Oceanographic variability shapes the spawning distribution of blue whiting (Micromesistius poutassou)

The spawning distribution of blue whiting (Micromesistius poutassou) has varied considerably between years, but quantitative understanding of the processes driving this change is lacking. Using 55 years of larval-observations from the wide-ranging Continuous Plankton Recorder (CPR) survey, we show that changes in the spawning distribution of blue whiting are associated with variations in the marine environment and particularly salinity. We first corroborated previously reported associations between variations in the spawning distribution and environmental regimes in the spawning region based on space-time interpolation models. We then applied species distribution models to quantify the linkage between the environment and the distribution of blue whiting larvae and verified these model results against independent fisheries and scientific survey data. Models incorporating salinity in the spawning region gave the best agreement with data, with observations of larvae in the CPR being limited to a window of salinities between 35.3 and 35.5. Changes in the area of suitable spawning habitat (estimated here to be up to 2.5 times) can therefore be understood as arising from the spread of saline subtropical water masses throughout the spawning region due to a weak North Atlantic subpolar gyre. We postulate that blue whiting actively select optimum oceanographic conditions to deliver their eggs to enhance their offsprings likelihood of survival and thereby their fitness. The knowledge derived here, together with the high predictability of salinity at depth in the North-East Atlantic, can potentially form the basis for forecasting the spawning distribution of this species.

General information
State: Accepted/In press
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Technical University of Denmark
Authors: Miesner, A. K. (Intern), Payne, M. R. (Intern)
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Fisheries Oceanography
ISSN (Print): 1365-2419
Ratings:
Web of Science (2018): Indexed yes
Scopus rating (2017): CiteScore 1.86
Web of Science (2017): Indexed Yes
Scopus rating (2016): CiteScore 2.19
Web of Science (2016): Indexed yes
Scopus rating (2015): CiteScore 2.4
Web of Science (2015): Indexed yes
Scopus rating (2014): CiteScore 2.61
Web of Science (2014): Indexed yes
Scopus rating (2013): CiteScore 2.61
Lessons from the first generation of marine ecological forecast products

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, University of California, Santa Cruz, Dalhousie University, Wageningen IMARES, NOAA, Woods Hole Oceanographic Institution, Max Planck Institute for Meteorology, Gulf of Maine Research Institute, Institute of Marine Research, AZTI Technalia, CSIRO Marine and Atmospheric Research
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Frontiers in Marine Science
Volume: 4
Article number: 289
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Scopus rating (2017): SNIP 0.862 SJR 1.225 CiteScore 2.89
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 0.53 SJR 1.425 SNIP 1.095
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.126 SNIP 0.812
BFI (2014): BFI-level 1
BFI (2013): BFI-level 1
ISI indexed (2013): ISI indexed no
Original language: English
Electronic versions:
Publishers version
DOIs:
10.3389/fmars.2017.00289
Links:
Publication: Research - peer-review › Journal article – Annual report year: 2017
Forecasting the spawning distribution of blue whiting (Micromesistius poutassou)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography
Authors: Miesner, A. K. (Intern), Payne, M. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences

Electronic versions:
Publishers version
Source: PublicationPreSubmission
Source-ID: 126631149
Publication: Research › Conference abstract for conference – Annual report year: 2016

The effect of Pseudo-nitzschia seriata on grazing and fecundity of Calanus finmarchicus and Calanus glacialis
This study investigates whether feeding on the domoic acid (DA)-producing diatom Pseudo-nitzschia seriata affects the faecal pellet (FP) production (proxy for grazing) and fecundity of Calanus finmarchicus and Calanus glacialis. Female copepods were fed a saturating concentration of food (400 mg C L⁻¹) in two combinations (i) natural phytoplankton spiked with 50% P. seriata and (ii) only the non-toxic phytoplankton community. The copepods ingested DA, as illustrated by DA accumulation in their FPs, and transferred a share of DA to their eggs and body tissue. DA was mainly excreted through FPs in both species. Compared with C. finmarchicus, C. glacialis accumulated substantially more DA in its body tissue. For both species, egg production and hatching success were unaffected by grazing on the toxic diatom. This suggests that feeding on DA-containing P. seriata does not affect copepod fecundity, despite increasing DA concentrations of P. seriata during the experiment.

General information
State: Published
Authors: Miesner, A. K. (Intern), Lundholm, N. (Forskerdatabase), Krock, B. (Ekstern), Nielsen, T. G. (Intern)
Pages: 564-574
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Plankton Research
Volume: 38
Issue number: 3
ISSN (Print): 0142-7873
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 2.22 SJR 1.163 SNIP 0.979
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.92 SJR 1.123 SNIP 0.856
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.029 SNIP 0.802 CiteScore 1.77
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.098 SNIP 1.234 CiteScore 2.24
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.292 SNIP 1.101 CiteScore 2.39
ISI indexed (2013): ISI indexed yes
Environmental determinates of blue whiting (Micromesistius poutassou) spawning distribution

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Centre for Ocean Life, Section for Marine Ecology and Oceanography
Authors: Miesner, A. K. (Intern), Payne, M. (Intern)
Publication date: 2015
Event: Abstract from ICES Annual Science Conference 2015, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences

Bibliographical note
ICES C.M. 2015/
Publication: Research › Conference abstract for conference – Annual report year: 2016
Projects:

Marine Ecosystem Climate Services
National Institute of Aquatic Resources
Period: 01/09/2016 → 13/12/2021
Number of participants: 3
Phd Student:
Miesner, Anna Katharina (Intern)
Supervisor:
MacKenzie, Brian (Intern)
Main Supervisor:
Payne, Mark (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

North Atlantic climate (NACLIM) (38945)
The North Atlantic Ocean is one of the most important drivers for the global ocean circulation and its variability on time scales beyond inter-annual. Global climate variability is to a large extent triggered by changes in the North Atlantic sea surface state. The quality and skill of climate predictions depends crucially on a good knowledge of the northern sea surface temperatures (SST) and sea ice distributions. On a regional scale, these parameters strongly impact on weather and climate in Europe, determining precipitation patterns and strengths, as well as changes in temperature and wind patterns. Knowledge of these factors, and of their development in the years to come, is of paramount importance for society and key economic sectors, which have to base their planning and decisions on robust climate information. NACLIM will contribute to this goal.

DTU Aqua is the leader of work package developing such climate services for marine ecosystems, pioneering the translation of decadal-scale forecasts of the ocean’s physical environment to forecasts of the biological environment.

There are 18 project partners in total. See http://naclim.zmaw.de/Consortium.2126.0.html

The project is coordinated by University of Hamburg, Germany.

The project is funded by EU, Framework Programme 7.

Section for Marine Ecology and Oceanography
National Institute of Aquatic Resources

Section for Oceans and Arctic
Period: 01/11/2012 → 31/01/2017
Number of participants: 3
Research areas: Marine Populations and Ecosystem Dynamics & Oceanography
Project participant:
MacKenzie, Brian (Intern)
Phd Student:
Miesner, Anna Katharina (Intern)
Project Manager, academic:
Payne, Mark (Intern)

Activities:

Environmental determinates of blue whiting (Micromesistius poutassou) spawning distributions
Period: 23 Sep 2015
Anna Katharina Miesner (Invited speaker)

National Institute of Aquatic Resources
Description
Presented at: ICES Annual Science Conference.
Theme Session: Basin-scale dynamics at lower trophic levels in the North Atlantic.
Documents:
AK Miesner 2015 ICES Presentation Abstract

Related event
ICES Annual Science Conference 2015
21/09/2015 → 25/09/2015
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations