16-20th June 2019
Split, Croatia

jadran.izor.hr/isc2019/
#ISCSplit2019

Conference Program

Conference Chair
Melita Peharda

Scientific Committee
Meghan Burchell
Paul G. Butler
Michael Carroll
John R. Morrongiello
Yuji Sano
Bernd R. Schöne
Kotaro Shirai
Julien Thébault
Alan Wanamaker

Organisation Committee
Daria Ezgeta-Balić
Damir Ivanković
Krešimir Markulin
Sanja Matić-Skoko
Mirela Petrić
Hana Uvanović
Ivica Vilibić
Dario Vrdoljak
Ivan Župan

Preparations for this Conference were conducted in a framework of Croatian Science Foundation projects SCOOL and NurseFish.

SCOOL

HrZZ Croatian Science Foundation

NurseFish

Dear sclerochronologists,

We wish you to leave Split, with beautiful memories and new research ideas. Enjoy!

Organisation Committee

Keynote Speakers

Biomineralization

Dr. Antonio Checa is full Professor of Paleontology at the Department of Stratigraphy and Paleontology, University of Granada, Granada, Spain. Some 20 years ago he began to be interested in the biomineralization of molluscs, which is the group with the greatest diversity of aragonite and calcite microstructures. With time, this study has extended to other groups such as brachiopods, foraminifers, and bryozoans.

Climate and Oceans: Past, Present and Future

Dr. Bryan Black works at Laboratory of Thre-Ring Research, University of Arizona, USA an applies dendrochronology techniques to growth increments formed in the hard parts of marine and freshwater species including fish, bivalves, and corals. These aquatic chronologies are used to establish long-term patterns in productivity and their relationships to climate.

Environmental Biomonitoring & Entrepreneurship

Dr. Karin Limburg is a Professor of Fisheries and Ecosystem Science at the State University of New York College of Environmental Science and Forestry. She is also a Visiting Professor Swedish University of Agricultural Sciences. Ever since her PhD student days, she has studied fishes and their ecosystems with the aid of fish otoliths, including not only to age fish, but also to study and interpret their chemical constituents.

Fisheries Ecology and Management

Dr. Steve Campana headed up the Otolith Research Laboratory at the Bedford Institute of Oceanography in Canada for 32 years, he is currently working as a Professor at the University of Iceland. His research interests lie in the population dynamics of sharks and other fishes, with particular emphasis on the development of new technologies and concepts in support of age determination, stock discrimination and fish tracking.

Growth, Bioenergetics and Ecosystems

Dr. Peter Grønkjær is an Associate Professor in Marine and Fisheries Ecology. His interest in how the environment impacts the ecology of fishes has led to research in topics ranging from the ecophysiology of zebra fish larvae to winter-migrations of cyprinids. However, the use of otoliths as proxies for growth, metabolism and size has been common to most of his projects.

Paleoecology and Evolution

Dr. Linda C. Ivany is Professor of Earth Sciences at Syracuse University. Her research lies at the intersection of paleoecology and paleoclimatology. She works mainly on fossil mollusks and is broadly interested in relationships among ecology, evolution, and environment. She is particularly interested in times of greenhouse climates in Earth's distant past, and uses fossils to constrain their conditions.

Proxy Development: Challenges and Opportunities

Dr. David P. Gillikin is a Professor of Geology and Director of the Environmental Science, Policy and Engineering program at Union College. His research is focused on the validation of bivalve shell geochemistry as a proxy of environmental and climate change. His recent work also involves speleothem geochemistry, lake core records, aquatic biogeochemistry, and chemical dendrochronology.

Sclerochronology and Human-Environmental Interactions: Past and Present

Dr. Amy L. Prendergast is a lecturer and McKenzie Fellow at the University of Melbourne in Australia. She applies sclerochronology to archaeological mollusc shells to reconstruct human-environment interaction and seasonal foraging patterns. Her research involves modern calibration as well as palaeoenvironmental reconstruction.

