Acute and semi-chronic toxicity of vanadium tested on copepods of the species Temora longicornis

Ecological effects of scrubber water discharge on coastal plankton: Potential synergistic effects of contaminants reduce survival and feeding of the copepod Acartia tonsa

To meet the oncoming requirements for lower sulphur emissions, shipping companies can install scrubbers where the exhaust is sprayed with seawater and subsequently discharged to the sea. The discharge water has a pH around 3 and contains elevated concentrations of vanadium, nickel, lead and hydrocarbons. We investigated 1) the threshold concentrations of scrubber discharge water for survival, feeding and reproduction of the copepod Acartia tonsa, 2) whether the effects depend on the exposure route and 3) whether exposure to discharge water can be detected in field-collected organisms. A direct exposure to discharge water increased adult copepod mortality and reduced feeding at metal concentrations which were orders of magnitude lower than the lethal concentrations in previous single-metal studies. In contrast, reproduction was not influenced by dietary uptake of contaminants. Scrubber water constituents could have synergistic effects on plankton productivity and bioaccumulation of metals, although the effects will depend on their dilution in the marine environment.
Ecological effects of scrubber water discharge on coastal plankton: Potential synergistic effects of contaminants reduce survival and feeding of the copepod Acartia tonsa

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Department of Environmental Engineering, Environmental Chemistry
Authors: Koski, M. (Intern), Stedmon, C. (Intern), Trapp, S. (Intern)
Number of pages: 1
Publication date: 2017

Host publication information
Title of host publication: Book of Abstracts Sustain 2017
Article number: A-9
Main Research Area: Technical/natural sciences
Conference: Sustain 2017, Kgs. Lyngby, Denmark, 06/12/2017 - 06/12/2017
Electronic versions:
SustainAbstracts2017c.compressed_12.pdf
Publication: Research - peer-review » Conference abstract in proceedings – Annual report year: 2017

Feeding on dispersed vs. aggregated particles: The effect of zooplankton feeding behavior on vertical flux
Zooplankton feeding activity is hypothesized to attenuate the downward flux of elements in the ocean. We investigated whether the zooplankton community composition could influence the flux attenuation, due to the differences of feeding modes (feeding on dispersed vs. aggregated particles) and of metabolic rates. We fed 5 copepod species-three calanoid, one harpacticoid and one poecilamastoid-microparticle food, in either dispersed or aggregated form and measured rates of respiration, fecal pellet production and egg production. Calanoid copepods were able to feed only on dispersed food; when their food was introduced as aggregates, their pellet production and respiration rates decreased to rates observed for starved individuals. In contrast, harpacticoids and the poecilamastoid copepod Oncaea spp. were able to feed only when the food was in the form of aggregates. The sum of copepod respiration, pellet production and respiration rates decreased to rates observed for starved individuals. In contrast, harpacticoids and the poecilamastoid copepod Oncaea spp. were able to feed only when the food was in the form of aggregates. The sum of copepod respiration, pellet production and egg production rates was equivalent to a daily minimum carbon demand of ca. 10% body weight-(1) for all non-feeding copepods; the carbon demand of calanoids feeding on dispersed food was 2-3 times greater, and the carbon demand of harpacticoids and Oncaea spp. feeding on aggregates was >7 times greater, than the resting rates. The zooplankton species composition combined with the type of available food strongly influences the calculated carbon demand of a copepod community, and thus also the attenuation of vertical carbon flux.

General information
State: Published
Organisations: Section for Marine Ecology and Oceanography, National Institute of Aquatic Resources, Universite de Bretagne Occidentale
Authors: Koski, M. (Intern), Boutorh, J. (Ekstern), De La Rocha, C. L. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: P L o S One
Volume: 12
Issue number: 5
Article number: e0177958
ISSN (Print): 1932-6203
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.11 SJR 1.201 SNIP 1.092
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Metagenomic insights into zooplankton-associated bacterial communities

Zooplankton and microbes play a key role in the ocean's biological cycles by releasing and consuming copious amounts of particulate and dissolved organic matter. Additionally, zooplankton provide a complex microhabitat rich in organic and inorganic nutrients in which bacteria thrive. In this study, we assessed the phylogenetic composition and metabolic potential of microbial communities associated with crustacean zooplankton species collected in the North Atlantic. Using Illumina sequencing of the 16S rRNA gene we found significant differences between the microbial communities associated with zooplankton and those inhabiting the surrounding seawater. Metagenomic analysis of the zooplankton-associated microbial community revealed a highly specialized bacterial community able to exploit zooplankton as microhabitat and thus, mediating biogeochemical processes generally underrepresented in the open ocean. The zooplankton-associated bacterial community is able to colonize the zooplankton's internal and external surfaces by using a large set of adhesion mechanisms and to metabolize complex organic compounds released or exuded by the zooplankton such as chitin, taurine and other complex molecules. Moreover, the high number of genes involved in iron and phosphorus metabolisms in the zooplankton-associated microbiome suggests that this zooplankton-associated bacterial community mediates specific biogeochemical processes (through the proliferation of specific taxa) that are generally underrepresented in the ambient waters. This article is protected by copyright. All rights reserved.
Prevalence and risk factors associated with Theileria parva infection in cattle in three regions of Tanzania

Ticks and tickborne diseases (TBDs) are serious constraints to cattle production in Tanzania and other tropical and subtropical countries. Among the TBDs, East Coast fever (ECF) is the most important as it causes significant economic losses to the cattle industry in Tanzania. However, control of ECF in Tanzania has continued to be a challenge due to inadequate epidemiological information. The main objective of this study was to determine the epidemiological situation of Theileria parva infections in cattle kept under pastoral and agro-pastoral farming systems in Mara, Singida, and Mbeya regions of Tanzania. Blood samples were collected from 648 cattle in the three regions. Genomic DNA was extracted and amplified in a polymerase chain reaction (PCR) using T. parva-specific primers targeting the 104-kD antigen (P104) gene. In addition, information was collected on the possible risk factors of T. parva infection (animal age, region, animal sex, tick burden, tick control method, and frequency of acaricide application). The prevalence of T. parva across the three regions was 14.2%. There was variation in prevalence among the three regions with Mara (21.8%) having a significantly higher (p = 0.001) prevalence than the other regions. Moreover, Mbeya exhibited relatively lower prevalence (7.4%) compared to the other regions. Factors found to be significantly associated with an animal being PCR positive for T. parva were region (p = 0.001) and tick burden (p = 0.003). Other factors were not found to be significant predictors of being PCR positive for T. parva. The present study showed high variation in tick burden and T. parva prevalence across the regions. Therefore, different strategic planning and cost-effective control measures for ticks and T. parva infection should be implemented region by region in order to reduce losses caused by ticks and ECF in the study area.
A marine eutrophication impacts assessment method in LCIA coupling coastal ecosystems exposure to nitrogen and species sensitivity to hypoxia

Characterisation modelling in Life Cycle Impact Assessment (LCIA) aims at quantifying potential impacts of anthropogenic emissions. It delivers substance-specific Characterisation Factors (CF) expressing ecosystem responses to marginal increments in emitted quantities. Nitrogen (N) emissions from e.g. agriculture and industry enrich coastal marine ecosystems. Excessive algal growth and dissolved oxygen (DO) depletion typify the resulting marine eutrophication. LCIA modelling frameworks typically encompass fate, exposure and effect in the environment. The present novel method couples relevant marine biological processes of ecosystem’s N exposure (Exposure Factor, XF) with the sensitivity of select species to hypoxia (Effect Factor, EF). The XF converts N-inputs into a sinking carbon flux from planktonic primary production and DO consumed by bacterial respiration in bottom waters, whereas EF builds on probabilistic Species Sensitivity Distribution (SSD) methodologies to quantify potential species losses from hypoxia. Results show 2 orders of magnitude global spatial differentiation on a Large Marine Ecosystems (LME) spatial resolution. Adding an N-fate model completes CFs for anthropogenic N-forms, thus producing comparative environmental sustainability indicators of human activities as applied in Life Cycle Assessment (LCA) of product systems.

General information
State: Published
Organisations: Department of Management Engineering, Quantitative Sustainability Assessment, National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Cosme, N. M. D. (Intern), Koski, M. (Intern), Hauschild, M. Z. (Intern)
Publication date: 2015
Event: Abstract from ASLO Aquatic Sciences Meeting 2015, Granada, Spain.
Main Research Area: Technical/natural sciences

Bibliographical note
Oral presentation

Relations
Activities:
Coupling ecosystems exposure to nitrogen and species sensitivity to hypoxia: modelling marine eutrophication in LCIA

Characterisation modelling in Life Cycle Impact Assessment (LCIA) quantifies impacts of anthropogenic emissions by applying substance-specific impact potentials, or Characterisation Factors (CF), to the amount of substances emitted. Nitrogen (N) emissions from human activities enrich coastal marine ecosystems and promote planktonic growth that may lead to marine eutrophication impacts. Excessive algal biomass and dissolved oxygen (DO) depletion typify the ecosystem response to the nutrient input. The present novel method couples a mechanistic model of coastal biological processes that determines the ecosystem response (exposure) to anthropogenic N enrichment (eXposure Factor, XF [kgO2·kgN⁻¹]) with the sensitivity of species exposed to oxygen-depleted waters (Effect Factor, EF [([PAF]·m3·kgO2⁻¹), expressed as a Potentially Affected Fraction (PAF) of species]. Thus, the coupled indicator (XF*EF, [([PAF]·m3·kgN⁻¹]) represents the potential impact on benthic and demersal marine species caused by N inputs. Preliminary results range from 2 (PAF)·m3·kgN⁻¹ (Central Arctic Ocean) to 94 (PAF)·m3·kgN⁻¹ (Baltic Sea). Comparative contributions per country or watersheds can also be obtained. Further adding environmental fate modelling of N emissions completes the CF for eutrophying emissions making it a useful contribution for sustainability assessment of human activities, as applied in Life Cycle Assessment (LCA).

General information
State: Published
Organisations: Department of Management Engineering, Quantitative Sustainability Assessment, National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography
Authors: Cosme, N. M. D. (Intern), Koski, M. (Intern), Hauschild, M. Z. (Intern)
Number of pages: 2
Publication date: 2015
Event: Abstract from ICES Annual Science Conference 2015, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
Relations
Activities:
ICES Annual Science Conference 2015
Publication: Research › Conference abstract for conference – Annual report year: 2015

Exposure factors for marine eutrophication impacts assessment based on a mechanistic biological model

Emissions of nitrogen (N) from anthropogenic sources enrich marine waters and promote planktonic growth. This newly synthesised organic carbon is eventually exported to benthic waters where aerobic respiration by heterotrophic bacteria results in the consumption of dissolved oxygen (DO). This pathway is typical of marine eutrophication. A model is proposed to mechanistically estimate the response of coastal marine ecosystems to N inputs. It addresses the biological processes of nutrient-limited primary production (PP), metazoan consumption, and bacterial degradation, in four distinct sinking routes from primary (cell aggregates) and secondary producers (faecal pellets, carcasses, and active vertical transport). Carbon export production (PE) and ecosystems eXposure Factors (XF), which represents a nitrogen-to-oxygen 'conversion' potential, were estimated at a spatial resolution of 66 large marine ecosystem (LME), five climate zones, and site-generic. The XFs obtained range from 0.45 (Central Arctic Ocean) to 15.9kgO2kgN⁻¹ (Baltic Sea). While LME resolution is recommended, aggregated PE or XF per climate zone can be adopted, but not global aggregation due to high variability. The XF is essential to estimate a marine eutrophication impacts indicator in Life Cycle Impact Assessment (LCIA) of anthropogenic-N emissions. Every relevant process was modelled and the uncertainty of the driving parameters considered low suggesting valid applicability in characterisation modelling in LCIA.

