, Almeida P, Harris MP, Stainier DYR, <i>et al.</i>	
09.25	Systematic large-scale dominant screen in zebrafish: genetic regulation affecting post-embryonic development of the skeleton Henke K, Harris MP	
09.50	Genetic architecture of skeletal deformities in gilthead seabream Lorenzo-Felipe A, Zamorano MJ, León-Bernabeu S, Elalfy I, Pérez-García C, Manchado M, Pérez-Sánchez J, <i>et al.</i>	
10.15	Rapid reverse genetic screening in the adult zebrafish skeleton Watson CJ, Bhimani RM, Monstad-Rios AT, <u>Kwon RY</u>	
10.40	Coffee break	
	ORAL SESSION 5. Gnathostome evolution	Chair: Dean MN
11.20	A phylogenetic perspective on the evolution of tessellated calcified cartilage Denton JSS, Maisey JG, Pradel A, Burrow C, Bronson AW	
11.45	The first hard evidence for a developmental link between teeth and dermal odontodes: 3D synchrotron dental histology of the Silurian stem osteichthyan <i>Lophosteus</i> Chen D, Blom H, Sanchez S, Tafforeau P, Märss T, Ahlberg PE	
12.10	Intraspecific tooth shape variation in sharks: phenotypic plasticity and developmental constraints on tooth evolution Berio F, Debiais-Thibaud M, Goudemand N	
12.35	Features of bone in little skate vertebrae suggest novel elasmobranch and gnathostome synapomorphies Eames BF, Atake J, Cooper DML	
13.00	Lunch	
	CONFERENCE PHOTO	
14.30	On the stairs of hotel western access See map on the back-cover	
	POSTER SESSION	
15.00	In the hotel museum See map on the back-cover. Wine and beer tasting during the session and coffee at 16.10	
18.20	Free	
	Evening lecture 2	Chair: Metz J
20.00	A regulatory pathway leading to joint formation and maintenance in zebrafish fin ray regenerates McMillan S, Zhang J, Phan E-H, Jeradi S, Hammerschmidt M, <u>Akimenko M-A</u>	
20.30	Dinner	

Wednesday April 18

	ORAL SESSION 6. Homeostasis and regeneration	Chair: Forlino A
09.00	Study of osteogenic activity in adult zebrafish cranium <u>Topczewska JM</u> , Ledwoń JK, Bidny S, Qiu CS, Topczewski J, Gosain AK	
09.25	The skeletal waltz: zebrafish models for osteoclast regulation in development and regeneration <u>Caetano-Lopes J</u> , Urso K, Henke K, Warman ML, Charles JF, Harris MP	
09.50	Modulation of osteoclast activity by small compounds in a medaka model for osteoporosis <u>Imangali N</u> , Phan QT, Sokolova V, Epple M, Mahady G, Winkler C	
10.15	Nanoparticle-based medicine – nitrogen-doped carbon dots functionalized with hydroxyapatite – accelerates bone regeneration Khajuria DK, <u>Karasik D</u>	
10.40	Coffee break	
	ORAL SESSION 7. Biomechanics	Chair: Shahar R
11.20	Increased mechanical loading through controlled swimming exercise induces bone formation and mineralization in adult zebrafish Suniaga S, Rolvien T, vom Scheidt A, <u>Fiedler IAK</u> , Bale HA, Huysseune A, Witten PE, Amling M, Busse B	
11.45	A swim-training fin regeneration model Cardeira J, Laizé V, Martins G, Martini A, Cancela ML, <u>Gavaia PJ</u>	
12.10	First bones do matter in larval fish Bouilliaert M, De Kegeel B, <u>Adriaens D</u>	
12.35	Lost in evolution: Novel form of modeling bypasses the need for osteocytes in the adaptation of bones to mechanical loading Ofer L, Dean MN, Zaslansky P, Zelzer E, Shahar R	
13.00	Lunch boxes	
	Free afternoon Possibility of a boat trip in the Ria Formosa nature reserve (register at the hotel reception)	
20.30	Dinner	

