



**FishBase**



Naturhistoriska  
riksmuseet

---

# **FishBase Symposium 2017**

## **The Polar Seas**

### **Programme**

### **Speaker Presentations and Abstracts**

### **Participant list**

Monday 16 October 2017

Main auditorium, Swedish Museum of Natural history, Stockholm

## **Polarhaven**

### **Program**

### **Presentation av talare och abstracts**

### **Deltagarlista**

Måndag 16 oktober 2017

Stora hörsalen, Naturhistoriska riksmuseet, Frescativägen 40, Stockholm

FishBase Sweden  
Naturhistoriska riksmuseet  
Box 50007  
104 05 Stockholm  
fishbase@nrm.se  
08-5195 40 00

---

## FishBase Symposium 2017 — *The Polar Seas*

### Preliminary programme

- 09:00 - 09:30 Registration, coffee and sandwiches  
Moderator: **Thomas Mörs**, Swedish Museum of Natural History
- 09:30 - 09:45 Opening **Bo Fernholm**, Swedish Museum of Natural History
- 09:45 - 10:30 **Joseph T. Eastman**, Ohio University, USA: *The Nature of Antarctic Fish Diversity*
- 10:30 – 11:00 Fruit break
- 11:00 – 11:45 **Dirk Steinke**, University of Guelph, Canada: *Under the ice – towards a comprehensive understanding of Arctic Fish*
- 11:45 – 12:30 **Stuart Hanchet**, NIWA, New Zealand: *The Antarctic toothfish fishery in the Ross Sea: balancing conservation with rational use*
- 12:30 – 13:30 Lunch break
- 13:30 – 14:15 **Pauline Snoeijs Leijonmalm**, Stockholm University, Sweden: *Fish under the North-Pole sea ice: regional politics and acoustic studies*
- 14:15 – 15:00 **Michael Axelsson**, University of Gothenburg, Sweden: *With the heart on the freezing point: Cardiovascular physiology in polar living fish*
- 15:00 – 15:25 Coffee break
- 15:25 – 16:10 **Jørgen S. Christiansen**, Arctic University of Norway, Norway: *No Future for Euro-Arctic ocean Fishes?*
- 16:10 – 16:55 **Edda Johannesen**, Institute of Marine Research, Norway: *The Barents Sea fish fauna*
- 16:55 – 17:00 Symposium Close

Time: Monday, 16<sup>th</sup> October 2017, 09:00 – 17:00.

Place: Main Auditorium, Swedish Museum of Natural History, Frescativägen 40, Stockholm.

---

## FishBase Symposium 2017 — *Polarhaven*

### Preliminärt program

- 09:00 - 09:30 Registrering, kaffe och smörgås  
Moderator: **Thomas Mörs**, Naturhistoriska riksmuseet
- 09:30 - 09:45 Inledning **Bo Fernholm**, Naturhistoriska riksmuseet
- 09:45 - 10:30 **Joseph T. Eastman**, Ohio University, USA: *The Nature of Antarctic Fish Diversity*
- 10:30 – 11:00 Fruktpaus
- 11:00 – 11:45 **Dirk Steinke**, University of Guelph, Kanada: *Under the ice – towards a comprehensive understanding of Arctic Fish*
- 11:45 – 12:30 **Stuart Hanchet**, NIWA, Nya Zeeland: *The Antarctic toothfish fishery in the Ross Sea: balancing conservation with rational use*
- 12:30 – 13:30 Lunch
- 13:30 – 14:15 **Pauline Snoeijs Leijonmalm**, Stockholms universitet: *Fish under the North-Pole sea ice: regional politics and acoustic studies*
- 14:15 – 15:00 **Michael Axelsson**, Göteborgs universitet: *With the heart on the freezing point: Cardiovascular physiology in polar living fish*
- 15:00 – 15:25 Kaffepaus
- 15:25 – 16:10 **Jørgen S. Christiansen**, Arctic University of Norway, Norge: *No Future for Euro-Arctic ocean Fishes?*
- 16:10 – 16:55 **Edda Johannesen**, Institute of Marine Research, Norge: *The Barents Sea fish fauna*
- 16:55 – 17:00 Avslutning

Tid: Måndag 16:e oktober 2017, 09:00 – 17:00.