General information
State: Published
Organisations: Department of Management Engineering, Quantitative Sustainability Assessment, National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography
Authors: Cosme, N. M. D. (Intern), Koski, M. (Intern), Hauschild, M. Z. (Intern)
Pages: 50-63
Publication date: 2015
Main Research Area: Technical/natural sciences
Publication information
Journal: Ecological Modelling
Volume: 317
ISSN (Print): 0304-3800
Ratings:
From nitrogen enrichment to oxygen depletion: a mechanistic model of coastal marine ecosystems response

Nitrogen (N) emissions from anthropogenic sources may enrich coastal waters and lead to marine eutrophication impacts. Processes describing N-limited primary production (PP), zooplankton grazing, and bacterial respiration of sinking organic carbon, were modelled to quantify the potential dissolved oxygen (DO) consumption as a function of N input. Such indicator is the basis for an Exposure Factor (XF) applied in Life Cycle Impact Assessment (LCIA) to estimate impacts from N enrichment. The Large Marine Ecosystems (LME) biogeographical classification system was adopted to address the spatial variation of the modelled parameters and to characterise spatially differentiated N-emissions. Preliminary XF results range from 0.5 kgO2·kgN-1 in the Central Arctic Ocean to 16 kgO2·kgN-1 in the Baltic Sea, out of a total of 66 LME-dependent XFs. All the relevant processes were included in a mechanistic model and the uncertainty of the driving parameters is considered low. The presented XF estimation method contributes with a central component for site-dependent characterization factors (CFs) for marine eutrophication, to be coupled with environmental fate of N emissions and effects of oxygen depletion on biota.
Does copepod size determine food consumption of particulate feeding fish?
The climate-induced reduction in the mean copepod size, mainly driven by a decrease in the abundance of the large Calanus finmarchicus around 1987, has been linked to the low survival of fish larvae in the North Sea. However, to what extent this sort of reduction in copepod size has any influence on adult particulate feeding fish is unknown. In the present study, we investigated the hypothesis that the availability of the large copepods determines food consumption and growth conditions of lesser sandeel (Ammodytes marinus) in the North Sea. Analysis of stomach content suggested that food consumption is higher for fish feeding on large copepods, and additional calculations revealed how handling time limitation may provide part of the explanation for this relationship. Comparing stomach data and zooplankton samples indicated that lesser sandeel actively target large copepods when these are available. Finally, we observed that the length of lesser sandeel began to decrease in the late 1980s, simultaneously with the C. finmarchicus decline.
Sexual selection in marine plankton

Copepods are among the most abundant metazoans on the planet and play an important role in the marine food web. Many aspects of their ecology have consequently been studied, including details of their reproductive biology and mating behaviour. Sexual selection, the part of evolution which selects for increased mating and fertilization success, is an important evolutionary process, with consequences at individual, population and species level. Yet very little is known about the significance of sexual selection for the evolution and ecology of this key group of animals. The presented thesis used behavioural studies and genetic parentage analyses to examine the fertilization status and occurrence of mate choice and polygamy in the copepod Temora longicornis (Copepoda, Calanoida). The overall objective of my PhD project was to examine the intensity and direction of sexual selection in T. longicornis and elucidate the role of sexual selection for the behaviour of individuals, the dynamics of populations, and the functioning of the pelagic ecosystem. I wanted to address the following overarching questions: i) What is the fraction of fertilized females in field and laboratory populations? Is it influenced by adult abundance, male mating capacity and the environment? ii) Is mating in T. longicornis random, or do some individuals have a higher-than-average chance of fertilizing or being fertilized? iii) Which traits control mating in T. longicornis? Are body size and age significant factors influencing male fecundity (mating rate and sperm production) and female reproductive fitness? iv) Does multiple mating lead to multiple paternity? What is the effect of multiple mating on the female’s reproductive output as well as the longevity of the individual? The thesis is divided into 5 chapters that report on different efforts to address these objectivities. It opens with a general introduction and synopsis that lays out the context for the research, summarizes the main findings and discusses perspective for future research (Chapter 1). In Chapter 2 we studied female fertilization status in North Sea summer populations and in laboratory cultures of T. longicornis. The study showed that the fractions of fertilized females in both field and laboratory populations were much smaller (< 50%) than predicted by a theoretical model that assumes random mating. Such low fertilization rates are normally related to environmental factors such as poor food or low densities, which we could not confirm in our experiment. Male density was negatively related to fertilization rate, and a large fraction of males did not mate in laboratory incubations. This led to Chapter 3, where we investigated age- and size-dependent reproductive performance (egg and sperm production, mating success) in T. longicornis. We found that ageing effects were evident: mortality rate increased with age, and fertility decreased rapidly with age. We also found that several aspects of reproductive performance increased with size in both males and females: large females produced more offspring than small ones, and large males mated more often, produced larger spermatophores containing more sperm cells and sired more offspring. The study also showed that repeated mating was not only potentially advantageous (e.g. in terms of higher genetic variability) for females, but can come at the disadvantage of increased mortality. Chapter 4 describes the identification and characterization of the six microsatellites primers used in Chapter 5 to do paternity testing of the offspring. To investigate if mating was random or under the influence of sexual selection, we tested which males sired the female’s offspring. By establishing paternity, we can precisely quantify the reproductive success of individual males and thus assess how successful particular males have been. Our study clearly demonstrated the occurrence of
multiple paternity in *T. longicornis*. This is the first time that genetic polyandry has been documented in a pelagic copepod. Multiple paternity opens up for the possibility of post-copulatory sexual selection, such as sperm competition and cryptic female choice. We further found that mating was non-random, as we identified superior individuals with a higher than average mating success both among females and among males. Some of the variation between individuals could be explained by variation in size and age. Large males were superior to small males in terms of reproductive success, with the larger males (0.8 mm) mating about 3 times as frequent as the smaller males (0.6 mm). In accordance with the findings in Chapter 2, we found that a fraction of the males (8-14 %) in our study never mated during incubations, despite a plentiful supply of females. Only about half of the females in our experiments were fertilized, even though male availability was high and mate encounters not limiting. The strong size- and age-dependent fertility in this species is conducive to the existence of sexual selection via mate choice for young and large partners, as has been shown in another copepod species. We further suggest that sexual selection, through mate choice or male–male competition could account for low fertilization rates of females in populations of pelagic copepods during some periods of the year.

This thesis suggests that the processes and mechanisms of sexual selection have to be considered when studying reproductive rates in copepod populations.

---

**General information**

State: Published

Organisations: National Institute of Aquatic Resources, Centre for Ocean Life

Authors: Sichlau, M. H. (Intern), Kiørboe, T. (Intern), Koski, M. (Intern)

Number of pages: 93

Publication date: 2014

---

**Publication information**

Place of publication: Charlottenlund

Publisher: Technical University of Denmark. National Institute of Aquatic Resources

Original language: English

Main Research Area: Technical/natural sciences

Electronic versions:

Publishers version

Publication: Research › Ph.D. thesis – Annual report year: 2014

---

**The Biological carbon pump in the North Atlantic**

Mediated principally by the sinking of organic rich particles from the upper ocean, the Biological Carbon Pump (BCP) is a significant component of the global carbon cycle. It transfers roughly 11 Gt C yr⁻¹ into the ocean’s interior and maintains atmospheric carbon dioxide at significantly lower levels than would be the case if it did not exist. More specifically, export by the BCP in the North Atlantic is ~0.55–1.94 Gt C yr⁻¹. A rich set of observations suggests that a complex set of processes drives this export. However, significant uncertainties exist regarding the BCP in the North Atlantic, including both the magnitude of the downward flux and the ecological, chemical and physical processes by which it is sustained and controlled. Our lack of detailed mechanistic understanding has also hindered modelling attempts to quantify and predict changes to the BCP. In this paper, we assess current knowledge concerning the BCP in the North Atlantic in order to identify priorities for future research, as well as suggesting how they might be addressed.

---

**General information**

State: Published

Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Marine Ecology and Oceanography, Université de Bretagne Occidentale, Institute of Marine Sciences, Norwegian Institute for Water Research, National Oceanography Centre

Authors: Sanders, R. (Ekstern), Henson, S. A. (Ekstern), Koski, M. (Intern), De La Rocha, C. L. (Ekstern), Painter, S. C. (Ekstern), Poulton, A. J. (Ekstern), Riley, J. (Ekstern), Salihoglu, B. (Ekstern), Visser, A. (Intern), Yool, A. (Ekstern), Bellerby, R. (Ekstern), Martin, A. P. (Ekstern)

Pages: 200-218

Publication date: 2014

Main Research Area: Technical/natural sciences

---

**Publication information**

Journal: Progress in Oceanography

Volume: 129 B

ISSN (Print): 0079-6611

Ratings:

BFI (2018): BFI-level 2

Web of Science (2018): Indexed yes

BFI (2017): BFI-level 2

Web of Science (2017): Indexed yes
The Mystery of Microsetella – Combination of egg- and broadcast spawning in an Arctic fjord?

Different life-history stages of the pelagic harpacticoid Microsetella norvegica were sampled in a Greenland fjord, to investigate how this slowly growing species can achieve high abundances at low temperatures. We expected low but continuous reproduction coupled with a low mortality, but observed the opposite: a short reproductive period with high estimated weight-specific egg production and egg mortality, and indication of a life-history strategy combining the advantages of egg carrying with egg production rates independent of temperature.
Copepods use chemical trails to find sinking marine snow aggregates

Copepods are major consumers of sinking marine particles and hence reduce the efficiency of the biological carbon pump. Their high abundance on marine snow suggests that they can detect sinking particles remotely. By means of laboratory observations, we show that the copepod Temora longicornis can detect chemical trails originating from sinking marine snow particles (appendicularian houses). The chemical cue was detected by copepods from a distance of >25 particle radii, with the probability of detection decreasing with distance. The behavior of T. longicornis following the trail resembled the behavior of males tracking pheromone trails, although with a lower tracking velocity. Upon finding a house, the copepod would attach for a short period (10–30 s) and feed intensively. Due to short residence times, daily feeding rates were moderate. Our results demonstrate that even T. longicornis, a species usually considered a microparticle feeder, is able to detect and feed on marine snow aggregates. If similar behaviors are displayed by the more dedicated aggregate-feeding copepods, a topic that remains unexplored, the effect of copepods on vertical flux attenuation may be significant.
The effect of egg versus seston quality on hatching success, naupliar metabolism and survival of Calanus finnarchicus in mesocosms dominated by Phaeocystis and diatoms

We studied the effect of a developing Skeletonema marinoi/Phaeocystis spp. bloom on Calanus finnarchicus hatching success, early naupliar survival and metabolism. Our focus was (1) on the development of reproductive rates during a bloom initiation, peak and decline in relation to the production of potentially toxic algal metabolites and (2) on the proportional importance of female nutrition versus naupliar food environment for the production of viable nauplii. Despite polyunsaturated aldehyde (PUA) production by both S. marinoi and Phaeocystis sp., we did not observe any harmful effects on hatching success or naupliar survival and condition in any stages of the short-term (annual) bloom.
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Biology
Volume: 159
Issue number: 3
ISSN (Print): 0025-3162
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.41 SJR 1.198 SNIP 0.993
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.315 SNIP 0.932 CiteScore 2.21
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.204 SNIP 1.041 CiteScore 2.32
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.272 SNIP 1.064 CiteScore 2.4
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.306 SNIP 1.107 CiteScore 2.43
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.145 SNIP 1.073 CiteScore 2.22
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.235 SNIP 1.069
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.178 SNIP 1.052
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.236 SNIP 1.022
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.348 SNIP 1.21
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.195 SNIP 1.09
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.253 SNIP 1.198
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.392 SNIP 1.228
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.333 SNIP 1.274
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.268 SNIP 1.19
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.241 SNIP 1.158
Web of Science (2001): Indexed yes
Biological processes in the North Sea: comparison of Calanus helgolandicus and Calanus finmarchicus vertical distribution and production

Comparison of abundance, vertical distribution and reproduction of the cousin species, the boreal Calanus finmarchicus and temperate Calanus helgolandicus was carried out on four cruises in July and August north of the Dogger Bank, North Sea. During this period, the water column was highly stratified with a tidally generated deep chlorophyll maximum at 30 m depth. When co-occurring, a separation of the species was evident, where C. finmarchicus preferred colder (9°C) deeper waters, while C. helgolandicus stayed in the warmer (16°C) surface waters. Egg production rates (EPRs) were not statistically different between the species, and the population egg production depended primarily on female abundance and was generally higher for C. finmarchicus. EPRs of the Calanus spp. were best explained by the abundance of autotrophic and heterotrophic dinoflagellates, flagellates and ciliates. Hatching success remained over 90% at all times but the estimated naupliar survival (N1–N6) was only 9%. The chlorophyll maximum supported highest faecal pellet production and egg production at the stations close to the bank. This study shows that C. finmarchicus can remain reproductively active in the North Sea ecosystem longer than previously thought, and with warmer surface temperatures retreat to cooler, deeper waters utilizing the deep chlorophyll maximum. This implies that C. finmarchicus cannot be reliably sampled with the Continuous Plankton Recorder during summer.

