

INTERNATIONAL SYMPOSIUM  
DRIVERS OF DYNAMICS  
OF SMALL PELAGIC FISH RESOURCES  
PROGRAM



MARCH 6-11, 2017 VICTORIA, CANADA





## Table of Contents

Symposium Organizers .....	2
Notes for Guidance .....	4
Welcome .....	5
Floor Plan .....	6
Program at a Glance .....	7
Detailed Workshop/Session Schedules at a Glance .....	8
List of Posters .....	22
Upcoming International Events .....	27

For convenience all presentations (oral and posters) include the presenter's name only.  
Please refer to the Book of Abstracts for the full list of co-authors.

## Symposium Organizers

### Symposium Convenors

Jürgen Alheit (ICES)  
Germany

Yoshioki Oozeki (PICES)  
Headquarters, Fisheries Research Agency, Japan

### Symposium Coordinators

Alexander Bychkov (PICES)

Wojciech Wawrzynski (ICES)

### Scientific Steering Committee

Jürgen Alheit (ICES)  
Germany

Miguel Bernal  
FAO, General Fisheries Commission for the  
Mediterranean

Arnaud Bertrand  
Institut de Recherche pour le Développement,  
France

Jennifer Boldt  
Department of Fisheries and Oceans, Canada

Emanuele Di Lorenzo (PICES)  
Georgia Institute of Technology, USA

Salvador Lluch-Cota  
CIBNOR-CONACYT, Mexico

Yoshioki Oozeki (PICES)  
Headquarters, Fisheries Research Agency, Japan

William Peterson (PICES)  
Northwest Fisheries Science Center, NMFS, USA

David Reid (ICES)  
Irish Marine Institute, Ireland

Svein Sundby (ICES)  
Marine Research Institute, Norway

Merete Tandstad (FAO)  
FAO Fisheries and Aquaculture Department

### Session Convenors

*Session 1: Environmental control of spatio-temporal changes in population size, distribution and migration of small pelagic fish in the ecosystem context*

Emanuele Di Lorenzo (Georgia Institute of  
Technology, USA)

Dimitri Gutierrez (IMARPE, Peru)

Svein Sundby (Institute of Marine Research,  
Norway)

Yongjun Tian (Ocean University of China, China)

*Session 2: External drivers of change in early life history, growth and recruitment processes of small pelagic fish*

David Checkley (Scripps Institution of  
Oceanography, UCSD, USA)

Susana Garrido (Instituto Português do Mar e da  
Atmosfera, Portugal)

Pierre Petitgas (IFREMER, France)

Akinori Takasuka (National Research Institute of  
Fisheries Science, FRA, Japan)

*Session 3: The role of small pelagic fish in food web dynamics between plankton and top predators*

Arnaud Bertrand (Institut de Recherche pour le  
Développement, France)

Salvador Lluch-Cota (CIBNOR-CONACYT,  
Mexico)

William Peterson (Northwest Fisheries Science  
Center, NMFS, USA)

*Session 4: Comparison of methods for assessment of small pelagic fish populations*

Miguel Bernal (FAO, General Fisheries Commission  
for the Mediterranean )

Jennifer Boldt (Department of Fisheries and Oceans,  
Canada)

Momoko Ichinokawa (National Research Institute of  
Fisheries Science, FRA, Japan)

Reidar Toresen (Institute of Marine Research,  
Norway)

***Session 5: Future challenges for ecosystem-based management of highly variable fish populations***

Warrick (Rick) Fletcher (Department of Fisheries, WA, Australia)

David Reid (Irish Marine Institute, Ireland)

Merete Tandstad (FAO Fisheries and Aquaculture Department)

Andres Uriarte (AZTI, Spain)

***Session 6: Small pelagic fish and humans – Social, economic and institutional dimensions***

Manuel Barange (FAO, Fisheries and Aquaculture Policy and Resources Division)

Marloes Kraan (IMARES, The Netherlands)

Mitsutaku Makino (Fisheries Research Agency, Japan)

Jörn Schmidt (University of Kiel, Germany)

Rashid Sumaila (Fisheries Centre, University of British Columbia, Canada)

**Workshop Convenors**

***Workshop 1: Environmental control of spatio-temporal changes in population size, distribution and migration of small pelagic fish in an ecosystem context***

Jürgen Alheit (Germany)

Emanuele Di Lorenzo (Georgia Institute of Technology, USA)

Ryan Rykaczewski (University of South Carolina, USA)

Svein Sundby (Institute of Marine Research, Norway)

***Workshop 2: Methods and techniques for sampling and assessing small pelagic fish populations***

Jennifer Boldt (Department of Fisheries and Oceans, Canada)

Matthew Baker (North Pacific Research Board, USA)

Miguel Bernal (FAO, General Fisheries Commission for the Mediterranean)

Stylianos (Stelios) Somarakis (Hellenic Centre for Marine Research, Institute of Marine Biological Resources and Inland Waters, Greece)

***Workshop 4: Modeling migratory fish behavior and distribution***

Shin-ichi Ito (AORI, University of Tokyo, Japan)

Enrique Curchitser (Rutgers University, USA)

***Workshop 5: Recent advances in the life stage ecophysiology of small pelagic fish: Linking laboratory, field and modeling studies***

Myron Peck (University of Hamburg, Germany)

Kirstin Holsman (AFSC, NOAA-Fisheries, USA)

Shin-ichi Ito (AORI, University of Tokyo, Japan)

Laure Pecquerie (IRD, France)

***Workshop 6: Remote sensing and ecology of small pelagics***

Shubha Sathyendranath (Plymouth Marine Laboratory, UK)

Grinson George (Central Marine Fisheries Research Institute, India)

Nandini Menon (Nansen Environmental Research Centre India, India)

Trevor Platt (Plymouth Marine Laboratory, UK)

***Workshop 7: Simulation approaches of forage fish populations for management strategy evaluations***

Margaret Siple (University of Washington, USA)

Laura Koehn (University of Washington, USA)

## Notes for Guidance

### Location

The entire symposium (all sessions and workshops) will be held on the first floor at the Victoria Conference Centre (VCC) located at 720 Douglas Street, Victoria (<http://victoriacommunity.com/>).

### Registration

The registration desk will be set in the Pre-function Area 1A.

The desk will be open from 15:00–17:00 on March 5, from 8:00–18:00 on March 6–10, and from 8:30–14:30 on March 11.

### Presentations

In order to allow the sessions to run smoothly, and in fairness to other speakers, please note that all presentations are expected to adhere strictly to the time allocated. All authors should designate at least 5 minutes for questions. Authors can download their presentations directly to the computers where the session/workshops will be held.

**Important:** Please rename your files - time-name.ppt (e.g. 0900-Smith.ppt, 1530-Kim.ppt).

If complications occur due to incompatibilities between PCs and Macs, Macintosh owners may use their own computers to make presentations.

### Posters

Posters will be on display in Saanich Room/Pre-function Area 1A from the morning of March 6 until noon of March 10. Poster presenters are expected to be available at their posters for at least one hour to answer questions during the two Poster Sessions/Receptions to be held from 18:00–20:30 on March 7 and March 9. To facilitate planning of poster viewing, authors should leave a note with their posters to notify viewers on the times when they will be available.

### Internet access

A few computers with Internet access will be available for participants. Participants can also purchase the self-serve Wi-Fi connection (\$5/device/day rate).

### Social activities

#### Welcome Reception

*March 6 (18:30-21:00)*

*Royal British Columbia Museum*

The Welcome Reception for all participants and registered guests will be held at the Royal British Columbia Museum (<http://royalbcmuseum.bc.ca/>).

The Museum is located at 675 Belleville St, Victoria, BC, V8W 9W2, a short walk from the meeting venue.

#### Wine & Cheese Poster Session Reception

*March 7 & March 9 (18:00-20:30)*

*Victoria Conference Centre (Saanich Room and Pre-function Area 1A)*

Two “Wine & Cheese” Poster Sessions held at the Victoria Conference Centre will allow participants and registered guests to roam around the poster displays and chat with presenters while sipping beer or wine, and nibbling on hot and cold hors d’oeuvres.

## Welcome

We welcome you to the international symposium on “*Drivers of dynamics of small pelagic fish resources*”. Small pelagic fish provide about 25% of the total annual yield of capture fisheries, and the well-being of many coastal communities around the world, particularly in developing countries, is critically dependent on these resources. Small pelagic population sizes undergo extreme fluctuations in abundance and geographic distribution due to the impact of environmental and anthropogenic influences. In spite of many internationally coordinated research efforts, we still do not have sufficient knowledge about the drivers of small pelagic fish recruitment and, particularly, the interactive effects of environmental and anthropogenic factors.

