

## REPORT OF THE ICES/PICES CONFERENCE FOR EARLY CAREER SCIENTISTS



### Background and objectives

Jointly sponsored by ICES and PICES, with generous support from the U.S. National Marine Fisheries Service and the North Pacific Research Board, the “*New frontiers in marine science*” Conference for Early Career Scientists was held from June 26–29, 2007, near Baltimore, Maryland, U.S.A. The objective of the conference was to encourage scientists who are at the beginning of their careers to share knowledge and to begin to build networks across disciplines and international borders.

The University of Maryland Center for Environmental Science (UMCES) was host to nearly 100 early career scientists from 20 nations. Participation was by invitation only, based on criteria established by the Scientific Steering Committee (SSC). Lodging and meals were provided by the organizers at no cost to all participants. In addition, travel costs were covered for approximately 40 selected scientists.

PICES SSC members were Drs. Franz Mueter (U.S.A.), Julie Keister (U.S.A.) and Sukyung Kang (Korea), and ICES SSC members included Drs. Jens Floeter (Germany) Angel Lopez-Urrutia (Spain) and Elizabeth W. North (U.S.A.). Drs. Skip McKinnell (PICES Secretariat) and Adi Kellermann (ICES Secretariat) served as coordinators for the conference. Ms. Jane Hawkey (UMCES) was responsible for local logistics and designed the conference logo. Ms. Julia Yazvenko created and maintained the conference website and the database, communicated with potential participants and convenors, and prepared (with Jane Hawkey) the book of abstracts.

The conference featured six theme sessions, for a total of 65 talks and 33 posters. Presentations spanned all of the marine science disciplines on topics ranging from estuaries to the deep ocean, and from bacteria and phytoplankton to whales and humans. Reflecting the conference’s international character, theme sessions were introduced by six keynote speakers from five nations from Europe, Asia and North America, with a mixture of senior scientists and accomplished early career scientists. The six “*New frontiers*” included:

- Biodiversity and productivity of marine organisms from pole to pole;
- Processes at ocean margins;
- The last frontier: Processes in the deep sea;
- The role of behavior in marine biological processes;
- The effect of climate on basin-scale processes and ecosystems;
- Humans and the marine environment.

In addition to the theme sessions, two workshops on “*Effective science communication*” and “*Integrated environmental assessment*” were led by staff from the UMCES Integration and Application Network. A mini-symposium on “*International and interdisciplinary collaboration*” included invitees from seven international oceanographic organizations and programs (ICES, PICES, SCOR, GLOBEC, IMBER, EUROCEANS, and EAST-1).

A brief summary of the conference was published in PICES Press (Vol. 15, No. 2, 2007). The conference was a success. Much new knowledge was gained from many excellent presentations, but the most immediate and long-lasting benefit for most participants was the development of personal and institutional contacts that will persist for decades.

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### Biodiversity and Productivity of Marine Organisms from Pole to Pole (Session 1)

Convenor: Sukyung Kang, National Fisheries Research and Development Institute, 424-1, Songhyun-ri, Sonyangmyeon, Yangyang, Gangwondo 215-821, Republic of Korea

Invited Speaker: Hyung-Chul Shin (Korea Polar Research Institute, Incheon, Republic of Korea)

#### Background

Marine biological diversity and productivity play a vital role in the global climate and carbon cycle, and provide much of the world's protein. Marine biodiversity also is recognized as an important source of medicines and raw materials. Understanding diversity and productivity is critical to the conservation and management of living marine resources. This session will address regional to large-scale patterns in diversity and productivity at all trophic levels from bacteria to marine mammals. Preference will be given to papers addressing (1) global patterns in diversity and productivity and the processes that give rise to them, (2) diversity in poorly sampled regions such as the deep sea and the polar seas, (3) effects of fisheries and climate change on marine biodiversity and ecosystem function, and (4) innovative theories, sampling techniques, indicators, and statistical models for assessing diversity and productivity.

#### Summary of presentations

Dr. Shin from the Korea Polar Research Institute gave a keynote speech. He highlighted the Antarctic marine ecosystem as a driver, detector, and depository of global changes by explaining the sensitivity of biological productivity and diversity to environmental changes in the Southern Ocean. A total of 10 oral and 6 poster presentations and heated discussions boosted the dynamic fever of the frontier spirits throughout the whole session. Session presentations covered not only the various niches of the ecosystem from the productivity and diversity of phytoplankton to those of sharks but also broad geographic diversities from Antarctica to Bering Sea and Chukchi Sea. The Session seemed to conclude that interdisciplinary collaboration of researches is the essence of the future construction to build a broad and deep marine science.

#### List of papers

##### *Oral presentations*

**Hyung Chul Shin** (Invited)

Polar marine ecosystems; driver, detector and depository of global changes and their records

**Mamoon M.D. Al-Rshaidat, Tracy A. Villareal, Heather Singler, Rob M. Sherrell and R. Michael L. McKay**

Iron physiological autecology of the vertically migrating diatoms *Ethmodiscus* spp. and *Rhizosolenia* spp. in the Central North Pacific (CNP) gyre

**A. Berenike S. Diekmann, Robert W. Campbell, Myron A. Peck and Michael A. St John**

Significance of Algal Bloom Temporal Dynamics on Zooplankton Vital Rates – Variation in diatom biochemical composition during a simulated bloom and its effect on copepod reproduction

**Susan M. Dippenaar**

The diversity of symbiotic Siphonostomatoida (Copepoda) of marine fish from southern Africa

**Yan Jiao**

Modeling population dynamics of Hammerhead Shark complex using a hierarchical Bayesian production model

**Anastasia M. Khrustaleva**

Application of microsatellite analysis to the study of the population structure and population assignment of Asian sockeye salmon (*Oncorhynchus nerka*)

**Hui Liu and Russell R. Hopcroft**

Modeling copepod growth rates in the northern Gulf of Alaska

**Kohei Mizobata and Jia Wang**

Phytoplankton Dynamics fluctuated by the Ice-Ocean Circulation in the Chukchi and Beaufort Seas

**Michelle J. Paddack**

Functional diversity in coral reef herbivores and impact upon ecosystem structure

**TaeKeun Rho, Sei-Ichi Saitoh and Terry E. Whittedge**

Spatial and temporal variation of primary production in the southeastern Bering Sea shelf: Merging field data and satellite estimates

**Sazlina Salleh and Andrew McMinn**

Effect of temperature on photoinhibition of Antarctic benthic microalgae

*Posters*

**Pedro R. Costa, Susana Garrido and Maria João Botelho**

Harmful algal bloom events and detection of marine biotoxins in sardines (*Sardina pilchardus*)

**Verena Häussermann and G. Försterra**

A hotspot in the cold – outstanding biodiversity in the Chilean Patagonian fjord region

**Angel Lopez-Urrutia, Elena San Martin, Roger P. Harris and Xabier Irigoien**

Scaling the metabolic balance of the oceans

**Sara E. Miller, James N. Ianelli and Terrance J. Quinn II**

Estimation of movement in a spatially-explicit stock assessment of Eastern Bering Sea walleye pollock (*Theragra chalcogramma*)

**Svetlana V. Pivanova and Andrey F. Petrov**

The oogenesis characteristics of Antarctic toothfish *Dissostichus mawsoni* Norman 1937 (Perciformes Nototheniidae) caught by the bottom longline in the Ross Sea

**Dace Zilniece, Maris Plikss, Danute Uzars, Didzis Ustups and Barbel Muller-Karulis**

The structure and dynamics of fish communities in the coastal zone of the central-eastern Baltic Sea

## Processes at Ocean Margins (Session 2)

Convenor: Julie Keister, College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, OR, 97331 U.S.A.

Invited Speaker: John Simpson (School of Ocean Sciences, University of Wales, Bangor, UK)

### Background

Ocean margins play a key role in the global ecosystem by supporting the majority of the world's fisheries, while being directly impacted by multiple human uses. These boundary areas are critical habitat for many species and are important in the transfer of energy and materials between oceans and continents. Ocean margins are areas where biological, physical, and chemical processes are tightly coupled and where multidisciplinary research is essential. This session aims to provide a forum for such interdisciplinary discussion and invites contributions covering all areas of nearshore and continental shelf research. Topics may include the effects of circulation on sediment transport, chemistry, and biology, interaction between estuaries and the nearshore environment, effects of river plumes on coastal oceans, characterization of the nearshore ecology and environment, ocean margin productivity, and the mechanisms of

energy transfer between the nearshore and the deep ocean. Contributions may address processes that occur on scales from tens of meters to thousands of kilometers, from the very nearshore to the continental slope region. Especially encouraged are interdisciplinary contributions.

### Summary of presentations

Dr. John Simpson of the University of Wales, Bangor (U.K.) kicked off the first session of the conference, “*Processes at Ocean Margins*” by challenging the early career scientists to continue some of his groundbreaking research on the dynamical processes that occur at the continental slope – the critical transition area between the shelf and the deep sea. The session continued with talks on physical and biological processes on mudflats, in estuaries, on rocky intertidal shores, in the transition area between the nearshore and the continental shelf, and over the shelf. Posters extended the domain seaward

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to the continental slope and shoreward into embayments. A diversity of topics was addressed. Highlights included debunked paradigms and tests

of long-standing hypotheses, demonstrating the enthusiasm, critical-thinking, and challenging nature of the conference participants.

### List of presentations

#### *Oral presentations*

**John H. Simpson** (Invited)

Transport and Mixing at the Shelf Edge: a key Challenge for Oceanographers

**Melanie J. Bishop, Brendan P. Kelaher, Ralph Alquezar, Paul H. York, Peter J. Ralph and C. Greg Skilbeck**  
Cul-de-sacs of detritus-based food-webs: large gastropods, *Pyrazus ebeninus*, short-circuit trophic transfer

**Sarah E. Dudas, Brian A. Grantham, Anthony K. Kirincich, Bruce A. Menge, Jane Lubchenco and Jack A. Barth**  
The influence of nearshore current reversals on intertidal invertebrate recruitment along the central Oregon coast

**Stephanie A. Henson and Andrew C. Thomas**  
Physical-biological interactions in the coastal Gulf of Alaska

**Yong Hoon Kim and George Voulgaris**  
Role of lateral circulation on suspended sediment transport in estuaries

**Anthony R. Kirincich and John A. Barth**  
Spatial and temporal variability of inner-shelf circulation along the central Oregon coast during summer

**Chaolun Li, Shiwei Wang, Song Sun and Bo Yang**  
Seasonal variations in reproduction of a planktonic copepod *Calanus sinicus* related to the physical and biological environments in the Yellow Sea, China

**Cindy M. Palinkas and Andrea S. Ogston**  
Event-scale analysis of shelf sedimentary processes

**Gil Rilov**  
Benthic-pelagic decoupling in the rocky intertidal by subtidal predators: The effect of seascape on species interactions and onshore recruitment

**Ryan R. Rykaczewski and David M. Checkley Jr.**  
From physics to fish: Influence of wind-stress curl on Pacific sardine

**Afonso Souza and Tamara K. Pease**  
Effect of organic enrichments on bacterial potential hydrolytic activity in organic-poor estuarine sediments

**Michael S. Wetz and Hans W. Paerl**  
Impact of large storms (hurricanes, tropical disturbances) on phytoplankton and microzooplankton in a large estuarine ecosystem: a glimpse into the effects of a period of elevated hurricane activity

**Juan P. Zwolinski, Paulo B. Oliveira, Alexandre Morais, Victor Quintino and Yorgos Stratoudakis**  
Sardine potential habitat and environmental forcing off western Portugal

#### *Posters*

**Daisuke Goto and William G. Wallace**  
The importance of metal storage by prey and digestive processes in predators to metal trophic transfer in coastal benthic food chains

**Alan F. Koropitan, Motoyoshi Ikeda, Ario Damar and Yasuhiro Yamanaka**  
Influences of physical processes on the ecosystem of Jakarta bay: a coupled hydrodynamic-ecosystem model experiment

**Hyunju Seo, Suam Kim, Sukyung Kang, Kibeik Seong, Hideaki Kudo and Masahide Kaeriyama**  
Variability in growth and survival of chum salmon in relation to environmental changes in the western Pacific Ocean

**Di Wu and Meng Zhou**  
Zooplankton offshore transport and population dynamics in California Current off Oregon in June 2002

### The Last Frontier: The Deep Sea (Session 3)

Convenor: Angel Lopez-Urrutia, Centro Oceanográfico de Gijón, Instituto Español de Oceanografía,  
Avda. Príncipe de Asturias 70 bis, E-33212 Gijón, Asturias, Spain

Invited Speaker: S. Kim Juniper (University of Victoria, BC, Canada)

#### Background

The deep sea is regarded by many as the ultimate frontier for marine research. New organisms and geochemical processes are continuously being discovered at the deep seafloor and in extreme ocean environments. At the same time, there has been a rapid increase in deep sea trawling and hydrocarbon exploration in these largely unknown ecosystems, which are now believed to be much more dynamic and diverse than previously assumed. A better understanding of the geochemical processes, life forms, and community dynamics in these environments, from the continental rise to the abyssal zone, is urgently needed. Recent advances in submersibles (*e.g.*, smart sensors) and marine communication (*e.g.*, telemetry for remote exploration) have greatly improved our ability to sample and monitor extreme systems. We invite contributions on the geological, geochemical, biochemical, and biological processes that shape the deep sea environment.