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Jonasdottir, S. (Intern), Koski, M. (Intern)
Pages: 63-84
Publication date: 2011
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Plankton Research
Volume: 33
Issue number: 1
ISSN (Print): 0142-7873
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.92 SJR 1.098 SNIP 0.848
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.025 SNIP 0.796 CiteScore 1.77
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.095 SNIP 1.255 CiteScore 2.24
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.289 SNIP 1.109 CiteScore 2.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.557 SNIP 1.101 CiteScore 2.43
Biological processes in the North Sea: vertical distribution and reproduction of neritic copepods in relation to environmental factors

We studied the vertical distribution and reproduction of dominant neritic copepod species in the Dogger Bank area and surrounding North Sea to reveal (i) if these species are concentrated in the subsurface chlorophyll maximum layer, (ii) if the chlorophyll maximum offers superior food conditions for reproduction compared with surface waters and (iii) if the secondary production is thus higher in the frontal areas with a subsurface chlorophyll maximum. In addition, we wanted to (iv) identify the most important environmental factors determining the reproduction of neritic copepods in the North Sea.

We observed a higher egg production of cultured Acartia tonsa when fed with the seston from chlorophyll maximum, but no evidence of a higher copepod abundance in this layer. Secondary production was highest at the station closest to the upwelling of new nutrients, although seasonal differences in environmental variables probably overrode the differences between frontal and stratified stations. Copepod egg production on an annual basis seemed to be best predicted by the body size and specific fatty acids, with a high egg production, but low hatching success associated with a high EPA:DHA ratio. Total secondary production of small copepods seemed mainly related to the species composition, suggesting that factors controlling abundance of specific species rather than reproduction might be more important in determining the secondary production of copepods.

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Koski, M. (Intern), Jonasdottir, S. (Intern), Bagøien, E. (Ekstern)
Copepods and the biological pump: The potential effects of large vs. small copepods on vertical flux

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Koski, M. (Intern), Arendt, K. E. (Ekstern), Lombard, F. (Intern), Jonasdottir, S. (Intern), Dutz, J. (Intern), Kjellerup, S. (Intern)
Number of pages: 143
Publication date: 2011

Host publication information
Title of host publication: Book of Abstracts
Main Research Area: Technical/natural sciences
Conference: 5th International Zooplankton Production Symposium, Púcon, Chile, 14/03/2011 - 14/03/2011
Source: orbit
Source-ID: 277482
Publication: Research › Conference abstract in proceedings – Annual report year: 2011

Extensive cross-disciplinary analysis of biological and chemical control of Calanus finmarchicus reproduction during an aldehyde forming diatom bloom in mesocosms
Egg and faecal pellet production and egg hatching success of the calanoid copepod Calanus finmarchicus were monitored over a period of 14 days (14-28 April, 2008) while fed water from 4 differently treated mesocosms and ambient water. Two of the mesocosms used were inoculated with the polyunsaturated aldehyde (PUA)-producing diatom Skeletonema marinoi, while 2 received only nutrient additions with or without silica. The mesocosms developed blooms of S. marinoi, mixed diatoms or the haptophyte Phaeocystis pouchetii, respectively. Faecal pellet production of C. finmarchicus increased with increasing food availability. Egg production increased with time in all mesocosms to a maximum single female production of 232 eggs female-1 day-1 (average of 90 eggs female-1 day-1) and followed the development of ciliates and P. pouchetii, but was not affected by the observed high (up to 15 nmol L-1) PUA production potential of the phytoplankton. The hatching success of the eggs produced on the mesocosm diets was high (78-96%) and was not affected by either aldehydes in the maternal diet or exposure to the dissolved aldehydes in the water

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Pages: 1943-1963
Publication date: 2011
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Biology
Volume: 158
Issue number: 9
ISSN (Print): 0025-3162
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
Seasonal changes in food quantity and quality of the common North Sea copepods Temora longicornis and Pseudocalanus elongatus: a bioassay approach

We evaluated the food quantity and quality over a seasonal cycle for the development and egg production of the common North Sea copepods Temora longicornis and Pseudocalanus elongatus, using a bioassay approach. Seston was sampled from December to October from a well-mixed water column of the Marsdiep (Dutch Wadden Sea) and fed to cultured copepods at a constant temperature of 15 degrees C, thus excluding seasonal effects of temperature, body size, age, and maternal nutrition. Copepod response was evaluated by measuring egg production and juvenile development, while the seston quantity and quality were measured as the concentrations of chl a, specific phytoplankton pigments, particulate organic carbon (POC), particulate organic nitrogen (PON), fatty acids, and sterols. The egg production of both copepods was low when feeding on seston collected in winter, but increased to peak values with the seston from the spring bloom in March-April. The juveniles of both species were able to complete their development only in spring experiments. A multiple regression analyses and comparison to a good-quality standard food of the same concentration suggested that, in an annual scale, the egg production and development of T longicornis mainly depended on phytoplankton concentration, while the egg production and development of P. elongatus appeared also to benefit from detritus or heterotrophic food sources. The present study did not detect an influence of a specific food quality variable; however, an unexplained high juvenile mortality in summer suggests that all factors are not understood yet.

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Koski, M. (Intern), Dutz, J. (Intern), Klein Breteler, W. (Ekstern), Rampen, S. (Ekstern), Noordeloos, A. (Ekstern)
Pages: 141-155
Publication date: 2010
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Ecology - Progress Series
Volume: 399
ISSN (Print): 0171-8630
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.4
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.56
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Effects of carbon-dioxide-induced acidification on algal quality for copepod reproduction

Glutathione transferase activity and oocyte development in copepods exposed to toxic phytoplankton

Organisms present a series of cellular mechanisms to avoid the effects of toxic compounds. Such mechanisms include the increase in activity of detoxification enzymes [e.g., 7-ethoxyresorufin-O-deethylase (EROD) and glutathione S-transferase (GST)], which could explain the low retention of ingested toxins generally observed in copepods. In addition, decreasing gross growth efficiency (GGE) of copepods with increasing concentration of toxic diets could be caused either by a high expenditure coping with toxins (e.g., increase in the activity of detoxification enzymes) or by a deterioration of reproductive tissues. To assess the effect of toxic phytoplankton on the activity of detoxification enzymes and on oocyte maturation of Acartia tonsa and Temora longicornis, feeding and egg production experiments were carried out with a variety of toxic diets and an adequate non-toxic food control (Rhodomonas spp.) all provided as single species diets. Toxic diets included the nodularin-producing cyanobacterium Nodularia spumigena, the dinoflagellates Alexandrium minutum, and A.
tamarense, which contained Paralytic Shellfish Poisoning (PSP) toxins, the dinoflagellate Prorocentrum lima with Diarrhetic Shellfish Poisoning (DSP) toxins and the haptophyte Prymnesium parvum, which produces ichthyotoxins with haemolytic activity. Feeding on toxic diets was lower than on Rhodomonas spp., except for A. minutum and A. tamarense. In addition, toxic diets negatively affected reproduction in both copepod species with the production of oocytes and oocyte development impaired with A. minutum and N. spumigena. While the negative effect of N. spumigena seemed to be connected to gonad atresia likely caused by severe food limitation (starvation), the negative effect of A. minutum could have been either caused by a direct effect of saxitoxins or nutritional inadequacy on oocyte production. We could not detect EROD activity in the copepods, while the activity of GST was generally higher with the non-toxic food control and positively related to the feeding and egestion rates, suggesting relation to feeding conditions rather than to exposure to toxic diets. No relationship was found between GGE and CST activity. Our results refute the hypothesis that toxic diets, provided at ecologically relevant levels, would induce cellular mechanisms in copepods regarding GST activity. GST activity thus seems to play no role in detoxification of copepods confronted with toxic phytoplankton. Toxin detoxification and its cost for copepods still remain an open question. (C) 2008 Elsevier B.V. All rights reserved.
Copepod reproduction is unaffected by diatom aldehydes or lipid composition

We investigated whether reduced reproductive success of copepods fed with diatoms was related to nutritional imbalances with regard to essential lipids or to the production of inhibitory aldehydes. In 10-d laboratory experiments, feeding, egg production, egg hatching success, and fecal pellet production of Temora longicornis were measured for six different diatom species as well as for a nondiatom control diet (Rhodomonas sp.). The experiments were accompanied by determinations of fatty acids, sterols, and polyunsaturated aldehydes (PUA) in the food. Although diatoms were generally ingested at high rates, they yielded a variable egg production response in copepods, ranging from high egg production in four species (two strains of Thalassiosira rotula, Chaetoceros affinis, and Thalassiosira weissflogii) to low egg production in two species (Leptocylindrus danicus and Skeletonema costatum). Egg hatching rates decreased after 4 d in all diatom treatments, irrespective of the egg production rate and without any relationship to diatom aldehyde production. Similarly, no evidence was found that diatoms are per se nutritionally inferior to nondiatom food. The lack of a distinct mechanism for the observed inhibitory activity of diatoms suggests that the cause(s) might be more complex. We suggest, as one possible explanation, that hatching-specific nutritional deficiencies might be induced by incomplete digestion following from the low gut passage time of diatoms, as indicated by a strong correlation between egg viability and fecal pellet production.
"Good" and "bad" diatoms: development, growth and juvenile mortality of the copepod Temora longicornis on diatom diets

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Koski, M. (Intern), Wichard, T. (Ekstern), Jonasdottir, S. (Intern)
Pages: 719-734
Publication date: 2008
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Biology
Volume: 154
Issue number: 4
ISSN (Print): 0025-3162
Ratings:
BFI (2018): BFI-level 1
Production, oxygen respiration rates, and sinking velocity of copepod fecal pellets: Direct measurements of ballasting by opal and calcite

Production, oxygen uptake, and sinking velocity of copepod fecal pellets egested by Temora longicornis were measured using a nanoflagellate (Rhodomonas sp.), a diatom (Thalassiosira weissflogii), or a coccolithophorid (Emiliania huxleyi) as food sources. Fecal pellet production varied between 0.8 pellets ind\(^{-1}\) h\(^{-1}\) and 3.8 pellets ind\(^{-1}\) h\(^{-1}\) and was significantly higher with T. weissflogii than with the other food sources. Average pellet size varied between 2.2 X 10\(^{(5)}\) mu m\(^{3}\) and 10.0 X 10\(^{(5)}\) mu m\(^{3}\). Using an oxygen microsensor, small-scale oxygen fluxes and microbial respiration rates were measured directly with a spatial resolution of 2 mu m at the interface of copepod fecal pellets and the surrounding water. Averaged volume-specific respiration rates were 4.12 fmol O-2 mu m\(^{-3}\) d\(^{-1}\), 2.86 fmol O-2 mu m\(^{-3}\) d\(^{-1}\), and 0.73 fmol O-2 mu m\(^{-3}\) d\(^{-1}\) in pellets produced on Rhodomonas sp., T. weissflogii, and E. huxleyi, respectively. The average carbon-specific respiration rate was 0.15 d\(^{-1}\) independent on diet (range: 0.08-0.21 d\(^{-1}\)). Because of ballasting of opal and calcite, sinking velocities were significantly higher for pellets produced on T. weissflogii (322 +/- 169 m d\(^{-1}\)) and E. huxleyi (200 +/- 93 m d\(^{-1}\)) than on Rhodomonas sp. (35 +/- 29 m d\(^{-1}\)). Preservation of carbon was estimated to be approximately 10-fold higher in fecal pellets produced when T. longicornis was fed E. huxleyi or T. weissflogii rather than Rhodomonas sp. Our study directly demonstrates that ballast increases the sinking rate of freshly-produced copepod fecal pellets but does not protect them from decomposition.