In 1983, the Fisheries and Agriculture Organization (FAO) and Intergovernmental Oceanographic Commission (IOC) organized an international symposium titled “*The Expert Consultation to Examine Changes in Abundance and Species Composition of Neritic Fish Resources*” in San José, Costa Rica (FAO Fisheries Report 291, 1983, 3 Volumes). The symposium was a major success and inspired many research efforts on small pelagics for the next three decades. It was the first time many of those attending the symposium were confronted with the phenomenon of small pelagic fish population abundances varying synchronously in many unconnected regions of the global ocean. This is an issue that we are still attempting to understand, as the distances between the small pelagic stocks are large, atmospheric and ocean connections are weak and unclear, and mechanisms are unresolved.

There has been no global symposium on small pelagic fish since 1983, and the exchange of information about them has declined on a global basis since the end of the Small Pelagics and Climate Change (SPACC) project of GLOBEC in 2008. The goal of this symposium is to revitalize global international cooperation on investigations of small pelagic fish, and to identify, discuss and develop a framework to address unresolved questions such as the impact of climate and/or fishing pressure on the resilience of small pelagic populations using a comparative approach.

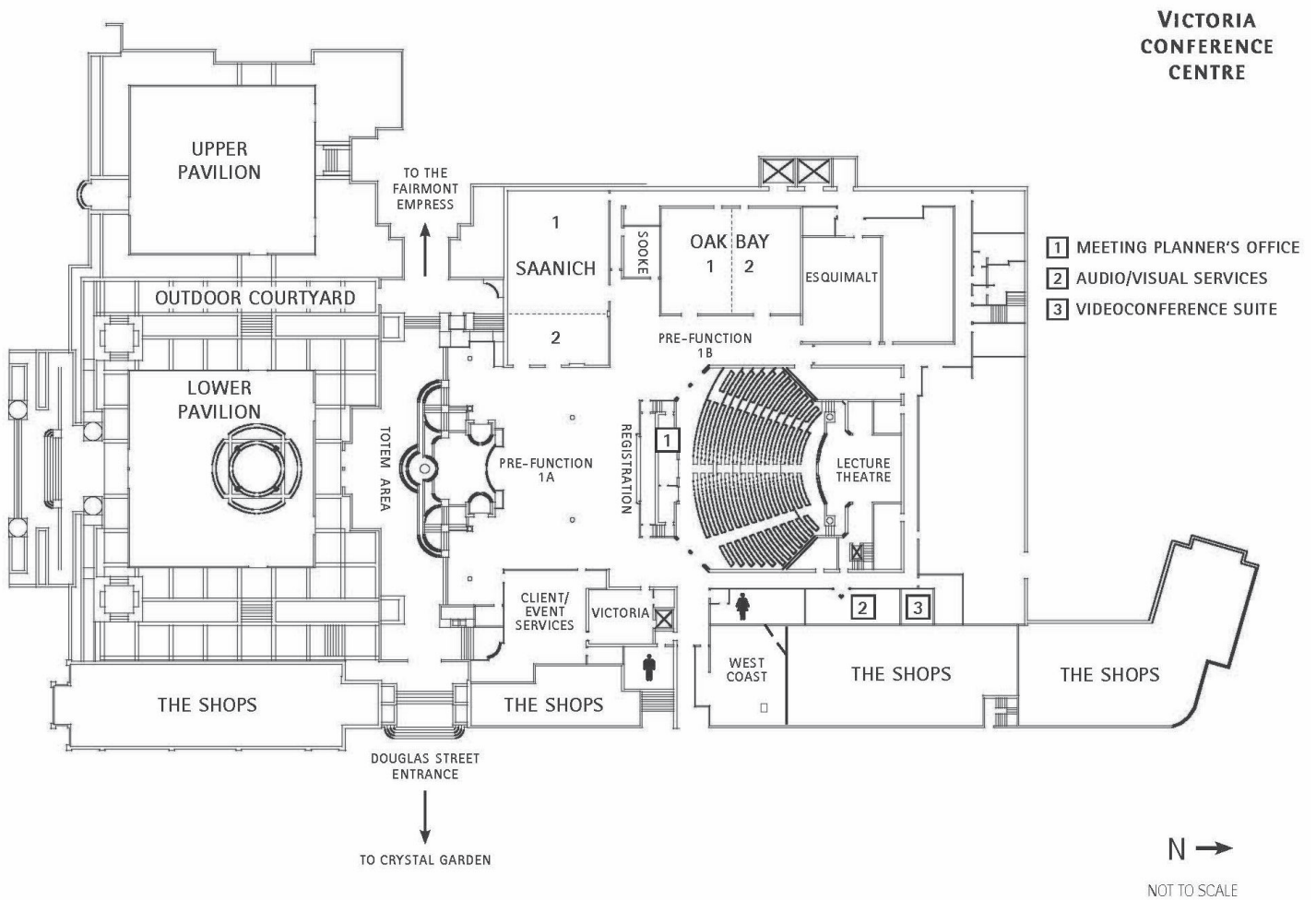
With deep satisfaction we acknowledge that more than 250 scientists from almost 40 countries are attending the symposium and that about 270 abstracts have been submitted, demonstrating the wide interest in small pelagic fish issues. We are particularly happy about the participation of experts from the fields of climate research, physical oceanography, zooplankton and socio-economic sciences, showing the interdisciplinary nature of research on small pelagics.

We thank the Secretariats of the organizing institutions, PICES and ICES, for their hard work in preparing this event, and express our gratitude to all the numerous sponsors – without their generous support this symposium would not have been possible. Our thanks go also to the Scientific Steering Committee and the session and workshop conveners and invited speakers for their commitment.

We expect this symposium to be as successful as the 1983 event. To reach this goal, we look forward to your intense cooperation this week.

*Jürgen Alheit, Yoshioki Oozeki, Alexander Bychkov and Wojciech Wawrzynski*  
*Symposium Convenors and Coordinators*

## Level I floor plan



### List of Sessions and Workshops

<b>S1</b>	Mar. 6-8, 10	Environmental control of spatio-temporal changes in population size, distribution and migration of small pelagic fish in the ecosystem context
<b>S2</b>	Mar. 6-8	External drivers of change in early life history, growth and recruitment processes of small pelagic fish
<b>S3</b>	Mar. 9-10	The role of small pelagic fish in food web dynamics between plankton and top predators
<b>S4</b>	Mar. 8	Comparison of methods for assessment of small pelagic fish populations
<b>S5</b>	Mar. 9	Future challenges for ecosystem-based management of highly variable fish populations
<b>S6</b>	Mar. 7	Small pelagic fish and humans – social, economic and institutional dimensions
<b>W1</b>	Mar. 11	Environmental control of spatio-temporal changes in population size, distribution and migration of small pelagic fish in an ecosystem context
<b>W2</b>	Mar. 11	Methods and techniques for sampling and assessing small pelagic fish populations
<b>W4</b>	Mar. 11	Modeling migratory fish behavior and distribution
<b>W5</b>	Mar. 11	Recent advances in the life stage ecophysiology of small pelagic fish: Linking laboratory, field and modeling studies
<b>W6</b>	Mar. 11	Remote sensing and ecology of small pelagics
<b>W7</b>	Mar. 11	Simulation approaches of forage fish populations for management strategy evaluations



## Program at a Glance

Monday, March 6				
09:00 12:30	<b>Opening Ceremony, Plenary Session</b> [Lecture Theatre]			
14:00 18:00	<b>Session 1 (Day 1)</b> [Lecture Theatre]	<b>Session 2 (Day 1)</b> [Saanich Room]		
18:30 21:00	<b>Welcome Reception</b> [Royal BC Museum]			
Tuesday, March 7				
09:00 10:10	<b>Plenary Session</b> [Lecture Theatre]			
10:30 18:00	<b>Session 1 (Day 2)</b> [Lecture Theatre]	<b>Session 2 (Day 2)</b> [Saanich Room]	<b>Session 6</b> [Esquimalt Room]	
18:00 20:30	<b>Poster Session / Reception</b> [Oak Bay Room / Pre-function Area]			
Wednesday, March 8				
09:00 10:10	<b>Plenary Session</b> [Lecture Theatre]			
10:30 18:00	<b>Session 1 (Day 3)</b> [Lecture Theatre]	<b>Session 2 (Day 3)</b> [Saanich Room]	<b>Session 4</b> [Esquimalt Room]	
Thursday, March 9				
09:00 10:10	<b>Plenary Session</b> [Lecture Theatre]			
10:30 18:00	<b>Session 3 (Day 1)</b> [Lecture Theatre]	<b>Session 5</b> [Saanich Room]		
18:00 20:30	<b>Poster Session / Reception</b> [Oak Bay Room / Pre-function Area]			
Friday, March 10				
09:00 12:30	<b>Session 1 (Day 4)</b> [Lecture Theatre]	<b>Session 3 (Day 2)</b> [Saanich Room]		
14:00 17:30	<b>Plenary Session, Closing Ceremony</b> [Lecture Theatre]			
Saturday, March 11				
09:00 12:30	<b>Workshop W1</b> [Saanich 1 Room]	<b>Workshop W2</b> [Oak Bay 1]	<b>Workshop W4</b> [Esquimalt Room]	<b>Workshop W6</b> [Oak Bay 2]
14:00 18:00		<b>Workshop W7</b> [Oak Bay 1]	<b>Workshop W5</b> [Esquimalt Room]	

Coffee/Tea Breaks will take place every day in the morning and afternoon.  
Lunch breaks are scheduled approximately from 12:30-14:00.