Sunday, June 16th, 2019

17:00-22:00 **Registrations** (Hotel Ora)
19:30-22:00 **Ice breaker reception** (Hotel Ora)

Monday, June 17th, 2019

8:00-9:00 **Registrations** (School of Medicine)

9:00-9:30 **Introductory remarks and welcome**

SESSION: **PROXY DEVELOPMENT: CHALLENGES AND OPPORTUNITIES**
Moderators: Al Wanamaker and Yuji Sano

9:30-10:00 **David Gillikin (keynote)**
Bivalve sclerochemistry: challenges and opportunities

10:00-10:15 **Sierra V. Petersen**
Separating seasonality in temperature and the oxygen isotopic composition of water: Sub-annual clumped isotope analysis of gastropods

10:15-10:30 **Nicolai Schleinkofer**
Assessing geochemical seawater temperature proxies in the deep sea bivalve *Acesta excavata*

10:30-11:00 *Refreshment break*

11:00-11:15 **Mikko Vihtakari**
sclero: an R package to measure growth patterns and align sampling spots in chronologically deposited materials

11:15-11:30 **Kristine DeLong**
Corals are not thermometers – How to extract a geochemical time series from a complex skeleton

11:30-11:45 **Krešimir Markulin**
Glycymeris pilosa - spatial and temporal insight into differences of trace element records

11:45-12:00 **Kozue Nishida**
Microscale stable isotopic analytical system (MICAL3c) reveals high-resolution temperature history of fish otoliths

12:00-12:15 **Franck Lartaud**
Sclerochronology beyond the deep

12:15-12:30 **Alexandra Németh**
Anomalous ^{18}O-depletions of Madeiran *Glycymeris* growth increments – A new tool to trace meridional shifts of the Azores Front

12:30-14:00 Lunch break

SESSION: **PALEOECOLOGY AND EVOLUTION**
Moderators: Paul G. Butler and Donna Surge

14:00-14:30 **Linda C. Ivany (keynote)**
How low can you go? Seasonal resolution in 300-million-year-old aragonite mollusks and the insights they provide

14:30-14:45 **Niels J. de Winter**
Reconstructing paleoseasonality in the Late Cretaceous greenhouse world: A multi-proxy approach

14:45-15:00 **Madleen Grohganz**
Unravelling the biology of conodonts (early vertebrates) through sclerochro nology of their skeletal tissues

15:00-15:15 **Kohki Sowa**
Ecological responses of coral reef under different seawater conditions inferred from mid-Holocene coral reefs at the central Ryukyu Islands, Japan

15:15-15:30 **Atsuko Yamazaki**
Linkage between climate condition and coral reef development on Holocene uplifted terraces in Kikai Island, Japan

15:30-15:45 **Andrew L.A. Johnson**
Growth rate, extinction and survival among late Cenozoic marine bivalves of the US eastern seaboard

15:45-16:15 Refreshment break

SESSION: **BIOMINERALIZATION**
Moderators: Bernd R. Schöne and Elizabeth Harper

16:15-16:45 **Antonio Checa (keynote)**
Direct cellular activity drives the fabrication of some invertebrate microstructures

16:45-17:00 **Stefania Milano**
Temperature-induced mineralogical transformations of aragonitic mollusc shells

17:00-17:15 **Morgane Oudot**
Biomineralization in *Spirula spirula:* first proteomic data and new microstruc tural inputs

17:15-17:30 **Jorune Sakalauskaite**
The "jewel of Mediterranean" *Spondylus gaederopus*: insights into the biomineralization through biomolecular analysis

17:30-17:45 **Helene de Pontual**
Asymmetry of otolith chemical composition from 2D mapping: relationship with biomineralization mechanisms and implications for microchemistry analyses

17:45-18:45 **POSTER SESSION A: PROXY DEVELOPMENT: CHALLENGES AND OPPORTUNITIES; PALEOECOLOGY AND EVOLUTION; BIOMINERALIZATION; GROWTH, BIOENERGETICS AND ECOSYSTEMS**

Tuesday, June 18th, 2019

8:30-8:40 Housekeeping

SESSION: **ENVIRONMENTAL BIOMONITORING & ENTREPRENEURSHIP**
Moderators: Michael Carroll and Andrew L.A. Johnson

8:40-9:10 **Karin E. Limburg (keynote)**
Environmental biomonitoring – challenges for sclerochronologists

9:10-9:25 **Rob Witbaard**
Seasonal patterns in shell gape activity of *Arctica islandica*

9:25-9:40 **Maxi Castrillejo**
Cerastoderma edule as a new proxy of historical liquid releases from European nuclear reprocessing plants

9:40-9:55 **Taro Komagoe**
Sclerochronological and geochemical approach for paleo typhoon seasonality reconstruction using giant clam fossils in Kikai Island, Japan

9:55-10:10 **Justine Doré**
Ba/Ca as a potential proxy for phytoplankton dynamics in *Arctica islandica* shells from Saint-Pierre and Miquelon (Northwest Atlantic Ocean)

10:10-10:40 *Refreshment break*

SESSION: **FISHERIES ECOLOGY AND MANAGEMENT**
Moderators: Beatriz Morales-Nin and Sanja Matić-Skoko

10:40-11:10 **Steve E. Campana (keynote)**
A view into the abyss; have we seen the limits of sclerochronology?