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Ploug, H. (Ekstern), Iversen, M. (Ekstern), Koski, M. (Intern), Buitenhuis, E. (Ekstern)
Pages: 469-476
Publication date: 2008
Main Research Area: Technical/natural sciences

Publication information
Journal: Limnology and Oceanography
Volume: 53
Issue number: 2
ISSN (Print): 0024-3590
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.5 SJR 1.712 SNIP 1.225
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.472 SNIP 1.422 CiteScore 3.93
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.112 SNIP 1.584 CiteScore 3.73
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.256 SNIP 1.587 CiteScore 3.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.456 SNIP 1.5 CiteScore 3.81
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.374 SNIP 1.445 CiteScore 3.59
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.38 SNIP 1.425
Prymnesium parvum exotoxins affect the grazing and viability of the calanoid copepod Eurytemora affinis

The calanoid copepod Eurytemora affinis from the northern Baltic Sea was exposed to cell-free filtrates of the toxic haptophyte Prymnesium parvum as well as to cell mixtures of P. parvum and Rhodomonas salina. To test the effects of P. parvum exudates and allelopathy on selective grazers, copepods were incubated (1) in increasing concentrations of cell-free filtrates of P. parvum in the presence of good food (R. salina), (2) in 1:1 cell mixtures at 2 cell concentrations of P. parvum and R. salina and (3) in R. salina cell suspension, which was used as a control for good-quality food. P. parvum cultures were grown in nutrient-balanced (+NP) or limited (-N or -P) media to obtain different levels of toxicity. Survival, ingestion, faecal pellet production rates and egg production were measured over 3 d, together with measurements of P. parvum toxicity (hemolytic activity) (HA). Most of the copepods incubated in high-filtrate concentrations died or became severely impaired, although (HA) in filtrates was under the detection limit. Further, the ingestion and faecal pellet production rates were suppressed in the highest filtrate concentrations in nutrient-limited treatments. Higher cell density in cell mixtures resulted in significantly lower faecal pellet production, although survival remained high. Our results show that HA is not a good overall indicator of the total harmful effects of P. parvum on grazers. Besides monospecific P. parvum diets, filtrates and cell mixtures have negative effects on grazers, and these effects are stronger under nutrient-depleted conditions; however, the presence of good-quality food lowers harmful effects for copepods. The negative effects caused either by direct intoxication or by food limitation following from strong allelopathic effects of P. parvum on other components of nano- and microplankton suggest that P. parvum blooms have a realistic potential to be deleterious for copepod secondary production, irrespective of the presence of alternative food sources.
Disruption of microbial food web and inhibition of metazooplankton development in the presence of iron and DOM-stimulated Baltic Sea cyanobacteria

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Kozlowsky-Suzuki, B. (Ekstern), Karjalainen, M. (Ekstern), Koski, M. (Intern), Carlsson, P. (Ekstern), Stolte, W. (Ekstern), Balode, M. (Ekstern), Granéli, E. (Ekstern)
High reproduction of Calanus finmarchicus during a diatom-dominated spring bloom

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Koski, M. (Intern)
Pages: 1785-1798
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Biology
Volume: 151
Issue number: 5
ISSN (Print): 0025-3162
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.41 SJR 1.198 SNIP 0.993
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.315 SNIP 0.932 CiteScore 2.21
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.204 SNIP 1.041 CiteScore 2.32
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.272 SNIP 1.064 CiteScore 2.4
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.306 SNIP 1.107 CiteScore 2.43
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.145 SNIP 1.073 CiteScore 2.22
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.235 SNIP 1.069
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.178 SNIP 1.052
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.236 SNIP 1.022
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.348 SNIP 1.21
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.195 SNIP 1.09
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.253 SNIP 1.198
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.392 SNIP 1.228
Supplemental effects of diet mixing on absorption of ingested organic carbon in the marine copepod Acartia tonsa

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Thor, P. (Ekstern), Koski, M. (Intern), Tang, K. (Ekstern), Jonasdottir, S. (Intern)
Pages: 131-138
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Ecology - Progress Series
Volume: 331
ISSN (Print): 0171-8630
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.4
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.56
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.79
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.9
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2.85
ISI indexed (2011): ISI indexed yes
The fate of discarded appendicularian houses: degradation by the copepod, Microsetella norvegica, and other agents

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Koski, M. (Intern), Møller, E. (Ekstern), Maar, M. (Ekstern), Visser, A. (Intern)
Pages: 641-654
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Plankton Research
Volume: 29
Issue number: 7
ISSN (Print): 0142-7873
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.92 SJR 1.098 SNIP 0.848
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.025 SNIP 0.796 CiteScore 1.77
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.095 SNIP 1.255 CiteScore 2.24
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.289 SNIP 1.109 CiteScore 2.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.557 SNIP 1.101 CiteScore 2.43
Zooplankton grazing on Phaeocystis: a quantitative review and future challenges

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Nejstgaard, J. (Ekstern), Tang, K. (Ekstern), Steinke, M. (Ekstern), Dutz, J. (Intern), Koski, M. (Intern), Antajan, E. (Ekstern), Long, J. (Ekstern)
Pages: 147-172
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: Biogeochemistry
Volume: 83
Issue number: 1/3
ISSN (Print): 0168-2563
Ratings:
Life-stage-specific differences in exploitation of food mixtures: diet mixing enhances copepod egg production but not juvenile development

Development, egg production and hatching success of the calanoid copepods Temora longicornis and Pseudocalanus elongatus were measured in food mixtures to test their ability to obtain a complete nutrition by combining different nutritionally poor food species. In all the food mixtures used, the copepods failed to moult past the first copepodite stage, and the mortality was high. In sharp contrast, mixing two nutritionally poor food species often resulted in egg production which was not significantly different from nutritionally high quality food, although hatching success in many mixtures was low. Whereas egg production was significantly correlated with particulate organic nitrogen in the diet, and independent of
the highly unsaturated fatty acids (HUFAs), eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), hatching increased with increasing DHA and EPA concentration. Growth and juvenile mortality were, however, independent of either nitrogen or HUFAs in the diet. Our results show that adult copepods are effective in combining their nutrition from several food sources, whereas juveniles are not. We suggest that there are species- and life-stage-specific differences in nutritional requirements and/or in the ability to digest and/or assimilate essential nutrients from food mixtures, which may significantly contribute to the success of copepod populations in nature.

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Koski, M. (Intern), Breteler, W. (Ekstern), Schogt, N. (Ekstern), Gonzalez, S. (Ekstern), Jakobsen, H. H. (Intern)
Pages: 919-936
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Plankton Research
Volume: 28
Issue number: 10
ISSN (Print): 0142-7873
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.92 SJR 1.098 SNIP 0.848
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.025 SNIP 0.796 CiteScore 1.77
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.095 SNIP 1.255 CiteScore 2.24
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.289 SNIP 1.109 CiteScore 2.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.557 SNIP 1.101 CiteScore 2.43
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.158 SNIP 1.045 CiteScore 1.99
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.186 SNIP 0.98
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.922 SNIP 1.046
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.174 SNIP 1.037
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.31 SNIP 1.225
Web of Science (2007): Indexed yes
Post-bloom feeding of Calanus finmarchicus copepodites: Selection for autotrophic versus heterotrophic prey

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Koski, M. (Intern), Riser, C. (Ekstern)
Pages: 109-119
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Biology Research
Volume: 2
Issue number: 2
ISSN (Print): 1745-1000
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.26 SJR 0.638 SNIP 0.725
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.8 SNIP 0.835 CiteScore 1.45
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.674 SNIP 0.872 CiteScore 1.34
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.571 SNIP 0.66 CiteScore 1.09
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.672 SNIP 0.737 CiteScore 1.27
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
Toxic haptophyte Prymnesium parvum affects grazing, survival, egestion and egg production of the calanoid copepods Eurytemora affinis and Acartia bifilosa

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Sopanen, S. (Ekstern), Koski, M. (Intern), Kuupo, P. (Ekstern), Uronen, P. (Ekstern), Legrand, C. (Ekstern), Tamminen, T. (Ekstern)
Pages: 223-232
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Ecology - Progress Series
Volume: 327
ISSN (Print): 0171-8630
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.4
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.56
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.79
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
Trophic significance of solitary cells of the prymnesiophyte *Phaeocystis globosa* depends on cell type

With the use of five different isolates of *Phaeocystis globosa* solitary cells from the North Sea, we conducted experiments to reveal whether grazing and development of the nauplii of the calanoid copepod *Temora longicornis* varies in response to the cell type. Two *P. globosa* strains representing nonflagellated cells were ingested at intermediate to high rates and resulted in high survival and development, comparable to the *Rhodomonas* sp. control. In contrast, the response to three mesoflagellate strains was highly variable. Feeding on two of these strains was avoided, whereas the third strain was ingested; however, the mesoflagellates induced poor survival and development regardless of the feeding response. These observations differ from previous results, which generally demonstrate microzooplankton feeding on *Phaeocystis*. The morphological characterization of strains, together with mixture experiments, revealed that neither the production of transparent exopolymer particles and chitinous threads nor toxicity can explain the observed response. The cohesion of the threads into pentagonal stars was observed only in the avoided mesoflagellate and might cause a mechanical hindrance for the ingestion of mesoflagellates. Our results suggest that grazing loss and trophic transfer efficiency might be overestimated when solitary cells are treated as a single functional group with regard to their trophic position.

General information

State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Dutz, J. (Intern), Koski, M. (Intern)
Pages: 1230-1238
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information

Journal: Limnology and Oceanography
Volume: 51
Issue number: 3
ISSN (Print): 0024-3590
Ratings:

BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
Benthic life in the pelagic: Aggregate encounter and degradation rates by pelagic harpacticoid copepods

We measured field abundances, feeding rates, swimming behavior, and particle colonization of two harpacticoids, the pelagic Microsetella norvegica and the semibenthic Amonardia normanni, to examine (1) if aggregates have a significant role in harpacticoid nutrition and (2) if harpacticoids contribute significantly to aggregate degradation. Neither of the harpacticoids was able to feed efficiently on suspended food, while both grazed well on attached food, indicating that pelagic harpacticoids depend on food attached to surfaces, such as those offered by marine aggregates. We estimated that the two harpacticoids are able to search substantial volumes of water for aggregates (up to 1.2 L d⁻¹), and that during bloom conditions in the North Sea, reported aggregate concentrations allow M. norvegica to daily encounter about three aggregates. High short-term hunger-induced feeding rates observed in A. normanni indicate that at least some harpacticoid species can fill their gut during few short visits to aggregates. Harpacticoids may cause substantial degradation of aggregates of <1 cm (5-100%) when their abundance exceeds 10⁵ m⁻², which is not atypical during summer in temperate waters.
Selective grazing of Temora longicornis in different stages of a Phaeocystis globosa bloom - a mesocosm study

Selective grazing of a calanoid copepod Temora longicornis was measured during different stages of a Phaeocystis globosa bloom, in order to reveal (1) if T longicornis feeds on single cells and/or colonies of P. globosa in the presence of alternative food sources, (2) if copepod food selection changes during the initiation, maintenance, collapse and decay of a P. globosa bloom and (3) if P. globosa dominated food assemblage provides a good diet for copepod egg production. Our results show low but constant feeding on small colonies of P. globosa, irrespective of the type or concentration of alternative food sources. In contrast, feeding on single cells was never significant, and the total contribution of P globosa to carbon ingestion of T longicornis was minor. T longicornis fed most actively on the decaying colonies, whereas during the peak of the bloom copepods selected against P globosa. Mostly, T longicornis fed unselectively on different food particles: before the bloom, the major part of the diet consisted of diatoms, whereas during and after the bloom copepod diet was dominated by dinoflagellates and ciliates. Egg production was highest during the decay of the bloom, coinciding with highest proportional ingestion of heterotrophic organisms, but was not seriously reduced even during the peak of the bloom. We conclude that P globosa blooms should not threaten survival of copepod populations, but the population recruitment may depend on the type (and concentration) of the dominant heterotrophs present during the blooms. Due to relatively unselective grazing, the impact of T longicornis to the initiation of a Phaeocystis bloom is considered small, although grazing on decaying colonies may contribute to the faster termination of a bloom. (C) 2005 Elsevier B.V. All rights reserved.