Examples include, but are not limited to, seismic and volcanic activities at mid-ocean ridges, chemosynthetic food webs at hydrothermal vents, adaptations of deep sea organisms, and unique microbial communities at cold vents and in subseafloor sediments.

#### Summary of presentations

It appears that the last of the new frontiers in marine science will remain for a while longer. The session attracted the fewest number of abstracts at the conference but the enthusiasm was high. Especially by Prof. Juniper, the invited speaker, who described a new world of cabled underwater ocean observing systems that are being deployed off the west coast of Canada. The VENUS project is focusing on two coastal loops while the larger project NEPTUNE will have undersea cables running off the continental shelf, down the slope, and into the deep ocean. New research opportunities in the last frontier are emerging in the northeastern Pacific.

#### List of papers

##### *Oral presentations*

**S. Kim Juniper** (Invited)

The Neptune Canada seafloor observatory project

**Günter Försterra and V. Häussermann**

Where the deep sea comes into reach – deep-water emergence in the Chilean fjord region

**Tadanori Fujino, Kazushi Miyashita, Hiroki Yasuma, Tsuyoshi Shimura, Shunichi Shimoyama and Shinya Masuda**

Seasonal change in distribution characteristics of mesopelagic fish in the Sea of Japan

**Henry A. Ruhl and Kenneth L. Smith Jr.**

Surface Climate and Megafauna Community Change in the Abyssal NE Pacific

**The Role of Behavior in Marine Biological Processes (Session 4)**

Convenor: Elizabeth W. North, Horn Point Laboratory, University of Maryland Center for Environmental Science, 2020 Horns Point Road, Cambridge, MD 21613 U.S.A.

Invited Speaker: Mark Baumgartner (Woods Hole Oceanographic Institution, Woods Hole, U.S.A.)

Background

From single-cell plants to marine mammals, behavior in response to physical, chemical and biological cues is a common trait whose significance is increasingly recognized. Behaviors as simple as vertical migration can cause differential transport and aggregations in frontal zones, with implications for predator-prey interactions and energy transfer in ocean ecosystems. Complex behaviors such as schooling and long-distance spawning migrations affect vulnerability to predation, exploitation, reproductive potential, stock structure, and an ability to recover from overharvest and habitat loss. Advances in *in-situ* measurement capabilities (*e.g.*, acoustics, tagging, laser and video optical methods, holography), coupled bio-physical and biogeochemical numerical models, and otolith and genetic approaches provide insights into the complexity of behavior, its role in structuring populations and ecosystem processes, and its impact on survey design and sample variability. Contributions were sought to improve understanding of the role of behavior in marine biological processes with an emphasis on methods that apply recent advances in technology.

Summary of presentations

Mark Baumgartner began with an exciting plenary talk that demonstrated how new technologies can significantly advance our understanding of the interactions between physical conditions, whales and their prey. Not only did his lecture provide an excellent introduction to progress in behavior-related research, but it also provided valuable experience-based advice for early-career scientists.

A major theme of this session concerned the vertical distribution of organisms. Many techniques were presented for identifying factors that influence vertical distributions, such as innovative net designs, acoustics techniques, remotely operated vehicles, laboratory studies, video plankton recorders, pop-up satellite and implantable archival tags, and direct observations of the plankton. Participants heard how copepods use foray behavior, depth facilitates retention of siphonophores in fjords, lobster larvae remain above the 12°C isotherm, coral reef fish larvae regulate depth in response to pressure, sprat move vertically in response to temperature, temperature gradient, oxygen and light, and how bluefin tuna make vertical excursions that vary in depth according to changes in prey distributions. Numerical modeling studies were also used to gain insight on the role of behavior in marine processes, indicating that small differences in the depth of larval fish and oysters can result in large differences in dispersal, and that the timing and location of adult spawning can have a significant influence on larval dispersal and settlement.

Participants also described and discussed the implications of different horizontal distributions of organisms. Separate migration patterns of individual stocks were discovered (in a species previously considered to be of mixed stock composition) using elemental and isotopic signatures in fish otoliths. Otolith analysis was also used to demonstrate that the distribution of eels along a salinity gradient affected the degree of parasite infection. One of the highlights of the session was an appreciation of the fine-scale picture that Video Plankton Recorders produce of the correspondence between biological and physical features in frontal regions, despite the many challenges associated with image interpretation.

