Experimental investigation on ultimate strength and failure response of composite box beams used in wind turbine blades

This study focuses on the ultimate strength and failure response of composite box beams under three-point bending. The box beams consist of spar caps and shear webs and they are typically used in wind turbine blades as load-carrying members. Different spar cap configurations and loading directions are examined experimentally to investigate structural behavior associated with multiple nonlinearities leading to structural collapse. Global displacements, local strains and video images are recorded throughout the loading history to capture failure initiation, propagation and the strain state contributing to post-collapse characteristics. The failure mechanisms of the box beams involving geometric, material and contact nonlinearities are discussed in detail. The study shows that compressive crushing failure, driven by local buckling of shear webs, determines the ultimate strength of the box beams under flapwise loading, and adhesive joint debonding, initiated by local adhesive cracking and spar cap buckling, is the critical failure mode of the box beams under edgewise loading. The Brazier effect and shear nonlinearity contribute to the initial failure depending on the loading directions. Debonding rather than delamination characterizes post-collapse behavior of all box beams examined in this study.

General information
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Organisations: Department of Wind Energy, Wind Turbine Structures and Component Design, Chinese Academy of Sciences
Authors: Tang, J. (Ekstern), Chen, X. (Intern)
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BFI (2014): BFI-level 2
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Scopus rating (2013): SJR 1.964 SNIP 2.878 CiteScore 3.7
ISI indexed (2013): ISI indexed yes
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Scopus rating (2012): SJR 1.779 SNIP 2.77 CiteScore 2.85
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.627 SNIP 2.567 CiteScore 2.68
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.528 SNIP 2.349
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.63 SNIP 2.043
Web of Science (2009): Indexed yes
Breakfast in Denmark. Prevalence of Consumption, Intake of Foods, Nutrients and Dietary Quality. A Study from the International Breakfast Research Initiative

Breakfast is considered by many to be the most important meal of the day. This study examined the intake of nutrients and foods at breakfast among Danes and the relation to the overall dietary quality. Data were derived from the Danish National Survey on Diet and Physical Activity 2011-2013, a cross-sectional national food consumption study. A total of 3680 participants aged 6-75 years were included in the analyses of breakfast consumption. The Nutrient Rich Food Index 9.3 method was used to examine the overall dietary quality of the diet. The intake of nutrients and foods at breakfast were compared across dietary quality score tertiles by ANCOVA adjusted for energy and socio economic status. Breakfast was eaten frequently by children and adults and contributed with 18-20% of total energy intake. Breakfast was relatively high in dietary fibre, B vitamins, calcium and magnesium and low in added sugar, total fat, sodium, vitamin A and D. A decrease in the intake of added sugar, total fat and saturated fat and an increase in the intake of dietary fibre and most micronutrients were seen across tertiles of dietary quality scores. Commonly consumed foods provided at breakfast in Denmark included bread, breakfast cereals and dairy products as well as water, coffee and juice, while intakes of fruits, vegetables, cakes and soft drinks were low.

General information
State: Published
Organisations: National Food Institute, Division of Risk Assessment and Nutrition, Department of Applied Mathematics and Computer Science, Statistics and Data Analysis
Authors: Fagt, S. (Intern), Matthiessen, J. (Intern), Thyregod, C. (Intern), Kørup, K. (Intern), Biltoft-Jensen, A. P. (Intern)
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BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 4.35 SJR 1.557 SNIP 1.403
Web of Science (2017): Indexed Yes
First record of the non-indigenous jellyfish *Blackfordia virginica* (Mayer, 1910) in the Baltic Sea