11:10-11:25 **James Scourse**
Atlantic herring recruitment in the North Sea for the past 455 years based on the $\delta^{13}C$ from annual shell increments of *Arctica islandica*

11:25-11:40 **Gotje von Leesen**
Temperature association and exposure of Icelandic cod (*Gadus morhua*) over the last 100 years

11:40-11:55 **Emile Le Luherne**
Can otolith $\delta^{18}O$ of tagged fish informed about migration behaviors and population structure of European sea bass in the North East Atlantic?

11:55-12:10 **Liqiang Zhao**
Large-scale mapping of $^{143}Nd/^{144}Nd$ ratios in bivalve shells for geographical traceability

12:10-14:00 Lunch break – on your own

SESSION: **FISHERIES ECOLOGY AND MANAGEMENT**
Moderators: Beatriz Morales-Nin and Sanja Matić-Skoko

14:00-14:15 **Yvette Heimbrand**
Seeking the true time: Exploring otolith chemistry as an age-determination tool

14:15-14:30 **Peter Fink-Jensen**
Provenance and stock structure of capelin in Greenland using microchemistry

14:30-14:45 **Patrick Reis-Santos**
Influence of El Niño Southern Oscillation events on otolith growth and chemical chronologies in dusky grouper

14:45-15:00 **Marine Randon**
Coupling individual natural tracers to assess the connectivity within a flatfish metapopulation

15:00-15:15 **Elizabeth Tray**
Investigating scale trace element microchemistry as a tool to track adult North Atlantic salmon populations

15:15-15:30 **Bronwyn M. Gillanders**
Using hard structure chemistry and growth increment chronologies to investigate partial migration: implications for fisheries management

15:30-15:45 **Audrey M. Darnaude**
Otolith analysis and particle drift modelling to investigate variation in early life connectivity for the gilthead sea bream in the Gulf of Lions

15:45-16:15 Refreshment break

SESSION: **FISHERIES ECOLOGY AND MANAGEMENT**
Moderators: Kotaro Shirai and Bronwyn M. Gillanders

16:15-16:30 **Susanne E. Tanner**
How do deep-sea fish respond to environmental change: Patterns and drivers of growth variation among space, time and taxonomy

16:30-16:45 **Raquel Ruiz-Díaz**
Hindcasting for forecasting. Disentangling the impact of environment and fishing in Flemish Cap Atlantic cod dynamics

16:45-17:00 **Pierluigi Carbonara**
An ecological perspective of age and growth in *Mullus surmuletus* Linnaeus, 1758 from South-West Adriatic Sea

17:00-17:15 **Peter van der Sleen**
Linking sclerochronology to fish population dynamics

17:15-17:30 **Louis Vaughan**
Relating patterns in annual growth of a Western Irish European eel *Anguilla anguilla* Linnaeus, 1758 population to habitat and climatic conditions

17:30-17:45 **Joyce Ong**
Drivers of synchrony among deep-water snappers

17:45-18:00 **Côme Denechaud**
Investigating long term temporal stability of otolith morphometry of North east Arctic cod (*Gadus morhua*) in the Barents Sea

Wednesday, June 19th, 2019

8:30-8:40 Housekeeping

SESSION: **GROWTH, BIOENERGETICS AND ECOSYSTEMS**
Moderators: Julien Thébault and Melita Peharda

8:40-9:10 **Peter Grønkjær (keynote)**
Elements, isotopes and banding patterns – Sclerochronogical approaches to the study physiological performance in fishes

9:10-9:25 **Ming-Tsung Chung**
Plasticity of field metabolic rate between genetically distinct and coexisting cod populations

9:25-9:40 **Leila Chapron**
Impact of global change on cold-water coral growth: threats to deep-sea ecosystems

9:40-9:55 **Karin Hüssy**
The "who, when and where" of cod migrations in the Kattegat

9:55-10:10 **Filipe Martinho**
Daily growth chronologies in a marine flatfish during estuarine colonization

10:10-10:25 **Deirdre Brophy**
Reconstructing growth histories across multiple fish species in the Celtic Sea using multidecadal otolith collections

10:25-10:55 Refreshment break

10:55-11:10 **Clive Trueman**
Inferring movement tracks of individual baleen whales from chemical records combined with coupled simulation models

11:10-11:25 **Christopher McQuaid**
Endolithic cyanobacteria: a complication for the study of ecology and sclerochronology

11:25-11:40 **Beatriz Morales-Nin**
Exploring illicia microchemistry: a new tool for fish age determination?