List of papers

*Oral presentations*

**Mark Baumgartner** (Invited)

Comparative studies of baleen whale foraging ecology

**Anik Brind'Amour, Daniel Boisclair, Stéphane Dray and Pierre Legendre**

Multi-scale assessment of the functional relationship between species traits and environmental conditions for littoral fish communities

**Robert W. Campbell and Morten Holtegaard Nielsen**

Meso- and small-scale distributions of plankton and marine snow in the southeastern north

**Tomas Didrikas and Sture Hansson**

Effects of light intensity on the vertical distribution and activity of pelagic fish—Studies with a seabed-mounted echo sounder

**Karen P. Edwards, Jonathon A. Hare and Francisco E. Werner**

Marine population connectivity and dispersal: The role of spawning behaviors, or why do parents know best?

**Susana Garrido, Ana Marçalo, Juan Zwolinski and Carl D. van der Lingen**

Laboratory investigations on the effect of prey size and concentration on the feeding behavior of *Sardina pilchardus*

**Eva Jakob, Karsten Zumholz and Reinhold Hanel**

Habitat dependent parasite infestations and virus infections of the European eel *Anguilla anguilla* (L.) in northern Germany

**Sarah E. Kolesar, Kenneth A. Rose and Denise L. Breitburg**

The effect of hypoxia on intraguild predation in an estuarine food web: An individual-based model of ctenophores, fish larvae, and copepods

**Gareth L. Lawson, Andre M. Boustany, Andreas Walli, Steven L.H. Teo and Barbara A. Block**

Distribution and movements of Atlantic bluefin tuna in the northwestern Atlantic studied using electronic tags

**James J. Pierson, Bruce W. Frost and Andrew W. Leising**

Foray foraging behavior in marine copepods

**Daniel Stepputtis, Uwe Böttcher, Thomas Neumann and Jörn Schmidt**

Distribution of Baltic sprat (*Sprattus sprattus* L.) – observations, models and consequences

**Frode Vikebo, Trond Kristiansen, Gert Dingsor, Svein Sundby, Christian Jorgensen and Oyvind Fiksen**

Drift, growth and distribution in northeast Arctic cod during the 1980s – predictions from a biological individual-based model embedded in a general circulation model

**Benjamin D. Walther and Simon R. Thorrold**

Marine migratory patterns of immature anadromous fish: An otolith chemistry approach

*Posters*

**Eric R. Annis**

*In situ* swimming behavior of lobster postlarvae: implications for transport and settlement

**Aino Hosia and Ulf Båmstedt**

Vertical distribution of physonect siphonophores in western Norwegian fjords

**Klaus B. Huebert**

Can pelagic coral reef fish larvae regulate their swimming depths via hydrostatic pressure cues?

**Trond Kristiansen, Frode Vikebø, Svein Sundby, Geir Huse and Øyvind Fiksen**

Growth and feeding of larval cod (*Gadus morhua*) in large-scale latitudinal environmental gradients

**Joel K. Llopiz and Robert K. Cowen**

Trophodynamics of larval billfishes and tunas: Are the constraints of the low-latitude open ocean actually constraining?

**Klas O. Moeller, Robert W. Campbell, Morten Holtegaard Nielsen and Michael A. St. John**

*In situ* distribution and vertical migration of plankton in the North Sea (German bight)

**Elizabeth W. North, Z. Schlag, R.R. Hood, M. Li, L. Zhong, T. Gross, and V.S. Kennedy**

The influence of larval behavior on oyster larvae transport and settlement: A numerical approach

**Susan E. Parks, Christopher W. Clarkm and Peter L. Tyack**

Evidence for a long-term change in the acoustic behavior of the North Atlantic right whale (*Eubalena glacialis*) in response to noise

**Didzis Ustups and Maris Plikss**

The influence of environmental conditions on the year-class strength of the Eastern-Gotland flounder (*Platichthys flesus*) in the Baltic Sea

**Yi Xu, Fei Chai, Lei Shi, Yi Chao, Kenneth Rose, Francisco Chavez, and Richard T. Barber**

Seasonal cycle, interannual and decadal variability of Peruvian anchovy population dynamics: A model study

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### The Effect of Climate on Basin-scale Processes and Ecosystems (Session 5)

Convenor: Jens Floeter, Institute of Hydrobiology and Fisheries Science, Hamburg University, Olbersweg 24, D-22767 Hamburg, Germany, and  
Julie Keister, College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, OR 97331 U.S.A.