## Schedule at a Glance, March 6

### Plenary

- 9:00 **Opening Ceremony**
- 9:30 **Andrew Bakun (General Plenary)**  
Progress in small pelagic fish research in the 3½ decades since ‘Costa Rica’
- 10:15 **Coffee/Tea Break**
- 10:40 **Shoshiro Minobe (General Plenary)**  
Causality linkages in atmosphere, ocean and marine ecosystem over the North Pacific: Modes, processes and prediction
- 11:15 **David Field (Plenary S1)**  
Fish scale records from California and Peru reveal new paradigms of variability in climate and small pelagic fish
- 11:50 **Stylianos Somarakis (Plenary S2)**  
From egg production to year class strength: A full life cycle perspective of small pelagic fish recruitment
- 12:25 **Lunch**

<b>S1, Day 1 (Lecture Theatre)</b> <i>Environmental control of spatio-temporal changes in population size, distribution and migration of small pelagic fish in the ecosystem context</i>		<b>S2, Day 1 (Oak Bay Room)</b> <i>External drivers of change in early life history, growth and recruitment processes of small pelagic fish</i>	
14:00	<b>Introduction by Convenors</b>	<b>Introduction by Convenors</b>	
14:10	<b>Bryan A. Black (Invited)</b> Synchrony in climate and biological response within and among the Benguela and California Current ecosystems	<b>Dominique Robert (Invited)</b> Revealing the link between prey availability during the larval stage and recruitment strength in small pelagic fish	
14:40	<b>Carmen Grados</b> Interdecadal upper ocean hydrology of the Northern Humboldt Current System and its impact on the small pelagic fish distribution	<b>Paul Gatti</b> Impact of seasonal environmental variability on the bioenergetics strategy of anchovy and sardine: A combined data and modelling study in the Bay of Biscay	
15:00	<b>Karen Walker</b> Environmental impact on fluctuations of juvenile sardine ( <i>Strangomera bentincki</i> ) in the central-southern Chile (32°-47°S)	<b>Rebecca G. Asch</b> Testing the reliability of species distribution models: How stable are relationships between small pelagic fishes and oceanographic conditions in the southern California Current ecosystem?	
15:20	<b>Antonio Fernando Aranis</b> Conceptual model for common sardine ( <i>Strangomera bentincki</i> ) in the south central zone of Chile (32°-47°S)	<b>Øystein Skagseth</b> Environmental drivers of peak recruitment years of Norwegian Spring Spawning Herring ( <i>Clupea harengus</i> L.)	
15:40	<b>Coffee/Tea Break</b>	<b>Coffee/Tea Break</b>	

## Schedule at a Glance, March 6

S1	S2, Day 1
16:00	<p><b>Giancarlo Moron</b> Effects of ENSO phases on Peruvian anchovy spatial aggregation patterns</p> <p><b>Jens-Otto Krakstad</b> <i>(by Øystein Skagseth)</i> Oceanographic conditions and runoff from Congo River as drivers for <i>Sardinella</i> recruitment off south-western Africa</p>
16:20	<p><b>Carola Hernández Santoro</b> Effects of El Niño 1997-98; 2002-03 and 2015-16 in spatial distribution, concentration of catch and reproductive activity of anchovy in northern Chile</p> <p><b>Guido Plaza</b> Fast growth and early age-at-recruitment of the anchovy (<i>Engraulis ringens</i>): Evidence from interannual monitoring of otolith microstructure in northern Chile</p>
16:40	<p><b>Carolina Lang</b> Modelling the habitat of anchovy (<i>Engraulis ringens</i>) between 2007 - 2016 off the coast of the Southeast Pacific</p> <p><b>Emma Pascoe</b> Quantifying interannual variability in growth and condition of juvenile Pacific herring (<i>Clupea pallasii</i>) in the Strait of Georgia, BC</p>
17:00	<p><b>Josymar Torrejon-Magallanes</b> <i>(by Luis Wenchang Lau-Medrano)</i> Displacements of the Peruvian anchoveta stocks in relation to environmental conditions: An analysis using length structure analysis from Vessel Monitoring System information</p> <p><b>Erling Kåre Stenevik</b> Mackerel predation on herring larvae during summer feeding in the Norwegian Sea</p>
17:20	<p><b>Dimitri Gutierrez</b> Multifarious anchovy and sardine regimes in the Humboldt Current System during the last 150 years</p> <p><b>Eneko Bachiller</b> Effects of Atlantic mackerel predation on early life stages mortality of anchovy and sardine</p>
17:40	<p><b>Criscely Luján-Paredes</b> Ontogenic variability of the ecological niche of Peruvian anchoveta (<i>Engraulis ringens</i>): Impacts on its present and future distribution</p> <p><b>Poster Presentations</b></p>
18:00	<p><b>Session 1, Day 1 ends</b></p> <p><b>Session 2, Day 1 ends</b></p>

# Schedule at a Glance, March 7

## Plenary

- 9:00 **Ratana Chuenpagdee (Plenary S6)**  
Small fish, big stake: Vulnerability and adaptation of small-scale small pelagic fisheries to global changes
- 9:35 **Manuel Barange (Plenary S6)**  
State of small pelagic fish resources and its implications for food security and nutrition
- 10:10 **Coffee/Tea Break**

	<b>S1, Day 2 (Lecture Theatre)</b> <i>Environmental control of spatio-temporal changes in population size, distribution and migration of small pelagic fish in the ecosystem context</i>	<b>S2, Day 2 (Oak Bay Room)</b> <i>External drivers of change in early life history, growth and recruitment processes of small pelagic fish</i>	<b>S6 (Esquimalt Room)</b> <i>Small pelagic fish and humans – Social, economic and institutional dimensions</i>
10:30	<b>Introduction by Convenors</b>	<b>Introduction by Convenors</b>	<b>Introduction by Convenors</b>
10:40	<b>David M. Checkley, Jr.</b> Climate, anchovy and sardine	<b>Reidar Toresen</b> Climate change as a causative factor in sustained reduced recruitment in Norwegian spring-spawning herring	<b>Rashid Sumaila</b> A simple bio-economic model of the effects of subsidies on small scale (pelagic) fisheries
11:00	<b>Dimitri Gutiérrez</b> Recent trends in the Peruvian Coastal Upwelling Ecosystem and implications for the anchovy habitat	<b>Grea Groenewald</b> Influence of temperature and food availability on anchovy ( <i>Engraulis encrasicolus</i> ) dynamics as seen through a Dynamic Energy Budget (DEB) model	<b>Poster Presentations</b>
11:20	<b>Jorge Csirke</b> Evidences anthropogenic and environmentally driven regime shifts in Peruvian pelagic fisheries	<b>William Duguid</b> Historical fluctuations and recent observations of Northern Anchovy in the Salish Sea	<b>Marloes Kraan</b> Understanding the fishery and value chain of anchovy (Keta Schoolboys) in Ghana
11:40	<b>Renato Guevara-Carrasco</b> <i>(by Blgo Miguel Ñiquen Carranza)</i> Are there early signals of a new warmer “sardine cycle” in the Peruvian upwelling system? Some implications for fisheries management	<b>Claudia Soares</b> Validation of daily increments in the otoliths of Atlanto-Iberian sardine larvae ( <i>Sardina pilchardus</i> Walbaum, 1792) reared at three different temperatures	<b>Katie Schleit</b> Management of small pelagics in Atlantic Canada: A case study of herring and mackerel
12:00	<b>Ana Alegre</b> Diet diversity of jack and chub mackerels and ecosystem changes in the northern Humboldt Current system: A long-term study	<b>Violaine Shikon</b> Larval capelin dynamics in coastal embayments of eastern Newfoundland	<b>Claus R. Sparrevojn</b> A spatial based management system for the sandeel fishery in the North Sea
12:20	<b>Daniel Grados</b> Impact of ocean stratification on small-scale physical oases for pelagic life	<b>Tessa B. Francis</b> Does the early bird catch the worm? Shifts in the spawn timing of Pacific herring ( <i>Clupea pallasii</i> ) in Puget Sound, USA, and consequences for local abundance trends	<b>Lunch</b>
12:40	<b>Lunch</b>	<b>Lunch</b>	
14:00	<b>Joana Boavida-Portugal</b> Global diversity and abundance of small pelagic fishes in the end of the 21st century	<b>Pierre Petitgas</b> On linking variability in early growth to habitat occupancy and mortality later in life: Anchovy in the Bay of Biscay	<b>Ruby P. Napata</b> Is closing the best option? The case of seasonal closure for sardine fishery in the Visayan Sea, Philippines
14:20	<b>Sam McClatchie</b> Collapse and recovery of forage fish populations before commercial fishing	<b>Aril Slotte</b> Use of otolith microstructure analyses to study the relation between larval hatching time, growth and survival in Norwegian spring spawning herring	<b>Momoko Ichinokawa</b> A variety of effort management and its quantitative evaluation in the Pacific purse seine fishery targeting small pelagic fish