Thursday April 19

	ORAL SESSION 8. Collagen and connective tissue diseases	Chair: Akimenko M-A
09.00	Zebrafish type I collagen mutants faithfully recapitulate human type I collagenopathies <u>Williaert A</u> , Gistelinc C, Kwon RY, Malfait F, Symoens S, Harris MP, Henke K, Fisher S, Sips P, Guillelmym B, <i>et al.</i>	
09.25	Generation and characterization of zebrafish models for recessive osteogenesis imperfecta type VII & VIII Tonelli F, Leoni L, Cotti S, Besio R, Gioia R, Busse B, Fiedler IAK, Rossi A, <u>Forlino A</u>	
09.50	Transcriptome profiling of osteoblasts in a medaka osteoporosis model identifies novel mediators of bone repair Tan WH, Sundaram S, Buettner A, Kneitz S, Liu R, Imangali N, Phan QT, Cheong B, Mathavan S, Scharlt M, <u>Winkler C</u>	
10.15	Impaired osteoblast maturation and activity in the developing F1-F3 medaka vertebrae and associated vertebral compression induced by ancestral exposure to benzo[a]pyrene <u>Mo JZ</u> , Seemann F, Wan MT, Winkler C, Zhang G, Au DWT	
10.40	Coffee break	
	ORAL SESSION 9. Speciation and adaptation	Chair: Adriaens D
11.20	Thyroid hormone-dependent asymmetric ossification drives eye migration during flatfish metamorphosis <u>Campinho MA</u> , Silva N, Martins GG, Anjos L, Florindo C, Roman-Padilla J, Garcia-Cegarra A, Louro B, <i>et al.</i>	
11.45	Differences in skull morphology between broad- and narrow-headed eels throughout their life cycle <u>De Meyer J</u> , Van Wassenbergh S, Dhaene J, Adriaens D	
12.10	Freshwater adaptation of female threespined stickleback <i>Gasterosteus aculeatus</i> is associated with prolactin axis stimulation <u>Pavlova N</u> , Neretina T, Smirnova O	
12.35	Skeletal anomalies in big-scale sand smelt (<i>Atherina boyeri</i>, Risso 1810, Teleostei) as a complementary tool for the assessment of the ecological status of coastal lagoons Leone C, Ciccotti E, Seno V, Tancioni L, <u>Boglione C</u>	
13.00	Lunch	
	ORAL SESSION 10. Aquaculture	Chair: Gavaia PJ
14.30	Feeding-induced skeletal deformations in reared juveniles of the crucian carp (<i>Carassius carassius</i>, L.) <u>Kasprzak R</u> , Ostaszewska T, Wagner B	
14.55	Skeletal anomalies in aquaculture: the case of Senegalese sole <u>de Azevedo AM</u> , Losada AP, Barreiro A, Barreiro JD, Vázquez S, Quiroga MI	
15.20	Supplementation of fat-soluble vitamins in diets high in plant based feedstuffs for gilthead seabream (<i>Sparus aurata</i>) fingerlings <u>Dominguez D</u> , Robaina L, Fontanillas R, Izquierdo MS	
15.45	The development of intermuscular bones in blunt snout bream <u>Gao Z-X</u> , Nie C-H, Wan S-M, Xiong X-M	
16.10	Coffee break	
	ORAL SESSION 11. Skeletal morphology	Chair: Arratia G
16.40	Testing a new morphological character set for thought-to-be cryptic species: a model case of the European <i>Phoxinus</i> complex <u>Bogutskaya N</u> , Jelić D, Stefanov T	
17.05	3-D morphology of pharyngeal dentition of recent Capoeta species (Teleostei, Barbinae): an application to the fossil record <u>Ayvazyan A</u> , Vasilyan D, Böhme M	
17.30	Characterization of <i>col10a1</i>-expressing cells in a medaka model for Schmid Metaphyseal Chondrodysplasia (SMCD) <u>Tan WH</u> , van Heuven BJ, Rücklin M, Witten PE, Huyseune A, Winkler C	
17.55	How did the maxilla get free from the cheek: on the evolutionary origin of the processus coronoideus in Neopterygii <u>Tsessarsky A</u> , Smirnov S	
18.20	Free	
	Evening lecture 3	Chair: Witten PE
20.00	Of all the fish in the sea: leveraging Nature's grand experiment to understand genetic basis of variation <u>Harris MP</u>	
20.30	Farewell barbecue (with music) Register and pay at the hotel reception	

Poster Session (Tuesday April 17)

Study of transcriptional regulation of zebrafish orthologues of human *ZNF687* gene

Authier T, Serrano S, Pinho AR, Cancela ML, [Conceição N](#)

Screening for osteogenic compounds using the zebrafish as a model

[Bek JW](#), Gistelincx C, De Saffel H, Coucke P, Willaert A

Histological analysis of cartilages from *Raja undulata* (Rajidae)

[Chaumel J](#), Dean M, Gonçalves J, Gavaia PJ

Thermal regimes during early development demonstrate a craniofacial developmental plasticity in tropical gar (*Atractosteus tropicus*)