Invited Speaker: Emanuele Di Lorenzo (Georgia Institute of Technology, Atlanta, U.S.A.)

#### Background

Recent advances in earth monitoring systems and global climate models indicate that basin-scale phenomena profoundly influence physical, geochemical and biological systems in the world's oceans. Interacting processes between the oceans and the atmosphere, such as El Niños and decadal-scale oscillations, impact circulation patterns, nutrient cycling, and ecosystem structure and productivity within and across basins. In this session, we welcome contributions that apply global datasets and recent technological advances (*e.g.*, satellites, gliders and floats, and global climate models) to further our understanding of these basin- and global-scale processes. In particular, we invite papers that address effects of large-scale climate forcing on physical and chemical processes, mechanistic linkages between climate forcing and the dynamics of marine ecosystems, and advances in modeling

and predictive capabilities for oceanic ecosystems at basin-wide scales.

#### Summary of presentations

The session was jump-started with a spirited keynote address by Emanuele DiLorenzo, an early career scientist himself. Dr. DiLorenzo culminated his talk with advice for the audience drawn from his own experiences transitioning from Ph.D. candidate to the head of an active research laboratory. Further talks and posters addressed climate controls on fisheries, zooplankton communities, food web dynamics, carbon cycling, harmful algal blooms, variability in SST, and circulation. Throughout the excellent presentations, the importance of climate on the processes explored was a strong connecting theme. The session accentuated the need for long time series of observations and realistic models to address the potential consequences of changing climate on the world's ecosystems.

#### List of papers

##### *Oral presentations*

**Emanuele DiLorenzo** (Invited)

Linking North Pacific ocean climate variability to ecosystem changes: The interplay between a gyre-scale mode and the Pacific Decadal Oscillation

**Emmanuel Chassot, Sylvain Bonhommeau, Frédéric Mélin, Olivier Le Pape and Didier Gascuel**

World fish catch driven by primary production

**Dmitry D. Kaplunenko, Olga O. Trusenкова and Viacheslav B. Lobanov**

Features of seasonal and intra-annual variability of Japan Sea SST from satellite data.

**David G. Kimmel, W. David Miller, Lawrence W. Harding, Edward D. Houde and Michael R. Roman**

Regional scale climate forcing of Chesapeake Bay ecosystem dynamics

**Guimei Liu**

A Three-Dimensional Physical-Biogeochemical Modeling Study on Productivity and Carbon Cycle in South China Sea

**Stephanie K. Moore, Nathan J. Mantua, Vera L. Trainer and Barbara M. Hickey**

Climate impacts on Puget Sound oceanography and harmful algal blooms

**Olav A. Ormseth and Brenda L. Norcross**

Latitude, temperature, and growth: Implications for life history strategies of cod in the Pacific and Atlantic Oceans

**Mark D. Scheuerell and John G. Williams**

Forecasting climate-induced shifts in the marine survival of Pacific salmon (*Oncorhynchus* spp.)

**Robert M. Survan**

Environmental forcing of life history strategies: Multi-trophic level response at ocean basin scales

*Posters*

**Hongsheng Bi, William T. Peterson, Jesse Lamb and Edmundo Casillas**

Characterizing pelagic ocean habitat for juvenile salmon using generalized linear mixed model

**Sukyung Kang and Suam Kim**

Climate-induced variation in the distribution and abundance of mackerels in the Northwestern Pacific

**Julie E. Keister, William T. Peterson, P. Ted Strub and Timothy J. Cowles**

Climate effects on zooplankton biomass, species composition, and cross-shelf delivery of carbon in a coastal upwelling system.

**Yong-Woo Lee, Bernard A. Megrey and S. Allen Macklin**

Development of environment-based recruitment forecasting models and evaluation of forecast accuracy using a resampling strategy

**Yulia N. Tananaeva and Marat A. Bogdanov**

SST and ice conditions' variability, its influence on primary production and fishery resources of North West Pacific

**Humans and the Marine Environment (Session 6)**

Convenor: Franz J. Mueter, Sigma Plus Consulting, 697 Fordham Drive, Fairbanks, AK 99709 U.S.A.