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Koski, M. (Intern), Dutz, J. (Intern), Breteler, W. (Ekstern)
Pages: 915-927
Publication date: 2005
Main Research Area: Technical/natural sciences

Publication information
Journal: Harmful Algae
Volume: 4
Issue number: 5
ISSN (Print): 1568-9883
Ratings:
BFI (2018): BFI-level 2
Role of essential lipids in copepod nutrition: no evidence for trophic upgrading of food quality by a marine ciliate

The ciliate Strombidium sulcatum was used to feed and grow young stages of the copepods Temora longicornis (Muller) and Pseudocalanus elongatus (Boeck). The ciliate was cultured in the laboratory using either bacteria or the green alga Dunaliella sp. as a food source. Young copepodites of both copepod species consumed S. sulcatum at significant rates, but after 3 d, weight-specific ingestion decreased more than 2-fold. Larvae and copepodites feeding on S. sulcatum developed at suboptimal rates, survived poorly and showed abnormal morphology in comparison to control individuals fed a good-quality Rhodomonas sp. diet. The specific mass of fatty acids in S. sulcatum was much lower than in the Dunaliella sp. diet. However, the fatty acid composition of the protozoan more or less resembled that of the food, lacking long-chain highly unsaturated fatty acids (HUFAs). Sterols only occurred in Dunaliella sp., although in low abundance of unuseful Delta7 sterols. Obviously, S. sulcatum did not biochemically enhance bacterial or algal food for subsequent use at higher trophic levels, and only transferred fatty acids without further conversion. The results indicate a deficiency in the ciliate of HUFAs and sterols which are essential nutrients for copepod growth. Apart from energy, ciliates seem to contribute little nutritive value to the diet of higher trophic levels, and this may limit secondary production during periods of low algal abundance.

General information
Development and grazing of Temora longicornis (Copepoda, Calanoida) nauplii during nutrient limited Phaeocystis globosa blooms in mesocosms

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Klein Breteler, W. (Ekstern), Koski, M. (Intern)
Pages: 185-192
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information
Journal: Hydrobiologia
Volume: 491
Issue number: 1-3
ISSN (Print): 0018-8158
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.27
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.16
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.22
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.02
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.13
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 1.98
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
BFI (2008): BFI-level 1
Web of Science (2008): Indexed yes
Web of Science (2007): Indexed yes
Feeding, reproduction and toxin accumulation by the copepods Acartia bifilosa and Eurytemora affinis in the presence of the toxic cyanobacterium Nodularia spumigena

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Kozlowsky-Suzuki, B. (Ekstern), Karjalainen, M. (Ekstern), Lehtiniemi, M. (Ekstern), Engström-Öst, J. (Ekstern), Koski, M. (Intern), Carlsson, P. (Ekstern)
Pages: 237-249
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Ecology Progress Series
Volume: 249
ISSN (Print): 0171-8630
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.4
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.56
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.79
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.9
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2.85
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Web of Science (2008): Indexed yes
Web of Science (2007): Indexed yes
Influence of diet on copepod survival in the laboratory

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Koski, M. (Intern), Klein Breteler, W. (Ekstern)
Pages: 73-82
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Ecology Progress Series
Volume: 264
ISSN (Print): 0171-8630
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.4
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.56
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.79
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.9
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2.85
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Web of Science (2009): Indexed yes
Selective feeding of Temora longicornis adults vs. nauplii in a Phaeocystis dominated mesocosm

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Koski, M. (Intern), Dutz, J. (Intern), Breteler, W. K. (Ekstern)
Publication date: 2003
Event: Poster session presented at 3rd International Zooplankton Production Symposium, Gijon, Spain.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 281347
Publication: Research › Poster – Annual report year: 2003

Strain-specific grazing and development on Phaeocystis globosa by nauplii of Temora longicornis

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Authors: Dutz, J. (Intern), Koski, M. (Intern)
Publication date: 2003
Event: Poster session presented at 3rd International Zooplankton Production Symposium, Gijon, Spain.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 281346
Publication: Research › Poster – Annual report year: 2003

Calanoid copepods feed and produce eggs in the presence of toxic cyanobacteria Nodularia spumigena

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Pages: 878-885
Publication date: 2002
Main Research Area: Technical/natural sciences

Publication information
Journal: Limnology and Oceanography
Volume: 47
ISSN (Print): 0024-3590
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Copepod hatching success in marine ecosystems with high diatom concentrations.

Diatoms dominate spring bloom phytoplankton assemblages in temperate waters and coastal upwelling regions of the global ocean. Copepods usually dominate the zooplankton in these regions and are the prey of many larval fish species.
Recent laboratory studies suggest that diatoms may have a deleterious effect on the success of copepod egg hatching. These findings challenge the classical view of marine food-web energy flow from diatoms to fish by means of copepods. Egg mortality is an important factor in copepod population dynamics, thus, if diatoms have a deleterious in situ effect, paradoxically, high diatom abundance could limit secondary production. Therefore, the current understanding of energy transfer from primary production to fisheries in some of the most productive and economically important marine ecosystems may be seriously flawed. Here we present in situ estimates of copepod egg hatching success from twelve globally distributed areas, where diatoms dominate the phytoplankton assemblage. We did not observe a negative relationship between copepod egg hatching success and either diatom biomass or dominance in the microplankton in any of these regions. The classical model for diatom-dominated system remains valid.

**General information**

State: Published
Organisations: Plymouth Marine Laboratory, Institut Maurice-Lamontagne, University of Victoria, National Marine Fisheries Service, AZTI-Tecnalia, Marine and Coastal Management, University of Connecticut, University of Trieste, Netherlands Institute of Sea Research, National Oceanography Centre, University of New Hampshire, Durham
Pages: 387-389
Publication date: 2002
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Nature
Volume: 419
Issue number: 6905
ISSN (Print): 0028-0836
Ratings:
BFI (2018): BFI-level 3
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 13.33
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 14.38
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 14.22
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 14.96
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 14.01
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 13.96
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Development of Baltic Sea zooplankton in the presence of a toxic cyanobacterium: a mesocosm approach

Cyanobacteria blooms are common in the Baltic Sea and are considered to be a poor food source and sometimes toxic to zooplankton. Most experiments demonstrating harmful effects have been short-term incubations with monocultures or simple mixtures of food. In this study, a mesocosm approach was used to examine zooplankton responses over generation timescales. A toxic strain of the cyanobacterium Nodularia spumigena was added to bag enclosures of ambient water. The initial mesozooplankton concentration was either reduced by prescreening the water or enriched with locally caught zooplankton. Experiments ran for 15 days, long enough to monitor reproductive success and development of the next mesozooplankton generations. There was no major harmful effect on the zooplankton assemblage, even though the concentration of the toxin nodularin was in the upper range of field observations. The copepod Eurytemora affinis, rotifers Synchaeta spp. and the cladoceran Bosmina longispina maritima were able to develop and reproduce successfully in the presence of N. spumigena. The only species showing impaired recruitment was the copepod Acartia bifilosa. The general lack of population level effects from N. spumigena in this study can be reconciled with previous observations of adverse effects. Cyanobacteria alone may be poor food and toxic to zooplankton, but in the mesocosms a rich assemblage of microbiota developed, similar to that associated with blooms in the field. We suggest that, in the context of otherwise food-depleted summer situations in the open Baltic Sea, zooplankton can derive benefit from cyanobacteria bloom assemblages.
Effects of toxic cyanobacteria on plankton assemblage: community development during decay of Nodularia spumigena

We studied the development of the plankton community in an artificially created toxic Nodularia spumigena bloom during a 2 wk enclosure study at the SW coast of Finland in the Baltic Sea. We measured bacterial abundance, dominant phytoplankton groups and ciliates, as well as concentrations of phytoplankton pigments, fatty acids, nodularin, protein and nutrients. A high POC:chl a (}

**General information**

State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources
Pages: 1-14
Publication date: 2002
Main Research Area: Technical/natural sciences
Stoichiometry of mesozooplankton in N- and P-limited areas of the Baltic Sea

The Baltic Sea is a very suitable site for stoichiometric studies, since its subbasins differ in their concentration of elemental components, and primary production can therefore be either nitrogen or phosphorus limited. To reveal if the nutrient limitation of mesozooplankton mirrors that of the primary producers, carbon, nitrogen and phosphorus content of both seston and grazers (Acartia sp., Centropages hamatus, Daphnia cristata, Eurytemora affinis, Limnocalanus macrurus, Temora longicornis) were measured in midsummer in the Baltic proper, the Gulf of Finland and the Gulf of Bothnia. The mineral ratios of the different taxa were equal, apart from L. macrurus with notably higher C:P and N:P ratios. Molar C:N ratios were relatively stable (5.1-6.3), whereas C:P and N:P ratios fluctuated more (41-144 and 6.6-24). However, zooplankton elemental composition and limitation did not depend on the limiting nutrient of the phytoplankton, the seston mineral ratio or the sea area. Both the seston-zooplankton elemental imbalance and the food threshold ratio indicated phosphorus limitation of most of the grazers. While L. macrurus may be C or N limited, the possible P deficiency of the other studied taxa suggests that the Baltic Sea zooplankton may act as a potential phosphorus sink, as the freshwater secondary producers do.

General information
State: Published
Organisations: Finnish Institute of Marine Research, University of Helsinki, Tvärminne Zoological Station
Authors: Pertola, S. (Ekstern), Koski, M. (Intern), Viitasalo, M. (Ekstern)
Pages: 425-434
Publication date: 2002
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Biology (Berlin)
Volume: 140
Issue number: 2
ISSN (Print): 0025-3162
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.41 SJR 1.198 SNIP 0.993
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.315 SNIP 0.932 CiteScore 2.21
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.204 SNIP 1.041 CiteScore 2.32
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.272 SNIP 1.064 CiteScore 2.4
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.306 SNIP 1.107 CiteScore 2.43
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.145 SNIP 1.073 CiteScore 2.22
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.235 SNIP 1.069
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.178 SNIP 1.052
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Feeding interactions of the copepods Eurytemora affinis and Acartia bifilosa with the cyanobacteria Nodularia sp.: Short Communications

We measured ingestion and clearance rates of two Baltic Sea calanoid copepods, Eurytemora affinis and Acartia bifilosa, on toxic and non-toxic cyanobacteria Nodularia sp. using the isotope technique. Eurytemora affinis fed actively on the non-toxic strain and moderately actively on the toxic strain, whereas A. bifilosa totally avoided feeding on both strains. This suggests that A. bifilosa rejected cyanobacterial filaments due to their nutritional inadequacy or difficult manageability. The different response of E. affinis to the non-toxic and toxic strains, in turn, shows that this copepod species was able to sense the presence of the toxin in cyanobacterial filaments and therefore fed less on the toxic strain. The interaction between A. bifilosa and Nodularia sp. was further examined (with the particle counting method) by measuring the clearance rates of A. bifilosa on edible green flagellates in the presence of cyanobacteria. The presence or concentration of toxic Nodularia sp. did not affect grazing rates of A. bifilosa on Brachiomonas submarina. Since earlier studies have shown that ingestion of Nodularia sp. decreases egg production and increases mortality in E. affinis, we suggest that the occurrence of Nodularia sp. blooms in the Baltic Sea may favour individuals of copepod species capable of selective feeding, such as A. bifilosa.