## Schedule at a Glance, March 7

S1, Day 2		S2, Day 2	S6
14:40	<b>Ruben Rodriguez-Sanchez</b> Tracking the spatial dynamic of sardine abundance changes in the California Current large marine ecosystem: An approach to elucidate local and broad scale environmental drivers and their interactions	<b>Claudia Günther</b> Another critical period: Physiological limits determine recruitment success during the post-larval stage of a temperate clupeid ( <i>Sprattus sprattus</i> L.)	<b>Mimi E. Lam</b> A values- and ecosystem-based management approach to the Pacific herring fishery conflict in Haida Gwaii, Canada
15:00	<b>Juan P. Zwolinski</b> Use of environmental indices to predict the recruitment of Pacific sardine	<b>Florian Eggers</b> Do epigenetic effects of parental salinity conditions in herring influence subsequent offspring reproductive success?	<b>Jeff Scott</b> Identifying stakeholder values in British Columbia's herring fisheries
15:20	<b>Dimitris V. Politikos</b> Climate variability and recruitment dynamics of sardine in the California Current: A mechanistic analysis of an end-to-end model	<b>Akira Hayashi</b> Combination of income- and capital-breeder type stocks of Japanese anchovy population	<b>Anne Shaffer</b> Linking large-scale dam removal and forage fish restoration and conservation: Observations from the Elwha Dam removals
15:40	<b>Coffee/Tea Break</b>	<b>Coffee/Tea Break</b>	<b>Coffee/Tea Break</b>
16:00	<b>Désirée Tommasi</b> (by <i>David M. Checkley, Jr.</i> ) Seasonal climate predictions to improve forage fish management	<b>Thassya C. dos Santos Schmidt</b> How do Atlantic herring and Pacific herring compare in terms of reproductive investment and adult body growth?	<b>Mitsutaku Makino</b> A social-ecological approach for the full utilization of pelagic species alternation around Japan
16:20	<b>William J. Sydeman</b> Non-fishery collapse of northern anchovy in California: Climatic and biotic hypotheses	<b>Andres Ospina-Alvarez</b> Designing a reproductive resilience index for small pelagic fish in the southern Humboldt Current Upwelling Ecosystem	Panel Discussion
16:40	<b>Romeo Saldívar-Lucio</b> Primary productivity contribution to climate-catch models of Pacific sardine	<b>Jose-María Quintanilla</b> Comparative early life trophodynamics and larval growth of Alborán Sea sardine environmentally distinct larval habitats (Bays of Málaga and Almería) ( <i>Sardina pilchardus</i> ) (W Mediterranean)	
17:00	<b>Doug Hay</b> Temporal changes in size-at-age: Impact and implications on reproductive biology and egg density of Pacific herring in British Columbia	<b>Betsy Buitrón</b> Reproduction history of Peruvian anchovy and its relationship with environmental changes 1961 - 2015	
17:20	<b>Sourav Maity</b> Exceptional fish beaching off Arthungal, Alappuzha, along the southwest coast of India: Search for the possible cause	<b>Fabian Zimmermann</b> Drivers of recruitment dynamics in northeast Atlantic pelagic fish stocks	
17:40	<b>Momodou S. Jallow</b> (cancelled) Impact of climate change on the population of SPF resources of the Gambia	<b>Sandra Emry</b> (cancelled) Site specific and inter-annual variation (2013-2016) in growth rates and jellyfish predation of larval Pacific Herring ( <i>Clupea pallasii</i> ) on British Columbia's (Canada) Central Coast	
18:00	<b>Session 1, Day 2 ends</b>	<b>Session 2, Day 2 ends</b>	<b>Session 6 ends</b>

# Schedule at a Glance, March 8

## Plenary

9:00 **Ryan R. Rykaczewski (General Plenary)**  
Climate impacts on upwelling and the planktonic prey of anchovy and sardine in eastern boundary currents

9:35 **Reidar Toresen (Plenary S4)**  
Methods for assessment of small pelagic fish populations, - do we cope with it?

10:10 *Coffee/Tea Break*

<b>S1, Day 3 (Lecture Theatre)</b> <i>Environmental control of spatio-temporal changes in population size, distribution and migration of small pelagic fish in the ecosystem context</i>		<b>S2, Day 3 (Oak Bay Room)</b> <i>External drivers of change in early life history, growth and recruitment processes of small pelagic fish</i>		<b>S4 (Esquimalt Room)</b> <i>Comparison of methods for assessment of small pelagic fish populations</i>	
10:30	<b>Introduction by Convenors</b>	<b>Introduction by Convenors</b>		<b>Introduction by Convenors</b>	
10:40	<b>Vanessa Izquierdo-Peña</b> Revisiting the regime problem hypothesis: 25 years later	<b>Myron Peck</b> Physiological modelling of the foraging and growth of early life stages of small pelagic fish: Fish don't eat temperature		<b>James Ianelli (Invited)</b> Successful management of small pelagics within a large international region: The case for collaborative assessment work within the recently formed South Pacific Regional Fisheries Management Organization	
11:00	<b>Shuyang Ma</b> Variations in the catches of small pelagic fishes from China seas and their responses to climatic regime shifts	<b>Marion Claireaux</b> Is fishing driving energy acquisition and allocation changes in the Norwegian Spring-Spawning herring?			
11:20	<b>Aida Sartimbul</b> Catch dynamics of small pelagic fishes in Bali Strait and South Java Sea in relation to the climatic regime shift: Case study on <i>Sardinella lemuru</i>	<b>Leonardo Castro</b> Variations in vertical distribution of anchoveta eggs under contrasting spawning habitat characteristics: An environmental or maternal effect?		11:10	<b>Sherri C. Dressel and Jaclyn S. Cleary</b> Assessment of Pacific herring ( <i>Clupea pallasii</i> ) populations in the northeast Pacific Ocean
11:40	<b>Mutiara R. Putri</b> The influence of ocean dynamics and climate changes on the Lemuru ( <i>Bali Sardinella</i> ) abundance in the Bali Strait, Indonesia	<b>Hwahyun Lee</b> Observed pattern of diel vertical migration of Pacific mackerel larvae and its implication for spatial distribution off the Korean Peninsula		11:30	<b>Douglas P. Swain</b> Incorporating time-varying fishery catchability in assessment models for Atlantic herring ( <i>Clupea harengus</i> )
12:00	<b>Miguel Ñiquen</b> Size structure based associations between anchoveta and other pelagic resources in Peruvian waters	<b>Patricia M. Ayón</b> Distribution of anchovy and sardine eggs and larvae in the Humboldt Current System of Peru from 1960-2014: Implications for fish abundance and reproduction		11:50	<b>Divya A. Varkey</b> Length-based assessment method for data-limited fisheries of small pelagic species
12:20	<b>Lunch</b>	<b>Guðmundur J. Óskarsson</b> Development and nature of widespread and long-lasting <i>Ichthyophonus hoferi</i> outbreak in Icelandic summer-spawning herring		12:10	<b>John T. Trochta</b> Insights into the recovery of Atlantic and Pacific herring following population collapse
		12:40	<b>Lunch</b>	12:30	<b>Lunch</b>
14:00	<b>Brian P.V. Hunt</b> Energy transfer efficiency from zooplankton to forage fish over a eutrophic to oligotrophic gradient in global pelagic food-webs	<b>Sebastián Vásquez</b> A space oddity: The case of the anchoveta ( <i>Engraulis ringens</i> ) in southern Humboldt Current system		<b>Geneviève Nessler</b> Evaluating the performance of production models with time-varying parameters for assessing small pelagic fish in dynamic ecosystems	