Cordova de la Cruz SE, Martínez Bautista G, Calzada Ruiz D, Guzmán Villanueva LT, Álvarez Gonzalez CA, [Fernández I](#)

The external phenotype-skeleton link in post-hatch farmed Chinook salmon (*Oncorhynchus tshawytscha*)

[De Clercq A](#), Perrott MR, Davie PS, Preece MA, Huyseune A, Witten PE

Large batoid fishes frequently consume stingrays despite skeletal damage

[Dean MN](#), Bizzarro JJ, Clark B, Underwood CJ, Johanson Z

Does sperm cryopreservation affect osteological development of zebrafish (*Danio rerio*) progeny?

[Diogo P](#), Martins G, Nogueira R, Cabrita E, Gavaia PJ

Effects of combined replacement of fishmeal and oil on the incidence of skeletal anomalies in european sea bass (*Dicentrarchus labrax*) juveniles

[Dominguez D](#), Montero D, Robaina L, Torrecillas S, Karalazos V, Izquierdo MS

Transgenic zebrafish models for the study of dopamine neuron development, loss, and regeneration

[Ekker M](#), Ngoc DN, Hua K, Godoy R, Noble S, Xi Y

Phylogenetic and molecular characterization of *slc39a14* (*zip14*) zinc transporter in *Danio rerio*

Estremoz B, Simão M, Gavaia PJ, [Cancela ML](#)

Vertebral deformities in salmonid interspecific hybrids

[Fraser T](#), Hansen T, Fjellidal PG

Bone fracture and repair in the teleost axial skeleton: A radiological study

[Fraser T](#), Hansen T, Sambraus F, van der Meeren T, Fjellidal PG

Homologization of epural-like elements in the teleost caudal fin: experimental data

[Kapitanova DV](#), Shkil FN

Manipulating Hedgehog signaling during zebrafish tooth development: ultrastructural investigations

[Larionova D](#), Rosa JT, Huyseune A

Oil-induced deformities lead to early death in Atlantic haddock larvae

[Lie KK](#), Torvanger I, Meier S, Sørhus E, Fjellidal PG, Karlsen Ø, Guimaraes I, Olsvik PA

Skeletal development of the skull in the tongue sole (*Cynoglossus semilaevis*)

Ma Q, Wang X, Liu S, Zhuang Z

The effect of rearing density on skeletal malformations in zebrafish, *Danio rerio* (Hamilton, 1822)

Martini A, Witten PE, Bogliione C

Effects of dietary supplementation with different sources of phospholipids on the osteological development of zebrafish (*Danio rerio*) larvae

Martins G, Diogo P, Santos T, Rodrigues V, Pinto W, Dias J, Gavaia PJ

Coordinate retinoic acid, BMP and FGF signaling is required for the construction of the early zebrafish spine

Pogoda H-M, Riedl-Quinkertz I, Hammerschmidt M

Comparative cranial skeletogenesis in non-teleost fishes: towards understanding of developmental strategies of fish craniofacial diversity

Pospisilova A, Stundl J, Minarik M, Metscher B, Cerny R

Initiation, addition and loss of teeth in a sterlet (*Acipenser ruthenus*)

Pospisilova A, Stundl J, Metscher B, Cerny R, Soukup V

Assessing bone anabolic properties of marine extracts in fish

Roberto VP, Tarasco M, Surget G, Stiger-Pouvreau V, Fernández I, Gavaia PJ, Guérard F, Vasconcelos V, Poupart N, Cancela ML, Laizé V

***scpp5* expression as a tool to unravel the enigmatic origin of tooth attachment bone in teleosts**

Rosa JT, Witten PE, Huysseune A

The effect of different dietary phosphorous feeding regimes on bone mineralization and vertebral deformities in diploid and triploid Atlantic salmon (*Salmo salar* L.) reared in freshwater

Sambraus F, Hansen T, Sværen Daae B, Thorsen A, Sandvik R, Fjellidal PG

Structural and mechanical reinforcements in the tooth plates of *Chimaera monstrosa*

Seidel R, Underwood C, Johanson Z, Smith MM, Dean MN, Amini S

Can zebrafish *Crispans* be used as a screening strategy for bone GWAS candidate genes?