General information
State: Published
Organisations: Tvärminne Zoological Station, University of Helsinki
Authors: Engstrom, J. (Ekstern), Koski, M. (Intern), Viitasalo, M. (Ekstern), Reinikainen, M. (Ekstern), Repka, S. (Ekstern), Sivonen, K. (Ekstern)
Pages: 1403-1409
Publication date: 2000
Main Research Area: Technical/natural sciences

Publication information
Journal: JOURNAL OF PLANKTON RESEARCH
Volume: 22
Issue number: 7
ISSN (Print): 0142-7873
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
The carbon (C) and nitrogen (N) content and the C:N ratio of two common calanoid copepods, Eurytemora affinis and Acartia bifilosa, were measured during spring and summer at the SW coast of Finland, northern Baltic Sea. The C:N ratio of both copepod species was low and stable (4-4.5), irrespective of sampling time, which implies N limitation at least during intermediate to high food concentrations in spring and early summer. In addition, experiments were conducted to
reveal whether the diet of copepods affects their C and N content. Adding green algae Brachiomonas submarina in concentrations of 50-500 μg C l⁻¹ to

**General information**

State: Published
Organisations: Tvärminne Zoological Station
Authors: Koski, M. (Intern)
Pages: 1565-1573
Publication date: 1999
Main Research Area: Technical/natural sciences

**Publication information**

Journal: JOURNAL OF PLANKTON RESEARCH
Volume: 21
Issue number: 8
ISSN (Print): 0142-7873
Ratings:
- BFI (2018): BFI-level 1
- Web of Science (2018): Indexed yes
- BFI (2017): BFI-level 1
- Web of Science (2017): Indexed yes
- BFI (2016): BFI-level 1
- Scopus rating (2016): CiteScore 1.92 SJR 1.098 SNIP 0.848
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 1
- Scopus rating (2015): SJR 1.025 SNIP 0.796 CiteScore 1.77
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 1
- Scopus rating (2014): SJR 1.095 SNIP 1.255 CiteScore 2.24
- Web of Science (2014): Indexed yes
- BFI (2013): BFI-level 1
- Scopus rating (2013): SJR 1.289 SNIP 1.109 CiteScore 2.39
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 1
- Scopus rating (2012): SJR 1.557 SNIP 1.101 CiteScore 2.43
- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 1
- Scopus rating (2011): SJR 1.158 SNIP 1.045 CiteScore 1.99
- ISI indexed (2011): ISI indexed yes
- Web of Science (2011): Indexed yes
- BFI (2010): BFI-level 1
- Scopus rating (2010): SJR 1.186 SNIP 0.98
- Web of Science (2010): Indexed yes
- BFI (2009): BFI-level 1
- Scopus rating (2009): SJR 0.922 SNIP 1.046
- Web of Science (2009): Indexed yes
- BFI (2008): BFI-level 1
- Scopus rating (2008): SJR 1.174 SNIP 1.037
- Web of Science (2008): Indexed yes
- Scopus rating (2007): SJR 1.31 SNIP 1.225
- Web of Science (2007): Indexed yes
- Scopus rating (2006): SJR 1.19 SNIP 1.118
- Web of Science (2006): Indexed yes
- Scopus rating (2005): SJR 1.116 SNIP 1.068
Is Prymnesium patelliferum toxic for copepods? Grazing, egg production, and egestion of the calanoid copepod Eurytemora affinis in mixtures of “good” and “bad” food

The potentially toxic, bloom-forming prymnesiophyte Prymnesium patelliferum was offered to the copepod Eurytemora affinis as a sole food and in mixtures with the green alga Brachiomonas submarina and the chrysophyte Pseudopedinella elastica. Filtration, ingestion, egg, and faecal pellet production, and mortality were measured. In addition, videofilm was used to check the condition of copepods and possible changes in feeding behaviour due to different food species. With both B. submarina and P. elastica as a sole food, filtration, ingestion, egg production, and egestion were generally high and mortality low. In contrast, when fed with P. patelliferum, egg production and egestion were low. Mortality of copepods fed high concentrations of P. patelliferum was high, but copepods fed low concentrations survived generally well, both in single-species experiments and in mixtures. However, there were no significant differences in ingestion rates between algae species or concentrations. Thus, differences in ingestion of P. patelliferum could not explain the lower mortality in lower concentrations. We conclude that lethal effects were connected to toxic cell exudates, and thus independent on ingestion. When P. patelliferum was mixed with other species (1:1), egg production was equally high (P. elastica), or even higher (B. submarina), than with P. elastica and B. submarina alone. We conclude that even though P. patelliferum is harmful for copepods if offered as a sole food species, it can add to nutritional quality of other species in mixtures. In the experiments this may have been due to P. patelliferum containing specific nutritionally important components lacking from green algae, such as polyunsaturated fatty acids.

General information
State: Published
Organisations: Unknown
Authors: Koski, M. (Intern), Rosenberg, M. (Ekstern), Viitasalo, M. (Ekstern), Tanskanen, S. (Ekstern), Sjolund, U. (Ekstern)
Pages: 131-139
Publication date: 1999
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Journal of Marine Science
Volume: 56
Issue number: Supplement
ISSN (Print): 1054-3139
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.63
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.18
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Reproduction and survival of the calanoid copepod *Eurytemora affinis* fed with toxic and non-toxic cyanobacteria

Reproduction (egg production and hatching success) and maintenance (mortality and carbon and nitrogen content) of the calanoid copepod *Eurytemora affinis* were measured at 5 concentrations (ca 50, 100, 200, 400 and 600 μg C l⁻¹) of toxic and non-toxic strains of the cyanobacterium *Nodularia* sp. and the green alga *Brachiomonas submarina*, and in 3 different mixtures of these species (1:1, 8:1 and 1:8). In addition, females with egg-sacs were collected from the sea and exposed to different concentrations of *Nodularia* sp., to find out whether cyanobacterial exudates disturb hatching of eggs produced in natural food conditions. With the *B. submarina* diet copepod egg production was high (maximum ca 7 eggs female⁻¹ d⁻¹), and increased with increasing food concentration, whereas with both toxic and non-toxic *Nodularia* sp. diet egg production was comparable to that in filtered sea water (0 to 2 eggs female⁻¹ d⁻¹), irrespective of food concentration. With both toxic and non-toxic *Nodularia* sp., copepods produced deformed egg-sacs, and hatching success was low, while eggs produced in natural food conditions hatched well, with the exception of those exposed to a high concentration of toxic *Nodularia* sp. Mortality of *E. affinis* fed with toxic *Nodularia* sp. was high, whereas high concentrations of non-toxic *Nodularia* sp. kept copepods alive. No beneficial effects of *Nodularia* sp. in mixtures with *B. submarina* were observed. However, mortality in mixtures with toxic *Nodularia* sp. was low, hatching success generally high and no deformed egg-sacs were produced, which indicated that copepods were able to avoid feeding on toxic algae. Our results suggest that, in addition to its toxic effect, *Nodularia* sp. lacks certain essential elements needed for copepod reproduction. However, the non-toxic strain is sufficiently high in food quality to sustain maintenance of *E. affinis*, if offered in large quantities.

General information
State: Published
Organisations: Tvärminne Zoological Station
Authors: Koski, M. (Intern), Engstrom, J. (Ekstern), Viitasalo, M. (Ekstern)
Pages: 187-197
Publication date: 1999
Main Research Area: Technical/natural sciences
Seasonal development of mesozooplankton biomass and production on the SW coast of Finland

Seasonal development of mesozooplankton abundance, biomass and production were studied on the SW coast of Finland in three hydrographically distinct areas with different phytoplankton dynamics. In addition, the present species composition was compared to that at the beginning of the century, using a multidimensional scaling analysis. Mesozooplankton biomass and production were dominated by only a few species: the largest part of the production in the archipelago and open sea areas (11.3 g C m$^{-2}$ year$^{-1}$ and 28.1 g C m$^{-2}$ year$^{-1}$, respectively) consisted of that by raptorial and suspension-
feeding calanoid copepods (Acartia bifilosa and Eurytemora affinis) and of that by rotifers (Synchaeta baltica), while
annual mesozooplankton production in the bay area (10.5 g C m⁻² year⁻¹) was mainly due to production of filter-feeding
cladocerans (Daphnia cucullata and Bosmina longispina) and predatory cyclopoid copepods (Thermocyclops oithonoides).
The food chain in the bay area seemed to be based on heterotrophic organisms; the dominant rotifers and cladocerans
were feeding on bacteria and were in turn eaten by cyclopoid copepods. Salinity and trophic status of the area seemed to
be the main factors determining species composition, while seasonal development of biomass and production were mostly
affected by temperature and, probably, predation. The slight change in species composition in the study area since the
beginning of the century may due to increased salinity.

General information
State: Published
Organisations: Finnish Institute of Marine Research, University of Helsinki
Authors: Koski, M. (Intern), Viitasalo, M. (Ekstern), Kuosa, H. (Ekstern)
Pages: 69-91
Publication date: 1999
Main Research Area: Technical/natural sciences

Sedimentation of copepod fecal material in the coastal northern Baltic Sea: Where did all the pellets go?
We investigated the sedimentation of copepod fecal pellets in three different sea areas representing a sheltered bay, an
archipelago area, and the open sea on the southwestern coast of Finland in the northern Baltic Sea. Fecal carbon
sedimentation was always 99% of copepod fecal material was remineralized within the mixed water layer (0-20 m).
However, in the area and season dominated by the large calanoid copepod Limnocalanus macrurus (bay station in
spring), fecal carbon sedimentation was an order of magnitude higher than at the other two stations. From June onwards,
when the bay station was dominated by cyclopoids, the situation changed: the fecal carbon sedimentation remained 30%
lower in the bay than in the archipelago, although the fecal carbon production was estimated to be 2 times higher in the
bay. Furthermore, pellet fragmentation (percentage of broken pellets of total fecal carbon sedimentation) was highest in
spring and autumn at all areas and increased towards the open sea, being 27%, 45%, and 61% at the bay, archipelago,
and open sea stations, respectively. This gradation was probably due to more intense turbulence and water column mixing
in the open sea, resulting in more efficient loosening and breakup of pellets. The overall contribution of copepod feces to
vertical carbon export in the northern Baltic Sea appears to be small, but seasonal and spatial variations in hydrography
and mesozooplankton community structure significantly affect the fecal pellet sedimentation rates.

General information
State: Published
Organisations: University of Helsinki
Authors: Viitasalo, M. (Ekstern), Rosenberg, M. (Ekstern), Heiskanen, A. (Ekstern), Koski, M. (Intern)
Pages: 1388-1399
Publication date: 1999
Main Research Area: Technical/natural sciences
The effect of temperature, food concentration and female size on the egg production of the planktonic copepod Acartia bifilosa: Short Communications

Egg production of a brackish water calanoid copepod Acartia bifilosa was measured in the laboratory in different chlorophyll (Chl) a concentrations (0-24 μg l(-1)) and temperatures (4-24 degrees C), and the cephalothorax length and carbon content of females were determined. Egg production was positively correlated both with Chl a concentration and with temperature; highest egg production was obtained with 14-20 μg Chl a l(-1) and at 13-18 degrees C. There was also a significant positive correlation between egg production and female length-specific carbon content (μg C μm(-1)). However, no correlation was observed between egg production and cephalothorax length of females. Female carbon content changed during the 3 day experiments; carbon content was positively related to Chl a concentration and negatively related to temperature. We conclude that food availability (Chl a concentration), rather than temperature, limits the egg production of A. bifilosa in the present study area in the northern Baltic Sea. Further, both food concentration and temperature affect egg production not only through the direct effect on the numbers of eggs produced per female, but also through their effect on female carbon content.