## Schedule at a Glance, March 8

S1, Day 3		S2, Day 3	S4
14:20	<b>Pablo Brosset</b> Small pelagic fish in the Mediterranean Sea: Alarming body condition and size decline during the last decades	<b>Guillermo Boyra</b> Spatial dynamics of juvenile anchovy in the Bay of Biscay	<b>Zacharie Sohou</b> <i>(by Victor O. Okpeitcha)</i> Pelagic fish resources stocks assessment in southern part of the Gulf of Guinea: Benin Continental Shelf
14:40	<b>George Triantafyllou</b> A full-life-cycle multispecies IBM for Mediterranean small pelagic fish	<b>Timothée Brochier</b> Climate change scenario experiments predict a future reduction in small pelagic fish recruitment in the Humboldt Current System	<b>Stephani Zador</b> A new view on forage fish trends in relation to environmental conditions in the Gulf of Alaska
15:00	<b>Claire Saraux</b> Population changes in small pelagic fish of the Gulf of Lions: A bottom-up control?	<b>W. Scott Pegau</b> Herring research and monitoring in Prince William Sound, Alaska	<b>Matthew Baker</b> Pacific sand lance – Assessment of benthic habitat, population structure, abundance, distribution and response to environmental drivers in the San Juan Archipelago
15:20	<b>Nikolaos Nikolioudakis</b> Spatio-temporal modelling of Northeast Atlantic mackerel ( <i>Scomber scombrus</i> ) distribution: Introducing estimates of uncertainty and going beyond ‘visual’ correlations	<b>Daigo Kamada</b> Diet characterization and link between feeding success and recent growth of capelin ( <i>Mallotus villosus</i> ) during early ontogeny	<b>Emily M. Liljestrand</b> Estimating migration and mortality of adult Atlantic menhaden with data from a large-scale mark-recapture study
15:40	<b>Coffee/Tea Break</b>	<b>Coffee/Tea Break</b>	<b>Coffee/Tea Break</b>
16:00	<b>Jürgen Alheit</b> Ocean-atmosphere interactions related to the AMO caused simultaneous ‘regime shift’-like changes in ecosystems of eastern North Atlantic and Mediterranean in the mid-1990s	<b>Franziska Bills</b> Exploring the microzooplankton-ichthyoplankton link: A combined field and modeling study of Atlantic herring ( <i>Clupea harengus</i> ) in the Irish Sea	<b>Martin A. Pastoors</b> New insights into small pelagics from industry self-sampling in Europe, West-Africa and the South Pacific
16:20	<b>Maite Erauskin</b> Will climate change impact the anchovy spawning habitat in the Bay of Biscay?	<b>Quentin Queiros</b> Mechanisms underlying bottom-up controls of small pelagics in the Gulf of Lions through experimental studies	<b>Andrés Uriarte</b> <i>(cancelled)</i> Monitoring by direct surveys and integrated assessment of the Bay of Biscay anchovy (1989-2016) for the provision of management advice
16:40	<b>Piera Carpi</b> Storytelling based on a data limited situation: Dynamics of a small pelagic community in the Northeast Atlantic	<b>Sachihiko Itoh</b> Modeling large-amplitude recruitment variability of small pelagic fish	<b>David A. Demer</b> Use of a potential habitat model to sample Pacific sardine abundance
17:00	<b>Anna H. Olafsdottir</b> Expansion of Northeast Atlantic mackerel ( <i>Scomber scombrus</i> ) in the Nordic seas from 2007 to 2015 in relation to stock size and environmental conditions	<b>Matthias Paulsen</b> Stepping forward in understanding recruitment variability of western Baltic herring	<b>Wade D. Smith</b> Discerning connectivity and natal fidelity of Pacific herring ( <i>Clupea pallasii</i> ): Inferences on population structure from otolith chemistry
17:20	<b>Geir Huse</b> Norwegian spring spawning herring migration and feeding at the Arctic front	<b>Jennifer Boldt</b> Juvenile Pacific Herring ( <i>Clupea pallasii</i> ) trophic linkages in the Strait of Georgia, British Columbia	<b>Concluding remarks by Convenors</b>
17:40	<b>Svein Sundby</b> Multidecadal climate signal and its association with the Nordic Seas pelagic fish complex and their zooplankton prey	<b>Concluding remarks by Convenors</b>	<b>Session 4 ends</b>
18:00	<b>Session 1, Day 3 ends</b>	<b>Session 2 ends</b>	

## Schedule at a Glance, March 9

### Plenary

- 9:00 **Sophie Bertrand (Plenary S3)**  
How much, where and when? A seabird eye-view on forage fish dynamics and management
- 9:35 **Kwame A. Koranteng (Plenary S5)**  
Will ecosystem approach to fisheries improve our understanding of, and ability to manage, human impacts on variable fish populations?
- 10:10 **Coffee/Tea Break**

<b>S3, Day 1 (Lecture Theatre)</b> <i>The role of small pelagic fish in food web dynamics between plankton and top predators</i>		<b>S5 (Oak Bay Room)</b> <i>Future challenges for ecosystem-based management of highly variable fish populations</i>
10:30	<b>Introduction by Convenors</b>	<b>Introduction by Convenors</b>
10:40	<b>Susana Garrido (Invited)</b> To eat, to be eaten, and a lot of questions: Understanding the trophic ecology of small pelagic fish	<b>Verena Trenkel (Invited)</b> What are the challenges for ecosystem-based management of highly variable fish populations?
11:10	<b>Marta Albo-Puigserver</b> Ecological and functional role of key fish species from the pelagic community of the Mediterranean Sea	<b>Timothy Essington</b> Economic benefits from ecosystem-based forage fish management depends on fishing history
11:30	<b>Arezoo Vahabnezhad</b> Food web structure and small pelagic fish interactions in the Caspian Sea ecosystem, Iranian waters	<b>Szymon Surma</b> A reassessment of carrying capacity estimates for Northeast Pacific herring stocks
11:50	<b>Piotr Margonski</b> Feeding conditions for small pelagic fish in the southern Baltic Sea based on the long-term analyses of the zooplankton abundance and community structure changes in response to various environmental stressors	<b>Gustavo F. Carvalho-Souza (by Francisco Baldó)</b> Natural and anthropogenic factors in the Guadalquivir estuary affect the abundance of anchovy in the Gulf of Cadiz (SW Spain)
12:10	<b>Paul Kotterba</b> Atlantic herring <i>Clupea harengus</i> within the coastal food web of shallow inshore waters	<b>Rosamma Stephen</b> Factors for the fluctuations in the catches of oil sardine and Indian mackerel along southwest coast of India: Perspectives of fishery scientists and fishermen
12:30	<b>Lunch</b>	<b>Lunch</b>
14:00	<b>Cecilia E.K. Kvaavik</b> Trophic interactions of Atlantic mackerel ( <i>Scombrus Scomber</i> ) and herring ( <i>Clupea harengus</i> ) on the Icelandic shelf – A study of diet using stable nitrogen and carbon isotopes	<b>Isaac C. Kaplan</b> A multi-model approach to understanding the role of Pacific sardine in the California Current food web
14:20	<b>Tore Johannessen</b> Overfishing of planktivorous fishes may result in smaller plankton and less efficient energy flow to higher trophic levels	<b>Margaret C. Siple</b> Evaluating harvest strategies for small pelagic fish



## Schedule at a Glance, March 9

	<b>S3, Day 1</b>	<b>S5</b>
14:40	<p><b>Daigo Kamada</b> Pre-wintering adult capelin (<i>Mallotus villosus</i>) feeding dynamics off the northeast coast of Newfoundland and Labrador</p>	<p><b>Laura E. Koehn</b> Evaluating alternative forage fish harvest control rules from a seabird perspective</p>
15:00	<p><b>Andrew Bakun</b> A potential role of small pelagic fishes in combating dynamic deoxygenation occurring within intensified upwelling circulations</p>	<p><b>Mariano Gutierrez</b> A claim for precautionary adaptive management in upwelling systems. The case of Peruvian anchovy (<i>Engraulis ringens</i>) fishery</p>
15:20	<p><b>Arnaud Bertrand</b> The paradox of fish abundance in the Northern Humboldt Current system: Why is it so productive?</p>	<p><b>Filomena Vaz-Velho</b> The importance of fisheries independent surveys for an ecosystem approach to management of small pelagic fisheries</p>
15:40	<i>Coffee/Tea Break</i>	<i>Coffee/Tea Break</i>
16:00	<p><b>Sergio Neira</b> Ecosystem role of <i>Sprattus fuegensis</i> and impacts of its exploitation on the sustainability of other fishery resources</p>	<p><b>Nis Sand Jacobsen</b> The contribution of natural mortality to the decline and recovery in forage fish</p>
16:20	<p><b>Yuji Okazaki</b> Long-term changes in prey items of larvae and juveniles of two clupeoid species in the Kuroshio-Oyashio transition region</p>	<p><b>Andrés Uriarte</b> Managing the Bay of Biscay anchovy: Fishery requirements vs sustainability given recruitment uncertainty</p>
16:40	<p><b>James J. Ruzicka</b> Do jellyfish blooms affect small pelagic fishes in coastal marine environments?: A comparative analysis of three coastal ecosystems</p>	<p><b>Szymon Smoliński</b> Incorporation of environmental drivers in the prediction of pelagic stocks recruitment in the Baltic Sea using random forest algorithms</p>
17:00	<p><b>Mary Hunsicker</b> <i>(by Richard Brodeur)</i> Effects of warming ocean conditions on feeding ecology of small pelagic fishes in coastal ecosystems</p>	<p><b>Ruben Alarcón</b> Ecosystem impacts of applying single-species versus multiple-species MSY in the Patagonian sprat fishery (<i>Sprattus fuegensis</i>) in the inner sea ecosystem of southern Chile</p>
17:20	<p><b>Kym C. Jacobson</b> Using trophically transmitted parasites to help understand the role and dynamics of small pelagic fish in the California Current</p>	<p><b>Sonia Sánchez</b> Management strategy evaluation for the Bay of Biscay anchovy long term management plan definition</p>
17:40	<p><b>Evgeny Pakhomov</b> Feeding dynamics of Pacific herring (<i>Clupea pallasii</i>) in the northeastern Pacific coast of Canada</p>	<p><b>Aziza Lakhnigie</b> More than fifteen years of collaboration on the assessment of small pelagic fish off Northwest Africa: Lessons learned and future perspectives</p>
18:00	<b>Session 3, Day 1 ends</b>	<b>Session 5 ends</b>