Marine invasions are of increasing concern for biodiversity conservation worldwide. Gelatinous macrozooplankton contain members, which have become globally invasive, for example the ctenophore *Mnemiopsis leidyi* or the hydromedusae *Blackfordia virginica*. *B. virginica* is characterised by a large salinity tolerance, with a brackish-water habitat preference, and by a metagenic life history strategy with an alternation between sexually reproducing planktonic medusae and asexually reproducing benthic polyps to complete the life cycle. In this study we analysed 8 years of ichthyoplankton survey data (2010-2017) from the Kiel Canal and 14 ichthyoplankton summer surveys in the central Baltic Sea (2008-2017). We report the first presence of *B. virginica* in northern Europe, namely from the southwestern Baltic Sea and the Kiel Canal. In the Kiel Canal, *B. virginica* was first sporadically sighted in 2014 and 2015 and has developed persistent populations since summer 2016. Changes in size-frequency distributions during summer 2016 indicate active recruitment in the Kiel Canal at salinities between 7 and 13 and temperatures > 14 °C. Close vicinity to and direct connection with the southwestern Baltic Sea, where *B. virginica* was observed during 2017, indicate that the Baltic Sea and other brackish-water habitats of Northern Europe are at risk for colonisation of this non-indigenous species. Our results highlight that monitoring activities should consider gelatinous macrozooplankton for standard assessments to allow for the detection of non-indigenous species at an early stage of their colonisation.
Parasites in *Myodes glareolus* and their association with diet assessed by stable isotope analysis

Vertebrates are hosts to numerous parasites, belonging to many different taxa. These parasites differ in transmission, being through either direct contact, a faecal-oral route, ingestion of particular food items, vertical or sexual transmission, or by a vector. Assessing the impact of diet on parasitism can be difficult because analysis of faecal and stomach content are uncertain and labourious; and as with molecular methods, do not provide diet information over a longer period of time. We here explored whether the analysis of stable isotopes in hair provides insight into the impact of diet and the presence of parasites in the rodent *Myodes glareolus*. Twenty-one animals were examined for parasites and their hair analysed for stable isotopes (C and N). A positive correlation between $\delta^{15}N$ and one species of intestinal parasite was observed in females. Furthermore, several ectoparasites were negatively correlated with $\delta^{15}N$, indicating that infections are further associated with foraging habits (size and layout of the home range, length and timing of foraging, interaction with other rodents, etc.) that set the rodents in direct contact with infected hosts. Although a limited number of animals were
included, it seemed that the isotope values allowed for identification of the association between diet and parasite occurrence in this rodent. We therefore propose that this method is useful in providing further insight into host biology, feeding preferences and potential exposure to parasites species, contributing to the understanding of the complex relationship between hosts and parasites.

**General information**

State: Published
Organisations: National Veterinary Institute, Section for Diagnostics and Scientific Advice, University of Copenhagen, Norwegian Veterinary Institute, National Research Centre for the Working Environment
Authors: Lynggaard, C. (Ekstern), Woolsey, I. D. (Ekstern), Al-Sabi, M. N. S. (Intern), Bertram, N. (Ekstern), Jensen, P. M. (Ekstern)
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**Workshop on acceleration of the validation and regulatory acceptance of alternative methods and implementation of testing strategies**

This report describes the proceedings of the BfR-RIVM workshop on validation of alternative methods which was held 23 and 24 March 2017 in Berlin, Germany. Stakeholders from governmental agencies, regulatory authorities, universities, industry and the OECD were invited to discuss current problems concerning the regulatory acceptance and implementation of alternative test methods and testing strategies, with the aim to develop feasible solutions. Classical validation of alternative methods usually involves one to one comparison with the gold standard animal study. This approach suffers from the reductionist nature of an alternative test as compared to the animal study as well as from the animal study being considered as the gold standard. Modern approaches combine individual alternatives into testing strategies, for which integrated and defined approaches are emerging at OECD. Furthermore, progress in mechanistic toxicology, e.g. through the adverse outcome pathway approach, and in computational systems toxicology allows integration of alternative test battery results into toxicity predictions that are more fine-tuned to the human situation. The road towards transition to a mechanistically-based human-focused hazard and risk assessment of chemicals requires an open mind towards stepping away from the animal study as the gold standard and defining human biologically based regulatory requirements for human hazard and risk assessment.