Plats: Stora hörsalen, Naturhistoriska riksmuseet, Frescativägen 40, Stockholm.

# THOMAS MÖRS

Moderator, Swedish Museum of Natural History, Sweden

---



I studied geology, palaeontology and zoology at the German universities of Würzburg and Bonn where I received my doctoral degree in natural sciences in 1994. Until the year 2000 I worked as assistant professor at the Steinmann Institute in Bonn and in 2001 I was employed as curator/researcher of fossil vertebrates at the Swedish Museum of Natural History in Stockholm. In 2002 I became associate professor in palaeontology and historical geology at Uppsala University, and since 2012 I work as senior curator/researcher at the Swedish Museum of Natural History.

I have published on Devonian lungfish, taphonomy of Jurassic fishes from Solnhofen, and on Oligocene and Neogene cyprinids. I do field work in the North Atlantic realm (Faroe Islands, Iceland, Svalbard) and in Antarctica (Antarctic Peninsula and Transantarctic Mountains) which has resulted in eight publications on Eocene Antarctic fishes.

I acted as vice president of the German Palaeontological Society, and I am currently section editor (fossil vertebrates) of PalZ, and Swedish national representative for the Scientific Committee on Antarctic Sciences (SCAR).

## BO FERNHOLM

Opening speaker, Swedish Museum of Natural History, Sweden

---



Bo Fernholm är professor emeritus vid Naturhistoriska riksmuseets forskningsavdelning. I sin forskning är han specialiserad på pirålar. För i tur och ordning Miljödepartementets, Naturvårdsverkets och Havs- och Vattenmyndighetens räkning har han under många år representerat Sverige i Konventionen för bevarande av Antarktis marina levande resurser, CCAMLR, som årligen har sitt partsmöte i Australien. Konventionen har ett ekosystemperspektiv, kallas ibland krillkonventionen och arbetar huvudsakligen med fisk och krill. Den är en del av det fredsbevarande Antarktiskfördraget. Han har även under många år varit svensk representant i den internationella valfångstkonventionen, IWC.

---

### INLEDNING

---

I Arktis i norr är polarhavet omgivet av nationalstater som tvistar om var gränserna skall dras ute i vattnet. Där finns ännu ingen regim för att reglera fisket på internationellt vatten. I söder finns en Antarktisk kontinent där alla territoriella anspråk är frysta genom Antarktiskfördraget, som också har en resurskonvention, CCAMLR (Konventionen för bevarande av Antarktis marina levande resurser), som reglerar fisket i det omgivande havet. CCAMLR har det dubbla syftet att bevara det antarktiska ekosystemet och samtidigt medge ett reglerat och hållbart fiske. Sverige sökte och fick medlemskap i båda konventionerna under 1980-talet

Naturhistoriska riksmuseet var aktivt i utforskningen av polarhavens fiskfauna under slutet av 1800-talet och början av 1900-talet. Den svenska regeringen har under det sista årtiondet tyvärr visat minskat intresse för Antarktis.

## JOSEPH T. EASTMAN

Ohio University, USA

---



Joseph T. Eastman is Professor Emeritus of Anatomy at Ohio University in Athens, Ohio. He received BA, MS and PhD degrees in Zoology from the University of Minnesota. He has been Instructor (1970–1971) and Assistant Professor (1971–1973) of Anatomical Sciences at the University of Oklahoma Medical Center, Assistant Professor of Anatomy at Brown University School of Medicine (1973–1979), and Associate Professor (1979–1989) and Professor (1989–2014) of Anatomy at Ohio University. His research specialty is Antarctic fishes, especially, notothenioids, and the associated fieldwork has been in the Ross Sea, Antarctic Peninsula, Falkland Islands, South Georgia, the South Sandwich Islands, Bouvetøya and Tristan da Cunha. He is the author of *Antarctic Fish Biology: Evolution in a Unique Environment*, a contributor to *Fishes of the Southern Ocean*, and currently serves on the editorial boards of the journals

*Antarctic Science* and *Polar Biology*. He lives in Minneapolis, Minnesota.