## Schedule at a Glance, March 10

<b>S1, Day 4 (Lecture Theatre)</b> <i>Environmental control of spatio-temporal changes in population size, distribution and migration of small pelagic fish in the ecosystem context</i>		<b>S3, Day 2 (Oak Bay Room)</b> <i>The role of small pelagic fish in food web dynamics between plankton and top predators</i>	
9:00	<b>Emanuele Di Lorenzo</b> Tendency for climate synchrony and amplification in global fish populations	<b>Szymon Surma</b> Whale population recovery and forage fish in a Northeast Pacific ecosystem	
9:20	<b>Tatsuya Sakamoto</b> Reproducing migration history of Japanese sardine using otolith $\delta^{18}\text{O}$ and a data assimilation model	<b>Tamsyn Tyler</b> The feeding ecology of mesopelagic fishes ( <i>Lampanyctodes hectoris</i> and <i>Maurolicus walvisensis</i> ) off the South African west coast: A comparative analysis using stable isotope and dietary data	
9:40	<b>Hiroaki Saito</b> A story starting from the wind: A synthesis of the collapse of Japanese sardine stock	<b>William J. Sydeman</b> Small pelagics fisheries competition with seabirds: Review and application	
10:00	<b>Andrey S. Krovnin</b> Prospects of a new “sardine epoch” in the Northwest Pacific	<b>Julie A. Thayer</b> Predator forage needs: Comparison and synthesis of bioenergetic and numerical response models	
10:20	<b>Marek Ostrowski</b> From physical mechanisms to natural fluctuations of small pelagic fishes: The Angolan upwelling scenario	<b>Maite Louzao</b> Understanding pelagic seabird 3D environment from multidisciplinary oceanographic cruises	
10:40	<i>Coffee/Tea Break</i>	<i>Coffee/Tea Break</i>	
11:00	<b>Andreia V. Silva</b> Patterns in chub mackerel abundance and distribution in relation to environmental conditions	<b>Laura Wise</b> Portuguese purse seine fishery spatio-temporal overlap with top predators	
11:20	<b>Najib Charouki</b> Spatial time series analysis of the small pelagic fish on the shelf north of Cap Blanc within its upwelling ecosystem	<b>Róisín Pinfield</b> Biology and ecology of killer whales ( <i>Orcinus orca</i> ) foraging around pelagic trawlers in the northeast Atlantic	
11:40	<b>Alexandra Silva</b> Demographic connectivity of sardine in the Bay of Biscay and Iberian coast region	<b>Anders Frugård Opdal</b> Unclear associations between pelagic fish and jellyfish in four major marine ecosystems	
12:00	<b>Timothée Brochier</b> Population traits in small pelagic fish model: Emergence from interactions between a turbulent upwelling environment and individual behaviors in upwelling systems	<b>Richard D. Brodeur</b> Predation impact by juvenile salmon on early life stages of anchovy in the eastern North Pacific Ocean	
12:20	<b>Concluding remarks by Convenors</b>	<b>Concluding remarks by Convenors</b>	
12:30	<b>Session 1 ends</b>	<b>Session 3 ends</b>	

## Schedule at a Glance, March 10

### Plenary

14:00 **Session Summaries and General Discussion**

Ryan Rykaczewski (S1)

Susana Garrido (S2)

Arnaud Bertrand (S3)

***Coffee/Tea Break***

James Ianelli (S4)

Merete Tandstad (S5)

Maroes Kraan/Yoshioki Oozeki (S6)

17:00 **Closing Ceremony and Presentation of Awards**

## Schedule at a Glance, March 11

<b>W1 (Saanich 1 Room)</b> <i>Environmental control of spatio-temporal changes in population size, distribution and migration of small pelagic fish in an ecosystem context</i>		<b>W2 (Oak Bay 1 Room)</b> <i>Methods and techniques for sampling and assessing small pelagic fish populations</i>	
9:00	<b>Introduction by Convenors</b>	9:00	<b>Introduction by Convenors</b>
9:20	Statistical aspects <b>Roy Mendelssohn (Invited)</b> Easy access to environmental data for analyzing environmental drivers of the dynamics of small pelagic fish	9:10	<b>Timothy Essington (Invited)</b> Delayed detection of productivity declines amplifies forage fish population collapses
		9:30	<b>Sherri C. Dressel and Jaclyn S. Cleary</b> Assessment of Pacific herring ( <i>Clupea pallasii</i> ) populations in the northeast Pacific Ocean
		9:40	<b>Andrés Uriarte</b> BIOMAN: Anchovy DEPM surveys in the Bay of Biscay from 1987 to 2016
		9:50	<b>Matt Wilson</b> Recruitment Processes Alliance research on age-0 juvenile Walleye Pollock in the Gulf of Alaska and eastern Bering Sea
10:00	Impact of decadal and multi-decadal climate variability, large-scale current changes and fishing	10:00	<b>Leandra de Sousa</b> Methods and techniques for sampling and assessing Arctic Cod in the Chukchi Sea
		10:10	Brief overviews on sampling programs/assessments
10:40	<b>Coffee/Tea Break</b>	10:40	<b>Coffee/Tea Break</b>
11:00	Impact of decadal and multi-decadal climate variability, large-scale current changes and fishing ( <i>cont.</i> )	11:00	Discussion and Summary
11:30	Break-out groups		
12:20	<b>Lunch</b>		
		12:30	<b>Workshop 2 ends</b>

## Schedule at a Glance, March 11

<b>W4 (Esquimalt Room)</b> <i>Modeling migratory fish behavior and distribution</i>		<b>W6 (Oak Bay 2 Room)</b> <i>Remote sensing and ecology of small pelagics</i>	
9:00	<b>Introduction by Convenors</b>		
9:10	<b>Akinori Takasuka (Invited)</b> Reaching consensus on the growth–survival paradigm in early life stages of fish	9:30	<b>Introduction by Convenors</b>
9:50	<b>Geir Huse (Invited)</b> Individual based modeling of fish migration and distribution	9:40	<b>Daniel Pauly (Invited)</b> Mapping small pelagics, fisheries and the primary production they require
10:30	<b>Coffee/Tea Break</b>	10:20	<b>Grinson George</b> Inter-annual variability in <i>Sardinella longiceps</i> in response to ENSO event in the coastal waters of India
10:50	<b>Hitomi Oyaizu</b> Modeling effects of weight and growth rate on the recruitment variability of Pacific saury ( <i>Cololabis saira</i> )	10:40	<b>Coffee/Tea Break</b>
11:10	<b>Shin-ichi Ito</b> Challenges for modeling migratory fish behavior and distribution: An example in the western North Pacific	11:00	<b>Renato A. Quiñones (Invited)</b> Inter-annual variability of upwelling, nutrients and planktonic community net metabolism in the southern Humboldt Current System: Management implications for pelagic fisheries
11:30	Discussion	11:40	Discussion: Developing a remote sensing and fisheries community
12:30	<b>Workshop 4 ends</b>	12:30	<b>Lunch</b>

## Schedule at a Glance, March 11 (cont.)

<b>W1 (cont.) (Saanich 1 Room)</b> <i>Environmental control of spatio-temporal changes in population size, distribution and migration of small pelagic fish in an ecosystem context</i>		<b>W7 (Oak Bay 1 Room)</b> <i>Simulation approaches of forage fish populations for management strategy evaluations</i>	
14:00	Fish scale records	14:00	Workshop overview, scope, and purpose Talks on simulation methods (15 mins each)
		14:15	<b>André E. Punt (Invited)</b> Characterizing small pelagic fishes in management simulations: Examples from the US West Coast and South Africa
14:30	Hypotheses on (i) synchrony of small pelagic populations in different ecosystems and (ii) anchovy/sardine alternations	14:30	<b>Nis S. Jacobsen (Invited)</b> Predicting temporal mortality changes from size structure
		14:45	<b>Jin Gao (Invited)</b> Simulating forage fish dynamics for MSE: A nonlinear forecasting perspective
		15:00	Breakout discussion (small groups)
15:40	<b>Coffee/Tea Break</b>		
16:00	Impact of climate change, projections, forecasts, future states	16:00	<b>Coffee/Tea Break</b>
16:40	Break-out groups	16:20	Groups report back to whole workshop; further discussion
		17:20	Concluding remarks by Convenors
17:40	Wrapping-up, publications	17:30	<b>Workshop 7 ends</b>
18:00	<b>Workshop 1 ends</b>		