SESSION: **CLIMATE AND OCEANS: PAST, PRESENT AND FUTURE**

11:40-12:10 **Bryan A. Black (keynote)**
Towards an integrated synthesis of Earth's coupled marine-terrestrial systems

12:10-13:40 Lunch

SESSION: **CLIMATE AND OCEANS: PAST, PRESENT AND FUTURE**
Moderators: James Scourse and Jochen Halfar

13:40-13:55 **William M. Brocas**
Corals reveal a cooler and fresher tropical Atlantic during the mid-last inter glacial

13:55-14:10 **Phoebe T.W. Chan**
Modern-day decline in skeletal density of subarctic crustose coralline algae

14:10-14:25 **Meghan Zulian**
Evidence that coralline red algae are tougher than we thought - Industrial era pH seasonality and long-term trends in the Canadian Arctic Archipelago

14:25-14:40 **Malcolm McCulloch**
Reconstructing the upper-ocean ^{13}C Suess-effect using high-resolution sclerosponge records and implications for the oceanic CO_2 sink

14:40-14:55 **Nicholas Farley**
Evaluating *Porites* microatolls for climate reconstructions: Records from French Polynesia

14:55-15:10 **Evan Edinger**
Deep-water octocoral sclerochronology and microgeochemistry in cold waters of Atlantic and Arctic Canada

15:10-15:40 *Refreshment break*

15:40-15:55 **Bernd R. Schöne**
Brachiopods – faithful recorders of ocean properties?

15:55-16:10 **Eric O. Walliser**
Paleoseasonality in the benthic environment of the Tethys during the Late Cretaceous

16:10-16:25 **David Reynolds**
Northern Hemisphere ocean atmosphere interactions over the last 500 years

16:25-16:40 **Christine N. Bassett**
Fact or fiction? Exploring the possibility of Neoglacial sea ice off the coast of Unalaska

16:40-16:55 **Alejandro Román González**
Developing subannual isotope records from fingernail-sized shells from Antarctic coastal waters

17:00-18:00 **POSTER SESSION B: ENVIRONMENTAL BIOMONITORING AND ENTREPRENEURSHIP; FISHERIES ECOLOGY AND MANAGEMENT; CLIMATE AND OCEANS: PAST, PRESENT AND FUTURE; SCLEROCHRONOLOGY AND HUMAN-ENVIRONMENTAL INTERACTIONS: PAST AND PRESENT**

19:00 *Departure for conference dinner*

Thursday, June 20th, 2019

8:30-8:40 Housekeeping

SESSION: **CLIMATE AND OCEANS: PAST, PRESENT AND FUTURE**
Moderators: David Reynolds and Madelyn Mette

8:40-8:55 **Tsuyoshi Watanabe**
A 150 years *Margritifera* shell record reveals that summer air temperature in northern Japan is linked to Atlantic Multidecadal Oscillation

8:55-9:10 **Stella J. Alexandroff**
Hydrographic and climate variability at St Kilda, Scotland, since the late 19th century

9:10-9:25 **Sarah Holmes**
A novel study combining sclerochronology and biogeochemical modelling to understand mechanisms controlling bivalve growth on the North West European shelf

9:25-9:40 **Roger Mann**
A 250 year chronology of *Arctica islandica* in the Mid-Atlantic region of the US continental shelf

9:40-9:55 **Nina M. Whitney**
Insights on AMOC dynamics over the last 300 years using multiple geochemical proxies from an Arctica islandica record in the western North Atlantic

9:55-10:10 **Justine Briard**
Seawater paleotemperature and paleosalinity evolution in neritic environments of the Mediterranean margin during the Miocene: insights from combined $\delta^{18}O$-$\Delta47$ analyses of bivalve shells

10:10-10:25 **Jacob Warner**
Local perspectives on ENSO mean states ~2300 B.P. and now: $\delta^{18}O$ reconstructions from the short-lived bivalves *Donax obesulus* and *Mesodesma donacium*

10:25-10:55 *Refreshment break*

SESSION: **SCLEROCHRONOLOGY AND HUMAN-ENVIRONMENTAL INTERACTIONS: PAST AND PRESENT**
Moderators: Meghan Burchell and Stefania Milano

10:55-11:25 **Amy Prendergast (keynote)**
Sclerochronology and archaeology in the Mediterranean: seasonal foraging patterns, environmental change, and human-environment interaction

11:25-11:40 **Meghan Burchell**
Shell midden archives, climate change and human response in Barkley Sound, British Columbia

11:40-11:55 **Marc Gosselin**
Sclerochronological study in the Arabian Peninsula: growth pattern calibrations on modern bivalves and archaeological application from shell middens