---

### THE NATURE OF ANTARCTIC FISH DIVERSITY

---

The interaction between geological and biological processes has resulted in much of what we recognize as the modern fauna of the world. This interplay has frequently given rise to distinctive faunas in areas that became isolated during geologic history. Antarctica is such a place. Formerly part of Gondwana, Antarctica is now surrounded by the cold Southern Ocean, and its distinctive fauna inhabits the sea rather than the ice-covered landmass. This talk will utilize notothenioid fishes, and their antecedents—the Eocene La Meseta fossil fishes from Seymour Island—as an example of faunal change, ecological opportunity and radiation over the past 50 million years. During this time Antarctica waters cooled, the ice sheet developed, inshore habitats were reduced, and food webs were disrupted thereby creating an opportunity for faunal turnover. The outcome was that a taxonomically diverse and cosmopolitan Eocene fauna was succeeded by radiations of notothenioids that yielded a taxonomically restricted, highly endemic group of modern species that dominates abundance and biomass on the high latitude shelves. The radiation of notothenioids includes both adaptive and non-adaptive components. The greatest morphological and ecological disparity, involving just a few species, appeared early in the radiation and was uncoupled from the 61% of species diversity produced by three subsequent pulses separated by millions of years. The axes of the radiation were buoyancy (although notothenioids lack a swim bladder), habitat depth and body size. The 2-meter long, intermittently buoyant piscivore (*Dissostichus mawsoni*) and the 25-cm long neutrally buoyant zooplanktivore (*Pleuragramma antarctica*) exemplify the adaptive component, while the 27 similar species of *Pogonophryne* are a non-adaptive element. I will discuss the different buoyancy mechanisms in *D. mawsoni* and *Pleuragramma*. When *D. mawsoni* encounters oligotrophic conditions during its life cycle, its lipid-based neutral buoyancy is relinquished for gonadal maturation. Both species have sufficient physiological and ecological plasticity to have persisted recurrent habitat instability caused by advances of the ice sheet on the shelf. Liparids (snailfishes) and zoarcids (eelpouts) also radiated in the Antarctic and, although speciose, they are not ecologically and morphologically diverse when compared to notothenioids. I will suggest possible explanations for this.

## DIRK STEINKE

University of Guelph, Canada

---



I have a passion for aquatic life specifically fishes ever since my father and I kept and bred many ornamental fish species in various tanks at our home. Despite this started my professional life as a gardener before moving on to University and doing my MSc research on the molecular systematics of the land snail group Helicoidea at the Ecology & Evolution department at the Goethe University in Frankfurt. My doctorate research at the University of Konstanz on gene and genome duplication and the evolution of novel gene functions in vertebrates brought me back to fish. In 2006, joined the Biodiversity Institute of Ontario – Centre for Biodiversity Genomics (CBG) as postdoctoral fellow. I have been involved in DNA barcoding research since its early days. Among

other things I coordinated MarBOL, an international research program to barcoding marine species, supported by the Alfred P. Sloan Foundation in New York City. I served as CBG's Associate Director of Education & Outreach from 2012-2017. During my tenure I initiated an influential blog, edited a quarterly newsletter for the barcode research community, and developed an experiential biodiversity learning program for students in grades K-12. I am also the developer and instructor for three online courses in the field of DNA barcoding that are offered through the University of Guelph's distance education portfolio. Early 2017, I took on the role as Associate Director for Research Coordination managing CBG's research portfolio and became Adjunct Professor at the Department of Integrative Biology.