Shochat Carvalho C, Harari R, Karasik D

Benzo[α]pyrene and 3-methylcholanthrene osteotoxicity throughout zebrafish development

Tarasco M, Gavaia PJ, Bebianno MJ, Cancela ML, Laizé V

Dietary manganese and zinc supplementation levels modulate growth and bone status of Senegalese sole post-larvae

Viegas MN, Pinto W, Aguiar C, Salgado MA, Almeida A, Gavaia PJ, Dias J

Re-mineralisation of non-mineralised bone in Atlantic salmon (*Salmo salar*): recovery from phosphorus deficiency

Witten PE, Fjellidal PG, McGurk C, Huysseune A, Obach A, Owen MAG

Morphological and functional joint formation in zebrafish fins

Yano T, Li L, Saitoh S, Kawakami K, Sano H, Tamura K, Ohno N, Okabe M

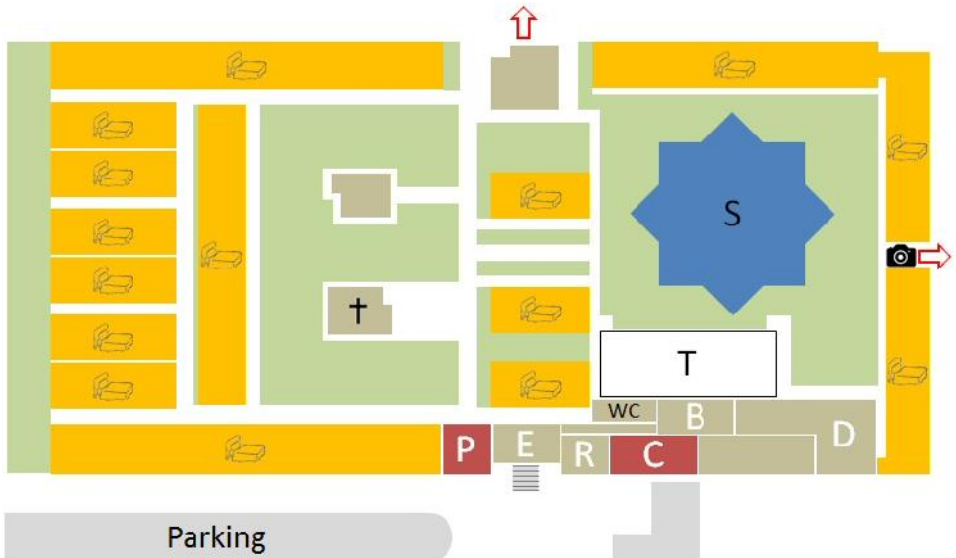
Zebrafish as a model to study PHYH related pathologies

Zhang W, Silva HG, Viana C, Duarte PJS, Veiga E, Bica B, de Matos I, Santos PM, Lopes ACF, Loiodice ME, Silva JM, Teixeira DT, Várzea BA, Cancela ML, Conceição N

Programme overview

Sunday 15.04.2018	Monday 16.04.2018	Tuesday 17.04.2018	Wednesday 18.04.2018	Thursday 19.04.2018
	09:00 Welcome	09:00 ORAL SESSION 4 Genetic regulation of skeletogenesis	09:00 ORAL SESSION 6 Homeostasis and regeneration	09:00 ORAL SESSION 8 Collagen and connective tissue diseases
	09:15 Keynote lecture			
	10:40 Coffee break	10:40 Coffee break	10:40 Coffee break	10:40 Coffee break
	11:10 ORAL SESSION 1 Vertebral column	11:20 ORAL SESSION 5 Gnathostome evolution	11:20 ORAL SESSION 7 Biomechanics	11:20 ORAL SESSION 9 Speciation and adaptation
	11:30 Lunch	13:00 Lunch	13:00 Lunch boxes	13:00 Lunch
	14:30 ORAL SESSION 2 Cartilage and joints	14:30 Group photo	Free afternoon	14:30 ORAL SESSION 10 Aquaculture
	16:10 Coffee break	15:00 Poster session (including coffee, wine and beer tasting)		16:10 Coffee break
18:00 Registration open 18:20 Welcome drink	16:40 ORAL SESSION 3 Two-deco teeth and oodontodes			16:40 ORAL SESSION 11 Skeletal morphology
	20:00 EVENING SESSION 1	20:00 EVENING SESSION 2		20:00 EVENING SESSION 3
	20:30 Dinner	20:30 Dinner	20:30 Dinner	20:30 Barbecue*

* Register and pay at the hotel reception



E - Entrance (registration desk)	D - Dining room	- Rooms
R - Hotel reception	B - Bar	† - Chapel
C - Conference room	T - Terrasse (coffee breaks)	- Access to Ria Formosa
P - Poster room	S - Swimming pools	- Group photo