11:55-12:10 **Kelsie Long**
High-resolution oxygen isotope records from fish and shell remains, Lake Kutubu, Papua New Guinea

12:10-13:40 *Lunch*

SESSION: **SCLEROCHRONOLOGY AND HUMAN-ENVIRONMENTAL INTERACTIONS: PAST AND PRESENT**
Moderators: Meghan Burchell and Stefania Milano

13:40-13:55 **Kaoru Kubota**
Geochemistry and sclerochronology of *Mercenaria stimpsoni* collected from the western North Pacific

13:55-14:10 **C. Fred T. Andrus**
Challenges and applications of oxygen isotope analysis of season of capture of freshwater mollusks

14:10-14:25 **Emma Loftus**
Stable isotope investigations of Later Stone Age shellfishing and local climate shifts on the South African west coast

14:25-14:40 **Asier García-Escárzaga**
Shell sclerochronology and stable oxygen isotope ratios from the limpet *Patella depressa* Pennant, 1777: Implications for palaeoclimate reconstruction and archaeology in northern Spain

14:40-15:20 **Concluding remarks & 6th International Sclerochronology Conference**

15:20-15:50 *Refreshment break*

15:50-17:20 **Early Stage Researcher workshop/panel**
Meghan Burchell, Thierry Corrège, Stefania Milano, Amy Prendergast, Alan Wanamaker

Proxy Development: Challenges and Opportunities

Christine N. Bassett
Examining the potential of Pacific abalone as a novel high-resolution archive of seasonal upwelling in the Channel Islands, CA, USA

Thierry Corrège
Deciphering high resolution structural and geochemical signals present in Stromatoporoids from the upper Cretaceous

Jean-François Cudennec
Highlighting inter-individual variability in *Patella vulgata* shell growth: what consequences for paleo-environmental proxies?

Jamekia Durrough-Pritchard
Nitrogen isotope records in Unionid mussels: assessing fidelity to stream conditions and post-mortem shell degradation

Daria Ezgeta-Balić
Sclerochronology of oyster shells – differences in trace and minor element composition between native *Ostrea edulis* and invasive *Magallana gigas*

Nils Höche
Automation of bivalve microstructure analysis: Making a new proxy feasible

Stefan Huck
Extracting seasonality signals from Late Albian bivalve shells: A multiproxy multispecies approach

Andrew L.A. Johnson
Microgrowth-increment and isotopic data from sub-thermocline *Aequipecten opercularis*: recognition of setting and fidelity of temperature records

Franck Lartaud
Dramatic growth anomalies and isotopic disequilibrium characterize the shell portion of oysters formed during the juvenile period

Alexandra Németh
Stable isotope study of a *Glycymeris glycymeris* population from the Iberian Shelf

Kozue Nishida
Temperature seasonality as recorded in shell microstructure of genus *Scapharca* (Mollusca: Bivalvia): new insights into the age determination and paleoenvironmental study

Amy Prendergast
Mediterranean limpets and Mg/Ca ratios - using LIBS to screen for SST changes and physiological effects

Lina M. Rasmusson
Exploring the potential of Arctic coralline algae as a paleosalinity proxy

Elodie Réveillac
Do scales and otoliths tell the same shad story?

David Reynolds
An integrated carbon and oxygen isotope approach to reconstructing past environmental variability in the northeast Atlantic Ocean

Ana Samperiz
Stylasterids: a new paleoceanographic archive?

Yuji Sano
High resolution analysis of bivalve shell by NanoSIMS

Kotaro Shirai
Mussel periostracum as a high-resolution archive of soft tissue $\delta^{15}N$ records in coastal ecosystems

Sophie Slater
Constraining palaeo-CO_2 reconstructions though B isotopes in marine carbonates using the NU Plasma II MC-ICP-MS

Kentaro Tanaka
Microscale magnesium distribution in shell of *Mytilus galloprovincialis*: An example of multiple factors controlling Mg/Ca in biogenic calcite

Tamara Trofimova
Oxygen isotope composition of *Arctica islandica* aragonite in the context of shell architectural organization

Meghan Zulian
Intra- and inter-observer reliability of coralline red alga *Clathromorphum compactum* as a sea ice cover proxy

Paleoecology and Evolution

Alexander Arkhipkin
Increment microstructure of the gladius in recent squid helped to assess duration of ontogenetic phases in Jurassic belemnites (Mollusca: Cephalopoda)

Valentina Brandolese
Sclerochronology and stable isotope records ($\delta^{18}O$) of Lower Jurassic lithiotid bivalves from the Trento Platform (Southern Alps, Italy)

Gaia Crippa
Bivalve shells as archives of seasonality during the early Pleistocene in the Mediterranean Sea

Kylie L. Palmer
Life history patterns of modern and fossil *Mercenaria* from the US Mid Atlantic Coastal Plain during cold vs. warm climate conditions

Eric O. Walliser
Were inoceramid chemosymbiotic bivalves?

Biomineralization

Lucian Barbu-Tudoran
Unravelling native nanostructured details in high resolution scanning electron microscopy (HRSEM) of wasted marine biomaterials

Simon Chenery
Micro-chemical and micro-mineralogical techniques for sclerochronological studies – which one should I choose?

Charlotte Colvin
Determining spatial and temporal compositional variation in *Buccinum undatum* shells

Simona Cinta Pinzaru
Raman spectroscopy and imaging tools for correlative analyses in otoliths sclerochronology

Maria Suciu
EDX in Bouligand pattern sclerochronology

Growth, Bioenergetics and Ecosystems

Michael Carroll
Extended chronology of the bivalve *Serripes groenlandicus* from a high-Arctic fjord in Svalbard, Norway

David H. Goodwin
Bivalve mollusk sclerochronology in a changing world: Environmental controls on the growth of *Mercenaria mercenaria* from North Carolina, USA

Carmen Hernández
Northeast Atlantic chub mackerel (*Scomber colias*): growth pattern and age validation in Northern Iberian waters

Guillermo Moyano
Determination of age and growth in fish of the Pacific pomfret (*Brama australis*) in south central and southern off Chile

Lizandro Muñoz
Stereoscopic vision of otoliths by microphotogrammetry

Szymon Smoliński
Variation of carbon isotopic composition in otoliths of Northeast Arctic cod (*Gadus morhua*)

Donna Surge
Assessing seasonality and life history of Baltic Sea *Astarte borealis* (Bivalvia) using oxygen isotope ratios measured by high-precision SIMS

Poster Session B - Wednesday, June 19th, 2019 - 17:00-18:00

Environmental Biomonitoring and Entrepreneurship

Naoko Murakami-Sugihara
The trace element composition of mussel shells reflected the tsunami-induced environmental changes inherent in individual bays

Rob Witbaard
Reconstruction of bomb ^{14}C in the North Sea derived from *Arctica islandica* using Laser Ablation AMS

Fisheries Ecology and Management

Pierluigi Carbonara
Growth and age validation of thornback ray in the West-Central Mediterranean basin

Pierluigi Carbonara
Ring deposition patterns in common sole otoliths from the Adriatic Sea

Simon Chenery
Mapping and quantification of sub-annual trace element variation in otoliths of toothfish (*Dissostichus eleginoides*) using µXRF and LA-ICP-MS

Carmen Hernández
Age estimation and corroboration of four-spot megrim (*Lepidorhombus boscii*) on the Porcupine Bank (west of Ireland)

Brian P. Kennedy
Understanding growth variation and life history diversity in a migratory salmon population using otolith microstructural and microchemical analysis

Andrea Massaro
Otolith morphometry relations of *Trachurus picturatus* (Bowdich, 1825) from two different areas: the Canary Islands and the Ligurian-Northern Tyrrhenian Seas

Andrea Massaro
Inferring the population dynamic from otolith phenotypes

Sanja Matić-Skoko
Fish and sclerochronology research in the Mediterranean – challengies and opportunities

Mary Elizabeth Matta
An otolith biochronology provides evidence for species interactions in the Aleutian Islands ecosystem

Mirela Petrić
Age determination of the short-finned squid *Illex coindetii* using statolith analysis

Allan T. Souza
Otolith shape variations between artificially stocked and autochthonous pikeperch (*Sander lucioperca*)

Elizabeth Tray
Unlocking the archive:a biochronology repository

Clive Trueman
Isotope chemistry of scales reveals continent-scale variation in at-sea foraging in European populations of Atlantic salmon

Mikko Vihtakari
Otolith chemistry of Greenland halibut – false hopes or an opportunity to learn about population boundaries?

Dario Vrdoljak
Otolith geochemistry of *Diplodus puntazzo* and *Diplodus vulgaris* from marine waters and estuaries in the eastern Adriatic Sea

Climate and oceans: Past, Present and Future

Fabian Bonitz
Climate variability of North Atlantic water masses along the Irminger Current: Insights from *Arctica islandica* shells from SW Iceland

Thomas C. Brachert
Coral calcification during the geological past – why was it so different?