---

### UNDER THE ICE – TOWARDS A COMPREHENSIVE UNDERSTANDING OF ARCTIC FISH

---

Just over 400 fish species are known from Arctic seas and adjacent waters including marine, diadromous, and freshwater fish species which enter brackish water. Most of these species are living on or near the bottom. The dominant Arctic fish families are cods, eelpouts, snailfishes, sculpins, and salmonids. Unlike most other oceans, commercial fisheries do not exist in the high Arctic, while they are extensive in the sub-Arctic southern Barents and southeastern Bering Seas. The lack of high-Arctic fisheries catch and by-catch data yields a void of even basic knowledge. The traditional methods of collecting fish by trawls do not work well in ice-covered waters, making it difficult even today to advance our understanding of fish biodiversity and biology. This talk will provide insights into the generation of modern, comprehensive, well-founded inventories of marine arctic fish species utilizing up to date technology and genetic signatures.



## STUART HANCHET

NIWA, New Zealand

---



Stuart Hanchet is a fisheries scientist with the National Institute of Water and Atmospheric Research (NIWA) based in Nelson. He has specialised in research on the biology and stock assessment of coastal and deepwater fish and fisheries around New Zealand, and more recently the Antarctic toothfish fishery in the Ross Sea. He is leader of the International Fisheries Programme at NIWA. He has been part of the New Zealand delegation to the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) since the mid-1990s and has been convenor of two of its Working Groups over the past ten years.

---

### THE ANTARCTIC TOOTHFISH FISHERY IN THE ROSS SEA: BALANCING CONSERVATION WITH RATIONAL USE

---

There have been many articles in the popular press and scientific opinion pieces over the past few years lamenting the lack of knowledge about the Antarctic toothfish population in the Ross Sea and questioning the sustainability of the fishery operating there. Indeed, a recent opinion piece in the journal *Nature* stated that virtually nothing is known about this fish: no eggs or larvae have ever been collected. So how true are these articles and what is known about Antarctic toothfish?

Dr Stuart Hanchet has been part of a team researching the biology, ecology, and population dynamics of Antarctic toothfish in the Ross Sea region, for the past 15 years. He will describe what is known about the Antarctic toothfish and the fishery including the development of a tagging program for monitoring its abundance and spatial population models for assessing bias. He will also point out what isn't known: the information gaps and uncertainties and how these need to be addressed. Lastly, he will discuss the spatial management in place for the fishery and the recently approved Ross Sea Marine Protected Area which, at over 1.5 million square kilometres, is one the largest MPAs in the world.

## PAULINE SNOEIJIS-LEIJONMALM

Stockholm University, Sweden

---



Pauline Snoeijs-Leijonmalm is professor of Marine Ecology at Stockholm University. Her research interests are biodiversity and food-web interactions. Since 1982 she has worked on the coastal and pelagic systems of the brackish Baltic Sea and since 2002 also on sea-ice and pelagic ecology in the Central Arctic Ocean (CAO). She has participated in three Arctic scientific expeditions with ice-breaker “Oden” to the CAO and her main Arctic research projects deals with the diversity and biogeochemical functions of ice-associated microbial communities and fish acoustics in the CAO.

---

### FISH UNDER THE NORTH-POLE SEA ICE: REGIONAL POLITICS AND ACOUSTIC STUDIES

---

Diplomatic negotiations are going on between ten northern nations (including the EU) with a possible future interest in commercial fishing in the High Seas Area (= the area outside the Exclusive Economic Zones of the five coastal states). This area overlaps to a large extent with the Large Marine Ecosystem called the Central Arctic Ocean (CAO = the deep waters outside the continental shelves). The High Seas Area will become more accessible in the near future with the decrease of the summer Arctic sea ice cover through climate change. The negotiations build on the precedent of the Oslo Accord (2015) in which the five nations with Exclusive Economic Zones adjacent to the High Seas Area agreed to interim measures controlling commercial fishing in the area. Scientific experts from the respective nations have met four times in the FiSCAO group to summarize the available scientific information on fish living in the High Seas Area. Only twelve fish species are known to be established here and published information about their distribution under the ice cover is scarce.

Recently, acoustic data from the Swedish ice-breaker “Oden” were made available for analysis from surveys carried out in 2016 (data: Martin Jakobsson and Katarina Gårdfeldt). These data - collected with an 18 KHz echosounder - were aimed at locating gas seeps from the seabed and not to monitor fish. The acoustic data analyses are carried out by the Institute of Marine Research in Bergen, Norway (Harald Gjørseter, Randi Ingvaldsson, et al.). A first exploratory analysis shows that most of the echograms are too noisy to use, probably caused by mechanical noise from breaking ice, propeller cavitation and/or electric noise from other instruments. However, during periods when the vessel was stationary, and after removing noise by running various filters built into the post-processing software, scattering from at least parts of the water column can be assessed. Preliminary analyses indicate that echoes from pelagic fish (most probably the Arctic cod *Boreogadus saida*) can be recognized in such echograms from several stations north of 85 °N. These data provide a first insight in the distribution of fish under the North Pole ice. We will collect a new - very extensive - data set during the coming one-year MOSAiC expedition with the German ice-breaker “Polarstern” that will be drifting in the Arctic sea ice in 2019-2020.

# MICHAEL AXELSSON

University of Gothenburg, Sweden

---



Född i Göteborg 1958. Startade mina universitetsstudier 1981 och disputerade 1990 på en avhandling med titeln: "*On the cardiovascular control in representatives of three vertebrate groups: Effects of exercise and feeding*". Spenderade 18 månader vid Simon Fraser University i Kanada och besökte under tiden University of Canterbury där jag träffade William Davison som introducerade mig till Antarktisk fiskfysiologi. Sedan 2000 är jag anställd som Professor i jämförande kardiovaskulär fysiologi vid Göteborgs universitet. Jag har under min karriär varit på den Nya Zeländska forskningsstationen Scott Base i McMurdo sundet 6 gånger, en gång på USAs forskningsstation McMurdo station och en gång på USAs forskningsstation Palmer station som ligger på den Antarktiska halvön. Jag har också organiserat två större internationella forskningsexpeditioner till den Danska forskningsstationen på Diskoön på Grönlands västkust. Jag har också deltagit som lärare på en doktorandkurs i fiskfysiologi på samma forskningsstation på Grönland. Min huvudinriktning är kardioskulärforskning på fisk med inriktning mot regional blodflödesreglering och effekter av stress, födointag, arbete, och miljövariabler som t.ex. temperatur, hypoxi.

---

## WITH THE HEART ON THE FREEZING POINT: CARDIOVASCULAR PHYSIOLOGY IN POLAR LIVING FISH

---

Temperature affects both physical properties and chemical reaction rates. Chemical reactions are affected by a factor of 2-3 for every 10 C temperature change and the physical properties such as the viscosity of fluids and the solubility of gases, most importantly oxygen is affected. Ectotherms such as fish are thus directly affected by temperature in their environment.

The polar regions share some features such as the extreme light conditions with long polar nights and days, the extremely low and stable water temperatures and the, at present, rapid changes in temperature in the Arctic and west Antarctic region. The polar regions also differ in many aspects. The opening of Drake sound and the establishment of the polar front 15-20 million years ago geographically, hydrologically isolated the Antarctic fish fauna genetically while there are not geographical and hydrological barriers for fish to move in and out of Arctic waters. Due to the isolation and low and in many regions stable water temperatures the polar living ectotherms are thought to be stenothermal and a very interesting research question is if this will limit their survival chances when the temperature increases in these regions?

One of the first adaptations to the frigid water temperature that was studied and described was the anti-freeze production that allows fish to live in water with a temperature down to the freezing point of water around -1.9C.

Another area that has fascinated and intrigued scientists for over 40 years is the function and regulation of the cardiorespiratory system. Its primary function is to transport respiratory gases and nutrients and it has been claimed that the cardiovascular system might be the limiting factor, especially at elevated temperatures. The effects of temperature on the physiology and survival of polar living fish (and other ectotherms) is an intense research area with both good and not so good studies pointing to various future scenarios.

This presentation will focus on the cardiorespiratory system and its function in polar fishes, how it is adapted to the extreme temperature condition and will it cope with the unprecedented fast changes in temperature that we see and predict for the future.

## JØRGEN S. CHRISTIANSEN

Arctic University of Norway, Norway

---



Jørgen S. Christiansen is a full professor in Arctic fish biology at UiT-The Arctic University of Norway. He has acted also as a guest professor at Åbo Akademi University, Åbo/Turku, Finland. JSC grew up in Qeqertarsuaq and other settlements in Greenland. He holds a BSc in biology, geography and geology at the University of Copenhagen, and a DSc in fish physiology at UiT. His professional interests are Arctic marine zoogeography, environmental physiology and conservation. He is a lead author of the Arctic Biodiversity Assessment Report commissioned by the Arctic Council (CAFF, 2013). He has lead several research expeditions to the Arctic seas (Jan Mayen, Svalbard and NE Greenland) and also worked in Arctic Russia (Kola and White Sea). JSC is member of the Norwegian Red List expert group on fishes and Head of the ongoing international TUNU Programme: Euro-Arctic marine fishes – diversity and adaptation.

---

### NO FUTURE FOR EURO-ARCTIC OCEAN FISHES?

---

Ocean warming and loss of sea ice displace harvested fishes of boreal origin (and their fisheries) northward into yet unexploited parts of the Arctic seas. Most arctic fishes are not directly associated with the sea ice, but constitute an integral part of the seafloor biota. Industrial fisheries, already in place on many Arctic shelves, will radically affect the native fish species as they turn up as unprecedented bycatch. Arctic marine fishes are indispensable to ecosystem structuring and functioning. But they are still beyond credible assessment due to lack of basic biological data. The time for conservation actions is now, and precautionary management practices by the Arctic coastal states are needed to mitigate the impact of industrial fisheries and other human enterprises in Arctic waters.

# EDDA JOHANNESSEN

Institute of Marine Research, Norway

---



Edda Johannesen (born 1967 in Oslo, Norway) is an ecologist who has been working with small mammals, penguins and sea turtles. The last 15 years she has been employed at the Institute of Marine Research in Bergen, Norway focusing on the ecology of the Barents Sea fish fauna with special emphasis on the interactions between Barents Sea cod and its prey.

---

## THE BARENTS SEA FISH FAUNA

---

The Arctic marine ecosystems comprise the deep Arctic Ocean with its surrounding continental shelves and marginal seas, of which the Barents Sea (BS) is the largest (~1.6 million km<sup>2</sup>). The whole of the Barents Sea is north of the polar circle and in the Arctic region, extending from ~68°N to the shelf break towards the polar basin in the high Arctic at around 81°N. The Barents Sea is a boundary area between two partly separate ecosystems: a temperate water system with boreal biota in the southwest and a seasonally ice covered system with Arctic biota in the northeast. The Barents Sea is one of the areas on the planet that have experienced the strongest warming trend in recent years, influencing the Arctic and boreal biotas in the Barents Sea differently. The Barents Sea is also strongly influenced by fishing. Some of the most important fisheries in the world are found here, exploiting some of the boreal fish species. In this talk an overview over the main Barents fisheries and fish species will be given. Further the recent development of the Barents Sea fish fauna will be presented and discussed in the context of global warming.





## **Deltagarlista/Participants FishBase Symposium 2017**

### **Talare/Speakers:**

Bo Fernholm	Swedish Museum of Natural History	Sweden
Dirk Steinke	University of Guelph	Canada
Edda Johannesen	Institute of Marine Research	Norway
Jørgen Schou Christiansen	Arctic University of Norway	Norway
Joseph Eastman	Ohio University	USA
Michael Axelsson	University of Gothenburg	Sweden
Pauline Snoeijs Leijonmalm	Stockholm University	Sweden
Stuart Hanchet	NIWA	New Zealand

### **Moderator:**

Thomas Mörs	Swedish Museum of Natural History	Sweden
-------------	-----------------------------------	--------