General information
State: Published
Organisations: Paul Scherrer Institut
Authors: Koski, M. (Intern), Kuosa, H. (Ekstern)
Pages: 1779-1789
Publication date: 1999
Main Research Area: Technical/natural sciences

Publication information
Journal: JOURNAL OF PLANKTON RESEARCH
Volume: 21
Issue number: 9
ISSN (Print): 0142-7873
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.92 SJR 1.098 SNIP 0.848
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.025 SNIP 0.796 CiteScore 1.77
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.095 SNIP 1.255 CiteScore 2.24
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.289 SNIP 1.109 CiteScore 2.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.557 SNIP 1.101 CiteScore 2.43
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Effect of food quality on rate of growth and development of the pelagic copepod Pseudocalanus elongatus (Copepoda, Calanoida)

Rates of body growth, development and egg production of Pseudocalanus elongatus were measured in the laboratory, in relation to the taxonomy and physiology of algal food. Four types of experiments were performed to measure the copepod's response to (1) 7 algal species of similar size and shape, but different taxonomic groups, (2) inferior food species that were offered with good food as a check of toxicity, (3) nitrogen limitation and the growth rate of food species, and (4) highly unsaturated fatty acids that were supplied with inferior food to test for lack of essential fatty acids. Grazing was measured to check that the offered food was really ingested. The best food species proved to be Rhodomonas sp., which induced a fast rate of development, good somatic growth and egg production and low mortality. The development rate was almost equally fast with Thalassiosira weissflogii, Gymnodiunum simplex and Tetraselmis suecica, but the rates of somatic growth or egg production were lower and mortality generally higher than with Rhodomonas sp. Three algal species, Dunaliella sp., Amphidinium sp. and Chrysochromulina polylepis, were poor food; copepod development was not completed, the rates of somatic growth and egg production were low and mortality was high. Ingestion was equally high with most of the species; only C. polylepis was not eaten. No clear toxic effects were found when the 3 poor-food species were offered in mixtures with Rhodomonas sp. N-limited Rhodomonas sp. did not reduce the rate of copepod development in comparison to a N-replete culture; however, N-limited T. weissflogii reduced the development rate to the low level of poor-food species. No effect of different growth rates of Dunaliella sp. was found. Lipids rich in highly unsaturated fatty acids supplied with Dunaliella sp. did not substantially improve the slow development and low egg production observed with this species. The weight-specific somatic growth rate was always higher than the weight-specific egg production rate, especially with less optimal food, which seems to hamper the estimation of the secondary production of copepods based on egg production alone. It is concluded that large differences in the food quality of different algal species are due to differences in digestibility or in mineral and biochemical composition.

General information
State: Published
Organisations: Royal Netherlands Institute for Sea Research - NIOZ
Seasonal occurrence and hatching of calanoid eggs in sediments of the northern Baltic Sea

The seasonal occurrence and hatching of benthic eggs of calanoid copepods were studied for 1 yr in the surface sediments at 2 sites (a 33 m deep archipelago area and a 42 m deep site in an enclosed bay) off the SW coast of Finland, northern Baltic Sea. Eggs were abundant at both sites (up to 4 and 6 x 10^6 eggs m^-2). At the archipelago site, most eggs belonged to Acartia bifilosa and A. tonsa; at the bay site, eggs of Eurytemora affinis and Acartia spp. occurred. At the archipelago site, the egg numbers in the surface sediment followed closely the seasonal abundance of the planktonic Acartia spp. females. The eggs collected from the sediment were incubated at temperatures corresponding to the in situ bottom temperatures. Hatching of the A. bifilosa eggs occurred throughout the year, but it was most intensive in autumn when water stratification broke and the deep water warmed up to 13 degrees C. It is suggested that a large number of the A. bifilosa eggs sink to the bottom prior to hatching in shallow coastal areas of the Baltic Sea. Hatching of the benthic eggs occurs throughout the year and the rate of naupliar emergence from the sediments depends on benthic conditions and processes (e.g. temperature, sediment resuspension and bioturbation). At the bay site, where the surface water layer was hydrographically separated from the deep water, the coupling between the benthic egg abundance and the planktonic populations was not so obvious. The dominant species E. affinis carries its eggs in an egg sac until hatching, and probably only the diapause eggs, which are produced in autumn, fall to the bottom. A. tonsa was abundant in the water column at both study sites in autumn, even outnumbering other Acartia spp, in some samples. The eggs of the species only hatched in autumn, when the incubations were conducted at 10 to 13 degrees C. It is probable that A. tonsa spends most of the year as benthic resting eggs in the northern Baltic Sea. In contrast, A. bifilosa and E. affinis occurred in the plankton in winter at both study sites, though in low concentrations. They thus have 2 possible sources of recruitment when conditions are again favourable for population growth in spring: hatching of benthic eggs and reproduction by the overwintering population.

General information
State: Published
Organisations: University of Helsinki, Finnish Institute of Marine Research
Authors: Katajisto, T. (Ekstern), Viitasalo, M. (Ekstern), Koski, M. (Intern)
Pages: 133-143
Publication date: 1998
Main Research Area: Technical/natural sciences

Publication information
Journal: MARINE ECOLOGY-PROGRESS SERIES
Volume: 163
ISSN (Print): 0171-8630
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.4
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.56
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.79
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.9
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2.85
General information

State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources, Danish Institute for Fisheries Research
Authors: Viitasalo, M. (Ekstern), Koski, M. (Intern), Pellikka, K. (Ekstern), Johansson, S. (Ekstern)
Pages: 241-250
Publication date: 1995
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Biology
Volume: 123
Issue number: 2
ISSN (Print): 0025-3162
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.41 SJR 1.198 SNIP 0.993
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.315 SNIP 0.932 CiteScore 2.21
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.204 SNIP 1.041 CiteScore 2.32
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.272 SNIP 1.064 CiteScore 2.4
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1

Seasonal and long-term variations in the body size of planktonic copepods in the northern Baltic Sea

Links:
Source: orbit
Source-ID: 282491
Publication: Research - peer-review › Journal article – Annual report year: 1998
Despite a transition from flow-through systems to more advanced open water reuse aquaculture systems (e.g. model trout farms), the need for water treatment still exists. In brackish and saltwater reuse systems, blooms of toxic microalgae in an example of a recently new challenge.

The purpose of this project is to further develop current aquaculture water treatment practice and reduce the total amount of disinfectants used.

The project includes 3 different work packages, investigating:
- ecological consequences of continuous application of peroxyacetic acid.
- toxicological effects of easy degradable disinfectants.
- alternative biological methods to control / avoid blooms of toxic heterotrophic dinoflagellates.

Trials will include mesocosmos experiments where disinfectants are added continuously or by daily pulses over a prolonged period of time where phyto- and zoo-plankton abundance and compositions will be investigated. Other trials will
be made in batch experiments with pure algae cultures, as will prolonged continuous peroxyacid application experiments be made.

This project is coordinated by DTU Aqua.

The project is funded by the Environmental Protection Agency's Programme for Pesticide Research.

National Institute of Aquatic Resources
Section for Aquaculture
Period: 01/08/2015 → 31/12/2017
Number of participants: 9
Research areas: Aquaculture & Marine Populations and Ecosystem Dynamics
Project participant:
Pedersen, Per Bovbjerg (Intern)
Koski, Marja (Intern)
Sproegel, Ulla (Intern)
Frandsen, Dorthe (Intern)
Møller, Brian (Intern)
Larsen, Ole Madvig (Intern)
Jensen, Rasmus Frydenlund (Intern)
Project Manager, organisational:
Pedersen, Lars-Flemming (Intern)
Phd Student:
Rojas-Tirado, Paula Andrea (Intern)

Baltic zooplankton; eco-physiology and adaptation
National Institute of Aquatic Resources
Period: 01/06/2014 → 20/12/2017
Number of participants: 6
Phd Student:
Christensen, Anette Maria (Intern)
Supervisor:
Dutz, Jörg (Intern)
Main Supervisor:
Koski, Marja (Intern)
Examiner:
Jonasdottir, Sigrun (Intern)
Guerrero, Han G. Dam (Ekstern)
Tiselius, Peter (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Grundforskningsfonden
Project: PhD

The early life of eel in the Sargasso Sea – Influence of oceanography and climate (SARGASSO-EEL) (39107)
The recruitment of the European eel has been in dramatic decline during the last 30 years, and is at a severe low of only 3-5% of earlier magnitude. This change and its influence on the eel fishery have led to an intensified research in the oceanic phase of the European eel.

In order to contribute to further understanding of the life cycle of eel the Danish eel expedition set out in 2014 for the eel spawning grounds in the Sargasso Sea. Here a consortium of Danish scientists and international collaborators focused on the linkages between oceanography, biological production, eel spawning and the growth and drift of eel larvae.

During the expedition, a wide range of organisms was collected: From the smallest plankton of less than a millimeter to very large fish. A number of research groups are now working on samples and data from the expedition and assembling information on key processes in the early life of eels. Preliminary findings indicate that biological and physical changes have taken place in the spawning areas that may affect the eel larvae’s chances of survival and their journey to Europe.

The project was coordinated by DTU Aqua.
The project is funded by the Carlsberg Foundation and Danish Centre of Marine Research (cruise).
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
University of Copenhagen
Aarhus University
Pierre and Marie Curie University - University of Paris VI
Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin
Université de la Méditerranée
University of Alaska Fairbanks
University of Rhode Island
Sir Alister Hardy Foundation for Ocean Science (SAHFOS)
International Council for the Exploration of the Sea
Period: 01/08/2013 → 01/08/2016
Number of participants: 11
Research areas: Marine Populations and Ecosystem Dynamics & Fish Biology & Oceanography
Project participant:
Thomsen, Helge Abildhauge (Intern)
Sørensen, Sune Riis (Intern)
Bekkevold, Dorte (Intern)
Malanski, Evandro (Intern)
Jaspers, Cornelia (Intern)
Koski, Marja (Intern)
Christoffersen, Mads (Intern)
Hansen, Susanne (Intern)
PhD Student:
Ayala, Daniel Jiro (Intern)
Project Manager, academic:
Nielsen, Torkel Gissel (Intern)
Project Coordinator:
Munk, Peter (Intern)

Sustainable technologies to control microalgae in land based saltwater recirculating systems (39032)
Land based salt water recirculating systems is a potential alternative to fish farming in net pens. This purpose of this project was to test different solutions on how to control unwanted microalgae growth thereby addressing a potential challenges associated with land based farming.

A high degree of water reuse and the associated nutrient accumulation may favour growth of microorganisms and thereby deteriorate the biological water quality.

The project included:
- Test of improved mechanical filtration (application of pilot scale protein skimmers on small to medium sized RAS, and application of full scale 4 meter vacuum airlift; an innovative treatment technique tested in full scale RAS)
- Test of chemical water treatment routines using easy degradable disinfectants (Peracetic acid, chloramine-T, hydrogen peroxide) to control and inhibit toxic microalgae,
- Test of electrochemical oxidation disinfection technology to assess the efficacy (radical formation and algicidal effects) of boron doped diamond electrodes.

Numerous batch and pilot scale experiments were made at the section for Aquaculture, Hirtshals. In addition, intensive, diurnal sampling/monitoring and analysis on location was performed on a commercial pike perch RAS facilities facing toxic algae problems.

The project is coordinated by DTU Aqua.

The project was funded by the National Environmental Protection Agency through Programme for Development and
Climate change is most pronounced at high latitudes, with rapid and dramatic changes observed in sea-ice coverage, circulation and the ecosystem. These changes have profound effects both at the regional scale as well as globally.

The North Atlantic and Arctic Ocean are the headwaters of the thermohaline circulation (THC), the global heat engine responsible, amongst other things, for the relatively mild climate we experience in Denmark. Subtle change in sea-ice formation, deep water circulation, and freshwater supply on a relatively local scale will have repercussions around the world. More subtle still are the feed-back controls these processes have on climate change. Sea-ice coverage and the earth’s albedo is one feed-back, but there is also the draw down and sequestering of atmospheric CO2 in deep waters by physical and biological processes. The whole is an intricate weave of interrelated mechanisms: the scientific challenge to draw together expertise across disciplines to address these issues was accomplished; the strategic outcome was a suite of knowledge-based tools designed to reduce the uncertainty and contribute to climate policies.