Paul G. Butler
Analysis of the persistence of seasonal stratification in the northern North Sea using a $\delta^{18}O_{shell}$ - based bottom water temperature reconstruction for the last 455 years

Jochen Halfar
Reconstruction of Arctic Oscillation driven sea ice variability in Lancaster Sound, Canadian Arctic, using the long-lived coralline alga *Clathromorphum compactum*

Sarah Holmes
Using anually-resolved bivalve records and biogeochemical models to understand and predict climate impacts in coastal oceans

Eleanor H. John
Recent ENSO Evidence from Fiji: Climate Archives in Middens (REEFCLAM)

Matthew Long
A multi-decade record of increasing growth rates in a Mid Atlantic population of ocean quahogs

Madelyn Mette
Depth-dependent environmental factors control *Arctica islandica* shell growth variability in SW Iceland

Markus Reuter
Coral calcification and sclerochronology during the Middle Miocene Climate Transition

David Reynolds
Annually resolved NE Atlantic Ocean variability through the 8.2K cold event

James Scourse
8.2 ka event North Sea hydrography determined by bivalve shell stable isotope geochemistry

Andreja Sironić
Sclerochronology and ^{14}C dating applied on bivalve *Glycymeris pilosa* from the Adriatic Sea

Julien Thébault
Highly synchronous shell growth records in *Laternula elliptica* from Adelie Land (East Antarctica)

Hana Uvanović
Potential for developing multispecies chronologies in the Mediterranean Sea

Alan Wanamaker
Constructing sclerochronology networks in the northwestern Atlantic: A progress report

Sclerochronology and human-environmental interactions: Past and Present

Marisa Dusseault
Structural order in biogenic carbonates: Screening for diagenesis with FTIR

Marc Gosselin
The carpet shell *Ruditapes decussatus* in archaeological context: insights on season of collection and coastal paleo-temperature

Daniel Killam
Giant clam growth in the Gulf of Aqaba is accelerated compared to fossil populations: The role of nitrate aerosol fertilization

Amy Prendergast
Pipi shells: a new high-resolution palaeoenvironmental archive for south-eastern Australia

Some local information

Emergency number (we hope you will not need it but in any case):

General emergency	112
Police	192
Fire brigade	193
Ambulance	194

Split has a wide selection of taxi companies and most of them you could order a ride online. Here are some of them:

www.st-taxi.com

gogreentaxisplit.hr/en/

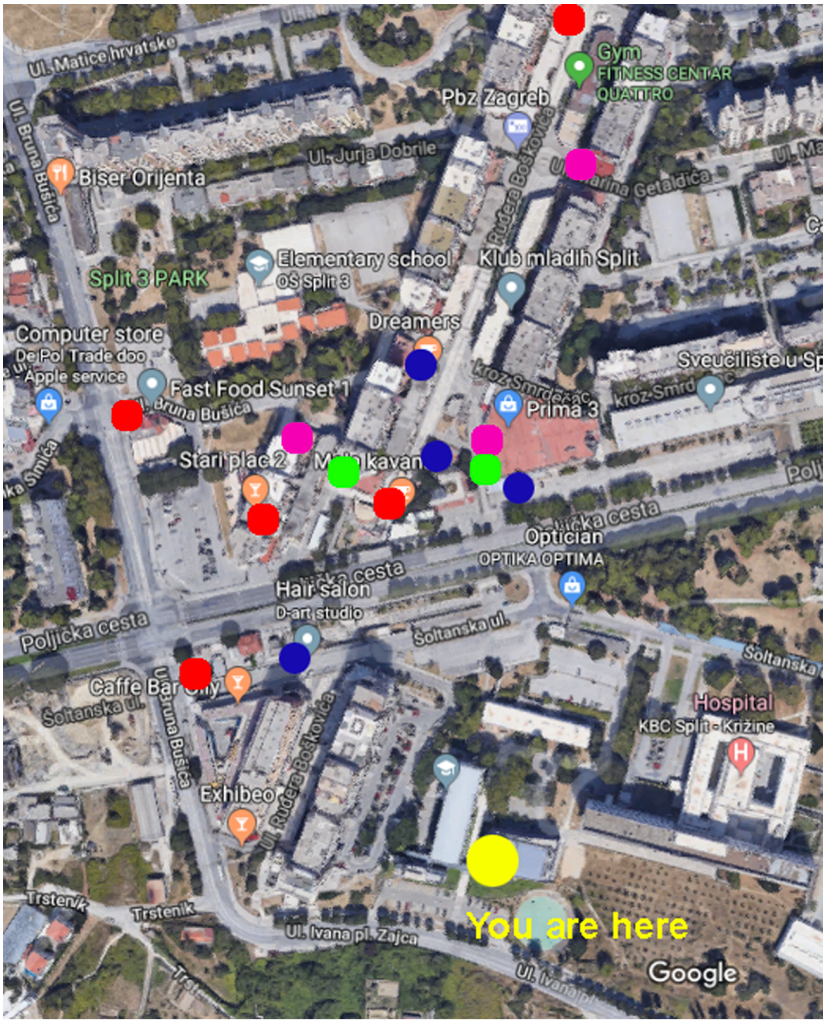
...and of course there is also a **Uber**