Invited Speaker: Philippe Cury (Centre de Recherche Halieutique Méditerranéenne et Tropicale, IRD, Sète Cedex, France)

Background

The marine environment is subject to a variety of human impacts including the introduction of contaminants, habitat disturbance, species invasions, and effects of increasing CO<sub>2</sub> levels in the atmosphere. These impacts result from activities both on land and in the ocean such as increased coastal development, oil and gas exploration, fishing, and shipping. This session explored how people affect the oceans, how changes in the oceans affect the lives and livelihoods of people, and how these can be managed to ensure both healthy oceans and healthy human societies in the future. Papers were sought to: (1) quantify large-scale impacts of human activity on ocean ecosystems including novel ways to monitor and assess such impacts, (2) provide examples of how communities and societies are impacted by changes in the ocean, and (3) develop new approaches to support ecosystem-based management, including the development of ecosystem indicators and reference points.

Summary of presentations

A session on “*Humans and the marine environment*” set out to explore how people

impact the oceans, how changes in the oceans impact the lives and livelihoods of people, and how these impacts can be managed to ensure both healthy oceans and healthy human societies in the future. While all presentations addressed impacts from human activities on the ocean, few presentations touched on the impacts of management or natural changes on coastal communities. This may simply reflect the fact that the marine sciences are dominated by environmental scientists, rather than social scientists. Nevertheless, the number of multi-author papers and the breadth of topics covered, with many speakers addressing new approaches to fisheries and ocean management, suggest that marine science in the 21<sup>st</sup> century is no longer aligned along traditional disciplines.

Reflecting this interdisciplinary approach, the wide-ranging and thought-provoking keynote address by Dr. Philippe Cury explored the scientific challenges of implementing an ecosystem approach to marine resources. These challenges range from basic ecological issues such as the processes that determine whether a community is dominated by bottom-up or top-down controls, over management challenges associated with developing suitable system-level reference points, to a need for ethical guidelines

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(a “hippocratic oath”) for marine scientists. Contributed papers and posters focused primarily on fisheries issues, but also documented the impacts of pollutants (in particular hydrocarbons), introduced species, coastal development, and climate change.

Human impacts from fishing on all components of the marine ecosystem appear to remain among the main concerns of the next generation of marine scientists. A variety of innovative approaches to measuring and modeling fishing impacts were presented, including the documentation of discarding practices, modeling of species interactions across multiple exploited systems, evaluation of single-species assessment and management strategies, development of novel system-level reference points, and a spatially explicit ecosystem model to explore the

consequences of introducing marine protected areas.

Presentations highlighted the multitude of challenges faced by marine scientists and resource managers working at the interface between marine ecosystems and the humans that depend on these systems. If there was an overarching message, it may be that the complexity of ecological interactions, the multiple levels at which humans interact with the marine environment, and the sometimes conflicting goals for marine stewardship require a cross-disciplinary perspective as well as a broad awareness of ecological, economic, and social science principles in order to define and achieve sustainable relationships with the marine environment.

### List of papers

#### *Oral presentations*

**Philippe Curv** (Invited)

Scientific challenges to respond to a shared vision: the ecosystem approach to marine resources

**Z. Teresa A'mar, A.E. Punt and M.W. Dorn**

The Management Strategy Evaluation Approach and the Fishery for Walleye Pollock in the Gulf of Alaska

**Andrey P. Chernyaev**

Distribution of petroleum hydrocarbons in Ussuriyskiy Bay (Japan/East Sea)

**Jason M. Cope and André E. Punt**

Drawing the lines: Resolving fishery management units with simple fisheries data

**Michelle L. Davis and Brian R. Murphy**

Harvest Impacts on Population Dynamics of Sex-Changing Fishes

**Paul. A. de Bruyn, M.H. Schleyer and C.L. Moloney**

A novel application of Operational Management Procedures in the fisheries management of the oyster (*Striostrea margaritacea*) in KwaZulu-Natal, South Africa

**Melissa A. Haltuch, Andre E. Punt and Martin Dorn**

Evaluating alternative estimators for fisheries biomass reference points: How close are we?