The NAACOS team comprised a number of well-recognized scientists with profound experience and a significant international collaboration. NAACOS developed and refined oceanographic models using remote sensing and observations to evaluate the impact of high latitude climate change on circulation, deep water formation, sea-ice and carbon flux, and their implications at regional scales.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Council for Strategic Research and a DHI student stipend.
Response of pelagic food webs to warmer, acidified oceans (Pelagic foods) (38923)

Atmospheric CO2 is projected to double by 2100, resulting in increased global temperature, ocean acidification (OA) and changes in the balance of marine ecosystems. A general lack of multifactorial studies means very limited knowledge on the combined effects of these pressures on ecosystem structure and function. Preliminary mono-factorial data indicate important but little studied appendicularians (pan-global pelagic urochordates) may be strongly impacted, directly and indirectly via altered phytoplankton growth and chemical composition. Effects on other key plankton such as copepods may depend on phytoplankton size. Appendicularians repetitively secrete and discard filter-feeding houses. Discarded houses with trapped particles make a significant contribution to global vertical carbon flux. We will study combined effects of temperature and CO2 on these dominant zooplankton by manipulating natural plankton in mesocosms. We hypothesize climate change will impact the important zooplanktonic trophic level through top down altered predation fields and bottom up changes in prey type and size. Copepods are size-selective feeders and recent data suggest appendicularians are bottom up regulated by large and spiny particles. We will test these hypotheses in mesocosms by generating blooms of diatoms (large) or flagellates (small) and evaluate subsequent zooplankton population dynamics. Under these different conditions, we will also examine competitive predatory interactions between copepods and appendicularians, leading to models of projected effects of p(CO2) and temperature on appendicularians and copepods through alterations in phytoplankton community structure and uni-directional predatory pressure. Both appendicularians and copepods are important in oceanic carbon sequestration, but do so via different pathways. Data from these experiments should also have important predictive value on the nature and extent of future carbon sequestration in marine pelagic communities.

The project is coordinated by University of Bergen, Norway.

National Institute of Aquatic Resources
Centre for Ocean Life
University of Bergen
Uni Research AS
Skidaway Institute of Oceanography
University of Gothenburg
Russian Academy of Sciences
Leibniz Institute of Marine Sciences

Period: 01/01/2011 → 31/12/2011
Number of participants: 2
Research area: Oceanography

Enzyme Immobilisation and Bioprocessing

National Food Institute

Period: 15/11/2010 → 04/06/2014
Number of participants: 6
Phd Student:
Alftrén, Johan (Intern)
Supervisor:
Koski, Marja (Intern)
Main Supervisor:
Arctic plankton in a changing climate (38783)
Climate change impacts the marine arctic environment through changes in ice cover, ice thickness, irradiance, freshwater outflow, concentrations of nutrients and CO2 and the stratification. These factors determine the production, seasonality and fate of the planktonic primary production in the marine ecosystem. Plankton is fueling stocks of fish, marine birds and mammals and through that constitutes the base of the Greenlandic economy.

The aim of the project was to gain knowledge about the interaction between climate, oceanography and plankton in the vulnerable Greenlandic marine ecosystem through field and laboratory experiments. The project was interdisciplinary and closely coordinated with the other projects under the Greenland Climate Research Centre.

The project was funded by the Commission for Scientific Investigations in Greenland (KVUG), Greenland Climate Research Centre, Danish Centre for Marine Research, and Carlsberg Foundation.

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Aarhus University
Greenland Institute of Natural Resources
Project Manager, academic:

European basin-scale analysis, synthesis and integration (EURO-BASIN) (38899)
EURO-BASIN was designed to advance our understanding on the variability, potential impacts, and feedbacks of global change and anthropogenic forcing on the structure, function and dynamics of the North Atlantic and associated shelf sea ecosystems as well as the key species influencing carbon sequestration and ecosystem functioning. Like the entire biosphere, marine ecosystems such as the North Atlantic and its associated shelf sea ecosystems can be characterized by emergent properties controlled by a dynamic network of interactions and relationships and not static entities. This system complexity is what Martin Luther King Jr. called "an inescapable network of mutuality" scientists today define as complex adaptive systems (CASs).

EURO-BASIN has represented the first attempt of creating future prognosis of marine ecosystem states sensitive to CAS dynamics using as its test case the North Atlantic. Long-term prediction of the status of these CAS systems, population dynamics of key species and hence management of marine systems requires the implementation and advancement of an ecosystem approach for the management of marine resources sensitive to CAS dynamics. What is the ecosystem approach? Unlike a single species approach, the ecosystem approach takes into account population and ecosystem responses to changes in the Earth's climate, fisheries, and interactions between them. In EURO-BASIN not only did we monitor and assess how North Atlantic marine ecosystems behaved in the past, but also predict how they will respond under possible future climate change scenarios. Hence, the results of this project have provided important
recommendations for better marine resource management in the European Union.

The project had participants from 23 European universities and research institutions as well as collaborations with key institutions and Universities in the US and Canada.

The project was coordinated by DTU Aqua.

The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources

Section for Marine Ecology and Oceanography
Period: 01/01/2010 → 31/12/2014
Number of participants: 12
Research areas: Marine Populations and Ecosystem Dynamics & Oceanography & Marine Living Resources
Acronym: EURO-BASIN
Number of related Ph.D. students: 4
Contact person:
Grigorov, Ivo (Intern)
Project participant:
Andersen, Ken Haste (Intern)
Jonasdottir, Sigrun (Intern)
Kiørboe, Thomas (Intern)
Koski, Marja (Intern)
Munk, Peter (Intern)
Stæhr, Karl-Johan (Intern)
Vinther, Morten (Intern)
Visser, Andre (Intern)
Project Manager, organisational:
Köster, Fritz (Intern)
MacKenzie, Brian (Intern)
Project Manager, academic:
St. John, Michael (Intern)

Relations
Activities:
40th CIESM Mediterranean Science Commission Congress: Mediterranean Science Commission, Annual Congress
Publications:
Acclimation, adaptation, traits and trade-offs in plankton functional type models – seeking clarity in terminology
Size structures sensory hierarchy in ocean life
Gut evacuation rate and grazing impact of the krill Thysanoessa raschi and T. inermis
Long-term retrospective analysis of mackerel spawning in the North Sea
Winter–spring transition in the subarctic Atlantic: microbial response to deep mixing and pre-bloom production
Challenges in integrative approaches to modelling the marine ecosystems of the North Atlantic: Physics to fish and coasts to ocean
Fishing out collective memory of migratory schools
Interactive effects of temperature and light during deep convection: a case study on growth and condition of the diatom Thalassiosira weissflogii
Identifying marine pelagic ecosystem management objectives and indicators
Effects of temperature and food availability on feeding and egg production of Calanus hyperboreus from Disko Bay, Western Greenland
The rise and fall of the NE Atlantic blue whiting (Micromesistius poutassou)
Physiological constrains on Sverdrup's Critical-Depth-Hypothesis: the influences of dark respiration and sinking
Effects of a future warmer ocean on the coexisting copepods Calanus finmarchicus and C. glacialis in Disko Bay, Western Greenland
Long-term changes of euphausiids in shelf and oceanic habitats southwest, south and southeast of Iceland
Pseudocollapse and rebuilding of North Sea mackerel (Scomber scombrus)
Distributions and seasonal abundances of krill eggs and larvae in the sub-Arctic Godthåbsfjord, SW Greenland
Distribution of phytoplankton functional types in high-nitrate low-chlorophyll waters in a new diagnostic ecological indicator model

A resolution to the blue whiting (Micromesistius poutassou) population paradox?

Effects of climate-induced habitat changes on a key zooplankton species

Patchy zooplankton grazing and high energy conversion efficiency: ecological implications of sandeel behavior and strategy

A cascade of warming impacts brings bluefin tuna to Greenland waters

Migration and fisheries of North East Atlantic mackerel (Scomber scombrus) in autumn and winter

Spatially explicit estimates of stock sizes, structure and biomass of herring and blue whiting, and catch data of bluefin tuna

Krill diversity and population structure along the sub-Arctic Godthåbsfjord, SW Greenland

Spatial segregation within the spawning migration of North Eastern Atlantic mackerel (Scomber scombrus) as indicated by juvenile growth patterns

Trophic position of coexisting krill species: a stable isotope approach

Marine snow, zooplankton and thin layers: indications of a trophic link from small-scale sampling with the Video Plankton Recorder

Bridging the gap between marine biogeochemical and fisheries sciences; configuring the zooplankton link

Comparative ecology of widely distributed pelagic fish species in the North Atlantic: Implications for modelling climate and fisheries impacts

Population structure of Atlantic Mackerel (Scomber scombrus)

Press / Media items:

Data sharing: An open mind on open data: The move to make scientific findings transparent can be a major boon to research, but it can be tricky to embrace the change.

Physical oceanography in Greenland waters under climate change (38767)

Changing climatic conditions will have considerable effects on the seas around Greenland. Melting glaciers, the formation of sea ice, large scale circulation of the Atlantic Ocean as well as more local changes in weather patterns will have direct impact, with cascading effects to biological processes and sustainable harvesting of marine resources. The aim of this project is to prepare modeling tools and analyses to describe expected oceanic conditions around Greenland under climate change. Particular focus will be on coupling these models and process studies to biology, biogeochemical cycling, and sea ice processes, with eventual feed backs to climate itself.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources

Centre for Ocean Life

Danish Meteorological Institute

VitusLab

Aarhus University

Period: 01/01/2010 → 31/12/2014

Number of participants: 2

Research area: Oceanography

Project participant:

Visser, Andre (Intern)

Koski, Marja (Intern)

Sexual selection in marine plankton

National Institute of Aquatic Resources

Period: 01/07/2009 → 02/07/2014

Number of participants: 6

Phd Student:

Sichlau, Mie Hylstofte (Intern)

Supervisor:

Koski, Marja (Intern)
The biological pump in the Nordic seas: Copepods and appendicularians as producers and consumers of sinking particles (BIOPUMP) (38757)

BIOPUMP is a research network investigating the vertical flux, its production and consumption, and how it is affected by the climate change. The main activities of the network are annual research workshops concentrating on diverse aspects of vertical flux, such as the role of different zooplankton groups in producing and degrading of sinking particles, and how will the changing temperature and CO2 concentrations of the ocean influence the dynamics of these groups. BIOPUMP is also involved in organizing a Nordic PhD course on vertical flux and factors influencing it.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Centre for Ocean Life
University of Tromsø
University of Bergen
University of Oslo
University of Gothenburg
Stockholm University
Greenland Institute of Natural Resources
National Environmental Research Institute
University of Copenhagen
Period: 01/01/2008 → 01/05/2013
Number of participants: 3
Research area: Oceanography
Project participant:
Kiørboe, Thomas (Intern)
Dutz, Jörg (Intern)

Fatty acids in the marine food chain (38160)

Primary production by autotrophic phytoplankton fuels the marine ecosystem and this energy is passed through the food web by trophic interactions. Understanding how energy flows through these interactions is vital for understanding how marine ecosystems function. The efficiency of energy transfer from primary producers to higher trophic levels depends on the efficiency of secondary producers utilizing the new carbon. This crucial link is still poorly understood and most often we observe that secondary production is not simply correlated with phytoplankton biomass. However, reproduction and growth of secondary producers, such as copepods, depend also on food quality. The goal of this project is to investigate the effect of essential fatty acids on copepod reproduction, growth and survival. Essential fatty acid are the ones the copepod need but has to attain from the food, as it cannot synthesize those de-novo. The project is based on series of laboratory, field and mesocosm studies with the focus on understanding on how food composition, both chemical composition and type affect growth and mortality all contribution to population dynamics of the copepod species. In addition the project has a strong teaching factor for masters and PhD students in form of advanced summer schools.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Centre for Ocean Life
Aarhus University

Uni Research AS
Period: 01/01/2004 → 31/12/2013
Number of participants: 3
Research area: Oceanography

Project participant:
Koski, Marja (Intern)
Dutz, Jörg (Intern)

Project Manager, academic:
Jonasdottir, Sigrun (Intern)

Project