There are several bus lines from city center to Conference venue (indicated on the map with blue dot). If you are taking bus in city center from near National Theatre you can use lines 5, 5a, and 11. From bus station near main green market you can use lines 3, 5, 5a, 8, 11, and 17 (ask a driver is it "BOLNICA" direction ("BOLNICA" means hospital). Take off on **"KRIŽINE"** station. (**www.promet-split.hr/en/**)

For more information visit the official website of the Tourist Board of Split:

www.visitsplit.com

Some local information



Fast foods:
Fast-food IN
Fast-food Sunset
Fast-food Mala Kavana
Calypso
Pancakes Stari plac 2

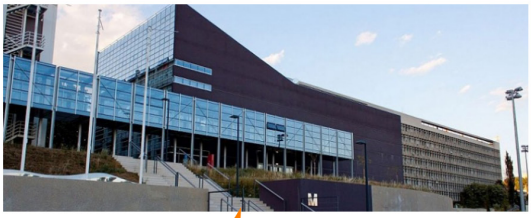
Cafe-bars:
Dreamers
Azzuro
Leonardo
Retro
Mala kavana

Healthy food:
Bio&Bio
Superfood

Grocery stores:
Tommy
Studenac

...if you want to go swimming just follow the yellow line - after or before the conference of course :)

Conference venue
School of Medicine
(Multimedia center)
Šoltanska ulica 2
21000 Split



Ice breaker party
Hotel ORA
Poljička cesta 26
21000 Split
Croatia

Sponsors

Platinum sponsor

Institute of Oceanography and Fisheries

www.izor.hr

Institute of Oceanography and Fisheries

Split, Croatia

www.izor.hr

Platinum sponsor
University of Zadar
Department of Ecology, Agronomy and Aquaculture
www.unizd.hr

Platinum sponsor
School of Medicine, University of Split
www.mefst.unist.hr

UNIVERSITY OF SPLIT
SCHOOL OF MEDICINE

Sponsors

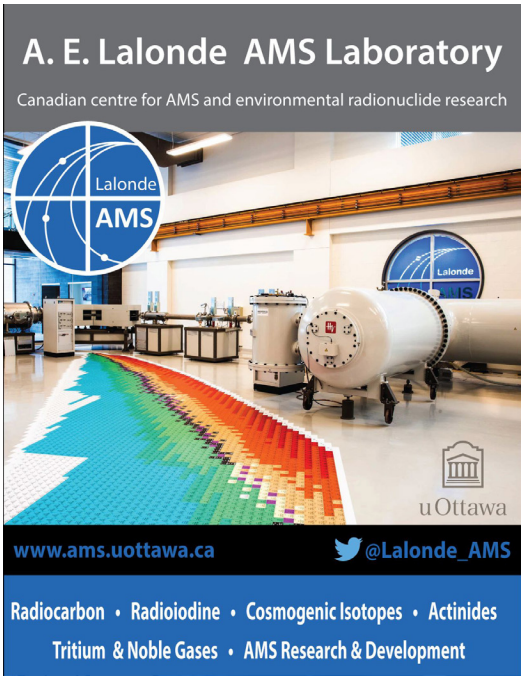
Gold sponsor
Nu Instruments
www.nu-ins.com

Gold sponsor
Struers - Ensuring Certainty
www.struers.com

Silver sponsor
Stable Isotope Facility, UC Davis
stableisotopefacility.ucdavis.edu

UCDAVIS
Stable Isotope Facility
Department of Plant Sciences

Silver sponsor
A.E. Lalonde AMS Laboratory
www.ams.uottawa.ca



Silver sponsor
Marine studies Group, The Geological Societys
www.geolsoc.org.uk/marine

Notes:

Notes:

Publisher:
Institute of Oceanography and Fisheries, Split, Croatia

Circulation:
170 copies

Contact:
Melita Peharda
Institute of Oceanography and Fisheries
Šetalište I. Meštrovića 63
21000 Split
Croatia
+385 21 408 053
www.izor.hr

Photo by Banko Dragičević