**Chih-hao Hsieh, Christian S. Reiss, Roger P. Hewitt and George Sugihara**

Spatial analysis shows fishing enhances the climatic sensitivity of marine fishes

**Hae-Cheol Kim, Xuyong Li, Charles L. Gallegos, Donald E. Weller, Thomas E. Jordan and Patrick J. Neale**

Predicted ecological responses of subestuarine ecosystems to different watershed loadings in the Chesapeake Bay: A modeling study

**Jae Bong Lee, Anne Hollowed and Chang-Ik Zhang**

Comparing ecosystem variations between the eastern and western North Pacific using size-based indicators

**Coilín Minto, Joanna Mills Flemming, Boris Worm and Ransom A. Myers**

Meta-analytical approaches to understanding species interactions

**Barbara Paterson, Coleen L. Moloney, Astrid Jarre, Tracy Fairweather, Carl van der Lingen, Lynne J. Shannon, and John G. Field**

A fuzzy logic expert system for monitoring the implementation of an Ecosystem Approach to Fisheries in the Southern Benguela

**John R. Peter and Victor M. Peddemors**

Responses of Indian Ocean bottlenose dolphins to active acoustic devices (pingers) in South Africa

**Jennifer N. Putland and Richard L. Iverson**

Ecology of microzooplankton in a subtropical estuary and implications of river water diversion

**Dawit Yemane, Yunne-J. Shin and John G. Field**

Exploring the consequences of introducing Marine Protected Areas for the dynamics of fish communities in the southern Benguela ecosystem: an Individual Based Modelling approach

*Posters*

**Svetlana A. Aleshko**

Antioxidant defense system in fish and mussels from polluted areas of Peter the Great Bay (Japan/East Sea)

**Susana Barbosa, Ana C. Fernandes, Laura Wise, Dina Silva and Graça Pestana**

Fishing and discarding practices in the Portuguese trawl, longline and purse seine fleet

**Claudia F. Bravo, Joseph Dietrich, Deborah Boylen, Bernadita Anulacion, Gina Ylitalo, Frank J. Loge, Tracy K. Collier and Mary R. Arkoosh**

Transcriptional patterns in head kidney of polybrominated diphenyl ethers (PBDE) exposed fall Chinook salmon (*Oncorhynchus tshawytscha*) challenged with the marine pathogen *Listonella anguillarum*

**Suchana Chavanich, Larry G. Harris, Jong-Geel Je and Rae-Seon Kang**

Distribution pattern of the green alga *Codium fragile* in its native range, Korea: is it similar to invaded habitats?

**Robert Enever, A. Reville and A. Grant**

Discarding around the UK - New information and analyses: English Channel, Western Approaches, Celtic & Irish Sea (ICES subarea VII)

**Kathleen R. Murphy, Gregory M. Ruiz, W.T.D. Dunsmuir and T. David Waite**

Verification of mid-ocean ballast water exchange using fluorescence spectroscopy

**Michael J. Wilberg and James R. Bence**

Use of Bayesian model selection to improve stock assessment advice

## Effective Science Communication (Workshop 1)

Instructor: Tim Carruthers (UMCES, Cambridge, MD, U.S.A.)

To have an impact, even excellent science needs to be effectively communicated. This workshop dealt with how to incorporate visual elements into print and electronic media-to expand on traditional peer reviewed journal formats-and more effectively communicate to managers, the

general public, as well as fellow scientists. Participants were introduced to conceptual diagrams, one of the key tools used to synthesize information and therefore facilitate effective communication.

## Integrated Environmental Assessment (Workshop 2)

Instructor: Bill Dennison (UMCES, Cambridge, MD, U.S.A.)

In our current scientific climate of mass data collection and a large and productive scientific community, the challenge is how to synthesize a mass of diverse information to answer apparently simple questions such as “how healthy is a system?” and “is the system getting better or worse?” This workshop considered

tools for syntheses and provided examples of where these approaches have been effective. Such issues as how to choose metrics, how to determine thresholds and how to combine metrics were discussed and presented in practical exercises.

**International and Interdisciplinary Collaboration (Overview and Panel Discussion)**

Moderator: Franz Mueter (Sigma Plus Consulting, Fairbanks, AK, U.S.A.)

Panel Members: Kyung-Il Chang (EAST-1), Philippe Cury (EUR-OCEANS), Elizabeth Gross (SCOR), Adi Kellerman (ICES), Skip McKinnell (PICES), Michael Roman (IMBER), Susan Weiler (invited speaker), Francisco E. Werner (GLOBEC)

International oceanographic organizations and research programs play an important role in coordinating marine research activities, sharing information, knowledge, and technology, and setting research priorities for collaborative research across borders and disciplines. This mini-symposium features speakers from various regional or global organizations to provide a very brief overview over their goals and activities. More importantly, speakers will

discuss how their organization can help early career scientists get involved in collaborative research, provide suggestions on what new investigators can do to get involved, and share their personal insights and advice on effective international collaborations. Individual presentations will be followed by a panel discussion on the challenges of successful collaborative research and on approaches to overcoming these challenges.