## Schedule at a Glance, March 11 (cont.)

<b>W5 (Esquimalt Room)</b> <i>Recent advances in the life stage ecophysiology of small pelagic fish: Linking laboratory, field and modeling studies</i>		<b>W6 (Oak Bay 2 Room)</b> <i>Remote sensing and ecology of small pelagics</i>	
14:00	<b>Introduction by Convenors</b>	14:00	<b>Jose A. Fernandes (Invited)</b> Prediction of species distribution and abundance using high quality satellite products in combination with Bayesian networks
14:05	<b>Martin Hurrett (Invited)</b> <i>(by Pierre Petitgas)</i> Bioenergetics modelling to advance knowledge on life history traits and population dynamics of small pelagic fish: Illustration with anchovy and sardine in the Bay of Biscay and beyond		
14:40	<b>Paul Gatti</b> Calibration of the DEB model for small pelagics. What data is needed and at which timescale?	14:40	<b>Nandini Menon N</b> Application of phytoplankton biomass as an aid in management of marine resources of the southeastern Arabian Sea
14:55	<b>Eneko Bachiller</b> Bioenergetics modeling of the annual consumption of zooplankton by pelagic fish feeding in the Norwegian Sea		
15:10	<b>Laure Pecquerie</b> Combining lab and bioenergetic modelling approaches to better reconstruct growth from otoliths of <i>Sardina pilchardus</i> larvae	15:00	<b>Coffee/Tea Break</b>
15:25	<b>Myron Peck</b> Ecophysiological models of foraging and growth of small pelagic fish: Progress and challenges	15:20	Discussion: Planing for a symposium on remote sensing and fisheries
15:40	<b>Coffee/Tea Break</b>		
16:00	Discussion / data overview / manuscript planning DEB Growth allocation modelling Stage-specific Ecophysiology Review	16:20	Concluding remarks by Convenors
17:10	Final summary – next steps (report/work/publication(s))	16:30	<b>Workshop 6 ends</b>
17:30	<b>Workshop 5 ends</b>		

## POSTERS

### SESSION 1: Environmental control of spatio-temporal changes in population size, distribution and migration of small pelagic fish in the ecosystem context

- S1-P1      **Kinsey Frick**  
Spatial and temporal variability in nearshore forage fish communities in the Strait of Juan de Fuca
- S1-P2      **Anna N. Kagley**  
(cancelled) Nearshore forage fish populations in the context of Elwha River dam removals
- S1-P3      **Alba Jurado-Ruzafa (by M. Teresa García Santamaría)**  
Seasonal evolution of oceanographic parameters in relation to *Trachurus picturatus* landings index in Tenerife (the Canary Islands, Spain)
- S1-P4      **Eleuterio Yáñez**  
Climate change and pelagic fisheries predictions in Chile (CLIPESCA)
- S1-P5      **Anthony B. Ndah**  
(cancelled) Multi-temporal Analysis of Upwelling/Downwelling Dynamics in the South China Sea and potential implications for coastal fisheries
- S1-P6      **Josephine Dianne L. Deauna**  
The effect of wind strength and variability on the Dipolog–Sindangan Bay upwelling system, Philippines
- S1-P7      **José Carlos Báez (by M. Teresa García Santamaría)**  
Influence of the climatic oscillations on the sardine off Northwest Africa during the period 1976-2014
- S1-P8      **Fatima Whabi**  
(cancelled) Age and growth of Atlantic horse mackerel *Trachurus trachurus* (Linnaeus, 1758) in Morocco's Atlantic region
- S1-P9      **Guðmundur J. Óskarsson**  
Quantification and causes of two incidents of fish kill of Icelandic summer-spawning herring (*Clupea harengus*) in the winter 2012/2013
- S1-P10     **Christina Bourne**  
Using otolith shape analysis to quantify changes in stock distribution and migration of Atlantic herring in Newfoundland
- S1-P11     **Alba Jurado-Ruzafa (by M. Teresa García Santamaría)**  
Seasonal evolution of oceanographic parameters in relation to small pelagic fish landings index in the Canary Islands (Spain) from 2009 to 2015
- S1-P12     **Athanassios C. Tsikliras**  
(cancelled) Synchronization of the mean temperature of the pelagic catch (MTpC) with North Atlantic climate variability
- S1-P13     **Dorothee Moll**  
Estimating the contribution of single nursery areas to the overall herring (*Clupea harengus*) population in the western Baltic Sea by otolith chemistry
- S1-P14     **Vanessa Izquierdo-Peña**  
Geographic detection of the Regime signature
- S1-P15     **Fran Mowbray**  
Distribution shifts of capelin (*Mallotus villosus*) and arctic cod (*Boreogadus saida*) in the Northwest Atlantic and consequences for regional productivity



- S1-P16 **Alexandra Silva**  
(March 10, talk, 11:40) Demographic connectivity of sardine in the Bay of Biscay and Iberian coast region
- S1-P17 **Ian S.F. Jones**  
Enhancing the pelagic fish catch in regions adjacent to ocean upwelling fisheries
- S1-P18 **Gertrudes Luque**  
Spatial and temporal variability of the North Humboldt Current System upwelling front and its influence on small pelagic resources distribution
- S1-P19 **Jose A. Valencia-Gasti**  
The sardine population in northwestern Mexico: Current state
- S1-P20 **Sourav Maity**  
Categorizing ecological indicators for predicting Hilsa shad (*Tenualosa Ilisha*) abundance in northern Bay of Bengal
- S1-P21 **Elena Ustinova (by Svetlana Naydenko)**  
Oceanographic conditions and spatial distribution, migration patterns and fishing grounds for saury, sardine and mackerels in the Northwest Pacific
- S1-P22 **Omar Ettahiri (by Najib Charouki)**  
Spatial patterns diversity of copepods under coastal upwelling variability off North West African Ecosystem
- S1-P23 **Santiago Montealegre-Quijano**  
(cancelled) Drivers of inter-annual variability in the abundance of the Broadband Anchovy *Anchoviella lepidentostole* in Southeast Brazil
- S1-P24 **Miguel Ñiquen**  
(March 8, talk, 12:00) Size structure based associations between anchoveta and other pelagic resources in Peruvian waters
- S1-P25 **Kirstin Holsman**  
Evaluating spatial patterns in foraging landscapes and energetics; (part 2) modeling projections for pollock under future scenarios.
- S1-P26 **Elizabeth Siddon**  
(cancelled) Evaluating spatial patterns in foraging landscapes and energetics (part 1): empirical observations for pollock across a long-term time series from the eastern Bering Sea

**SESSION 2: External drivers of change in early life history, growth and recruitment processes of small pelagic fish**

- S2-P1 **Matt Wilson**  
Geographic and temporal variation in elemental composition of age-0 walleye pollock (*Gadus chalcogrammus*) otoliths in the western Gulf of Alaska, September 2007 and 2011
- S2-P2 **W. Scott Pegau**  
(March 8, talk, 15:00) **(Poster & Talk)**  
Herring research and monitoring in Prince William Sound, Alaska
- S2-P3 **Yasuhiro Kamimura**  
Effects of density dependence in growth and condition factor on pre-recruit chub mackerel *Scomber japonicus*

- S2-P4 **Marta Albo-Puigserver**  
Bioenergetics of European sardine: simulating environmental influences on population dynamics in the western Mediterranean Sea
- S2-P5 **Fletcher Sewall**  
Empirically-based models of oceanographic and biological influences on Pacific Herring recruitment in Prince William Sound
- S2-P6 **Alexandra A. Bagarinao**  
Inter-annual variability in early life growth of the Bali sardine, *Sardinella lemuru*, caught off the northern Zamboanga Peninsula and the role of environmental factors
- S2-P7 **Francisco Cerna**  
Testing the growth-survival relationship in the anchovy (*Engraulis ringens*) in northern Chile
- S2-P8 **Samuel Soto**  
Modeling the transport of eggs and larvae of anchoveta (*Engraulis ringens*) during the spawning season in the inland sea of Chiloé, Northern Patagonia
- S2-P9 **Sara Malavolti**  
Distribution of European anchovy, *Engraulis encrasicolus*, eggs and larvae in relation to environmental conditions in the south-western Adriatic Sea
- S2-P10 **Jorge Castillo**  
Environmental conditions for anchovy and common sardine recruitment in central-southern Chile (33°-40°S) between 1987 and 2013
- S2-P11 **Moagabo Natalie Ragoasha**  
(cancelled) The interannual and intraseasonal variability of Lagrangian transport in the southern Benguela
- S2-P12 **Hitomi Oyaizu**  
Modeling effects of weight and growth rate on the recruitment variability of Pacific saury (*Cololabis saira*)
- S2-P13 **Brian P.V. Hunt**  
Comparison of muscle and scale isotope signatures of Pacific Herring (*Clupea pallasii*), and their application in regional life history studies in British Columbia (Canada)
- S2-P14 **Brendan D. Turley**  
Reconsidering evidence for the optimal environmental window in the southern Benguela
- S2-P15 **Khadija Amenzoui**  
(cancelled) Reproduction, age and condition factor (K) of *Sardina pilchardus* (Walbaum, 1792) in the Atlantic Moroccan
- S2-P16 **S. M. Nurul Amin**  
Population Dynamics of Devis' Anchovy, *Encrasicholina devisi* (Whitley, 1940) in Pitas Waters of Marudu Bay, Sabah, Malaysia
- S2-P17 **Hannah Murphy**  
A re-evaluation of the drivers of recruitment variability in capelin (*Mallotus villosus*)
- S2-P18 **Enrique Gonzalez-Ortegon (by Francisco Baldó)**  
Modelling the effect of environmental and anthropogenic factors on the abundance of early life-history stages of the European sardine in the Guadalquivir estuary

**SESSION 3: The role of small pelagic fish in food web dynamics between plankton and top predators**

- S3-P1 **Svetlana Naydenko**  
Food web changes in epipelagic nektonic communities of the Northwest Pacific
- S3-P2 **Joanna Calkiewicz**  
Zooplankton Mean Size and Total Stock (MSTS) indicator applied for testing the feeding conditions of small pelagic fish in the southern Baltic Sea
- S3-P3 **José-María Quintanilla**  
Diel variability of the diet of *Sardina pilchardus* larvae in Málaga Bay (Alboran Sea, SW Mediterranean)
- S3-P4 **Marta Albo-Puigserver**  
Colonizing new habitats and meeting new neighbors: trophic relationships between the expanding round sardinella and coexisting small pelagic fish in the NW Mediterranean Sea
- S3-P5 **Yunrong Yan**  
Function of the small pelagic fishes in the marine food web dynamics of the Beibu Gulf, South China Sea
- S3-P6 **Claudia Günther**  
Temperature and size-dependent functional response of *Sprattus sprattus* L.
- S3-P7 **Shingo Watari**  
Ecosystem modeling in the western North Pacific with a focus on small pelagic fish
- S3-P8 **Mayumi Arimitsu**  
Jellyfish blooms in warm water may signal trouble for forage fish in a warming climate
- S3-P9 **John Moran**  
Humpback whales ruin a perfectly good overwintering strategy for Pacific herring in Alaska
- S3-P10 **Alexandra Silva**  
The role of small pelagic fish in the western Iberian upwelling ecosystem
- S3-P11 **Aida Sartimbul**  
Seasonal variation of Omega-3 content from Bali Sardines catch in Bali Strait and its drivers
- S3-P12 **Tore Johannessen**  
Predator-prey synergism – A novel perspective in ecology
- S3-P13 **Julie A. Thayer**  
(cancelled) Are Northern Anchovy Caught in a “Predator Pit”?
- S3-P14 **James J. Ruzicka**  
(March 9, talk, 16:40) **(Poster & Talk)**  
Do jellyfish blooms affect small pelagic fishes in coastal marine environments?:  
A comparative analysis of three coastal ecosystems
- S3-P15 **Leandra Sousa**  
The role of prey selectivity in shaping Arctic Cod distribution in the Chukchi Sea

#### **SESSION 4: Comparison of methods for assessment of small pelagic fish populations**

- S4-P1 **Martin Huret (by Pierre Petitgas)**  
Estimation of total egg production from CUFES data and comparison with acoustics: an example with anchovy and sardine in the Bay of Biscay
- S4-P2 **Aida Sartimbul**  
Morphology, meristic, and genetic approach for *Sardinella lemuru* migration in Bali Strait and South Java
- S4-P3 **Santiago Montealegre-Quijano**  
(cancelled) Reproductive biology, population dynamics and fishing of the Broadband Anchovy (*Anchoviella lepidentostole*) in Southeast Brazil
- S4-P4 **Oleg Kruchinin (by Svetlana Naydenko)**  
Technique for assessment of saury concentration in the lighted area

#### **SESSION 5: Future challenges for ecosystem-based management of highly variable fish populations**

- S5-P1 **Marta Albo-Puigserver**  
Who did it?: Assessing potential pressures on small pelagic fish populations of the NW Mediterranean Sea using a qualitative modelling approach
- S5-P2 **Aziza Lakhnigue**  
Atlantic small pelagic resources in Morocco: which place in the north-west african sub-region?

#### **SESSION 6: Small pelagic fish and humans – Social, economic and institutional dimensions**

- S6-P1 **Dmytro Khrystenko**  
Stocks, harvest and potential use of Black and Caspian Sea sprat *Clupeonella cultriventris* in the Dnieper River Basin, Ukraine
- S6-P2 **Manuel Muntoni**  
Small vs Big: Lessons from small-scale small pelagic fisheries facing global changes
- S6-P3 **Luis Gallardo**  
Growth opportunities for artisanal fisheries in México
- S6-P4 **Aurelie Cosandey-Godin**  
How well does Canada manage forage fish fisheries?
- S6-P5 **Asuncion B. De Guzman**  
Interannual Variability in Sardine Fisheries in the Northern Zamboanga Peninsula, Philippines: Understanding Human-Environment Synergy in Sustainable Fisheries Management

#### **WORKSHOP 5: Recent advances in the life stage ecophysiology of small pelagic fish: Linking laboratory, field and modeling studies**

- W5-P1 **Shin-ichi Ito**  
Biological parameter estimation for a bioenergetics model of chub mackerel (*Scomber japonicus*)

## Upcoming International Events

### **31st Wakefield Symposium**

#### **Impacts of a Changing Environment on the Dynamics of High-latitude Fish and Fisheries**

May 9–12, 2017, Anchorage, Alaska, USA

<https://seagrant.uaf.edu/conferences/2017/wakefield-fish-dynamics/>

### **ESSAS Open Science Meeting on Subarctic and Arctic Science**

#### **Moving in, out, and across Arctic and Subarctic Marine Ecosystems: Shifting Boundaries of Water, Ice, Flora, Fauna, People and Institutions**

June 11-15, 2017, Tromsø, Norway

[http://www.imr.no/essas/international\\_conference\\_on\\_subarctic\\_and\\_arctic\\_science/en](http://www.imr.no/essas/international_conference_on_subarctic_and_arctic_science/en)

### **2017 ICES Annual Science Conference**

September 18–21, 2017, Fort Lauderdale, FL, USA

<http://ices.dk/news-and-events/asc/ASC2017/Pages/default.aspx>

### **PICES-2017 Annual Meeting**

#### **Environmental Changes in the North Pacific and Impacts on Biological Resources and Ecosystem Services**

Sep 20 – Oct 1, 2017, Vladivostok, Russia

<http://www.pices.int>

### **IMBIZO V**

#### **Marine Biosphere Research for a Sustainable Ocean: Linking Ecosystems, Future States and Resource Management**

October 2–6, 2017, Woods Hole, MA, USA

### **BONUS Symposium**

#### **Science Delivery for Sustainable Use of the Baltic Sea Living Resources**

October 17–19, 2017, Tallinn, Estonia

<http://www.bonus-inspire.org/symposium>

### **International Flatfish Symposium**

November 11-16, 2017, Saint-Malo, France

<http://www.flatfishsymposium.com/international-flatfish-symposium-2017>

### **4th International Symposium**

#### **The Effects of Climate Change on the World's Oceans**

June 4-8, 2018, Washington DC, USA

<http://www.pices.int/2018-climate-change>

For detailed information visit: [www.pices.int](http://www.pices.int)

## Notes

## PRIMARY INTERNATIONAL SPONSORS



North Pacific Marine Science Organization (PICES)

International Council for the Exploration of the Sea (ICES)

## LOCAL SPONSOR



Fisheries and Oceans  
Canada

Pêches et Océans  
Canada

Fisheries and Oceans Canada (DFO)

## CO-SPONSORS



Fisheries Research Agency, Japan (FRA)

Food and Agriculture Organization of the United Nations (FAO)

General Fisheries Commission for the Mediterranean (GFCM)

The Marine Ingredients Organization (IFFO)

Institut de Recherche pour le Développement, France (IRD)

Integrated Marine Biogeochemistry and Ecosystem Research  
(IMBER)

National Marine Fisheries Service, USA (NOAA Fisheries)

North Pacific Research Board, USA (NPRB)

Scientific Committee on Oceanic Research (SCOR)

## SUPPORTING ORGANIZATIONS



Japanese Society of Fisheries Oceanography (JSFO)

Japanese Society of Fisheries Science (JSFS)

North Pacific Fisheries Commission (NPFC)

World Wildlife Fund Canada (WWF- Canada)

All images on the front cover are from the book "Mie-ken suisan zukai" (1883) and demonstrate different fishing methods for sardines: beach seine method (large panel and top left panel), purse seine method (top right panel), set net method (bottom left panel) and dip net method (bottom right panel). Authorization to reproduce these images was generously granted by the Mie Prefectural Museum (Japan).