**General information**

State: Published
Organisations: Copenhagen Center for Health Technology, National Food Institute, Research Group for Molecular and Reproductive Toxicology, National Institute of Public Health and the Environment, Utrecht University, Federal Institute for Risk Assessment, European Chemicals Agency, Cosmetics Europe, BASF, European Commission Joint Research Centre Institute, Vrije Universiteit Brussel, SeCAM
Authors: Piersma, A. H. (Ekstern), Burgdorf, T. (Ekstern), Louekari, K. (Ekstern), Desprez, B. (Ekstern), Taalman, R. (Ekstern), Landsiedel, R. (Ekstern), Barroso, J. (Ekstern), Rogiers, V. (Ekstern), Eskes, C. (Ekstern), Oelgeschläger, M. (Ekstern), Whelan, M. (Ekstern), Braeuning, A. (Ekstern), Vinggaard, A. M. (Intern), Kienhuis, A. (Ekstern), van Benthem,
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Web of Science (2018): Indexed yes
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Scopus rating (2017): SNIP 0.981 SJR 0.931 CiteScore 3.37
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.15 SJR 1.025 SNIP 0.941
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.096 SNIP 1.132 CiteScore 3.38
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.949 SNIP 1.133 CiteScore 3.03
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.933 SNIP 1.245 CiteScore 3.32
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.924 SNIP 1.15 CiteScore 3.05
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.846 SNIP 1.03 CiteScore 2.8
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.836 SNIP 1.018
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.791 SNIP 0.93
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.796 SNIP 0.906
Scopus rating (2007): SJR 0.723 SNIP 0.956
Scopus rating (2006): SJR 0.696 SNIP 1.02
Scopus rating (2005): SJR 0.644 SNIP 0.976
Scopus rating (2004): SJR 0.63 SNIP 1.038
Scopus rating (2003): SJR 0.532 SNIP 0.785
Scopus rating (2002): SJR 0.331 SNIP 0.714
Scopus rating (2001): SJR 0.332 SNIP 0.523
Scopus rating (2000): SJR 0.355 SNIP 0.517
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.382 SNIP 0.587
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Vitamin D-biofortified beef: A comparison of cholecalciferol with synthetic versus UVB-mushroom-derived ergosterol as feed source

This study investigates dietary fortification of heifer feeds with cholecalciferol and ergocalciferol sources and effects on beef total vitamin D activity, vitamer, respective 25-hydroxymetabolite contents, and meat quality. Thirty heifers were allocated to one of three dietary treatments [(1) basal diet + 4000 IU of vitamin D₃ (Vit D₃); (2) basal diet + 4000 IU of vitamin D₂ (Vit D₂); and (3) basal diet + 4000 IU of vitamin D₂-enriched mushrooms (Mushroom D₂)] for a 30 day pre-slaughter period. Supplementation of heifer diets with Vit D₃ yielded higher (p < 0.001) Longissimus thoracis (LT) total vitamin D activity (by 38–56%; p < 0.05) and serum 25-OH-D concentration (by 20–36%; p < 0.05), compared to that from Vit D₂ and Mushroom D₂ supplemented animals. Irrespective of vitamin D source, carcass characteristics, sensory and meat quality parameter were unaffected (p > 0.05) by the dietary treatments. In conclusion, vitamin D₃ biofortification of cattle diets is the most efficacious way to enhance total beef vitamin D activity.

General information
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Web of Science (2017): Indexed yes
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Web of Science (2016): Indexed yes
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Scopus rating (2015): SJR 1.582 SNIP 1.946 CiteScore 4.31
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.557 SNIP 2.01 CiteScore 3.92
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.554 SNIP 2.056 CiteScore 3.87
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
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Scopus rating (2012): SJR 1.762 SNIP 2.342 CiteScore 3.98
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
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Scopus rating (2011): SJR 1.911 SNIP 2.383 CiteScore 4.17
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.981 SNIP 2.253
Web of Science (2010): Indexed yes
Combination of sodium caseinate and succinylated alginate improved stability of high fat fish oil-in-water emulsions

Sodium caseinate (CAS) and commercial sodium alginate (CA), long chain modified alginate (LCMA) or short chain modified alginate (SCMA) were used in combination for emulsifying and stabilizing high fat (50–70%) fish oil-in-water emulsions. Physical (creaming, droplet size, viscosity and protein determination) and oxidative (primary and secondary oxidation products) stabilities of the emulsions were studied during 12 days of storage. Creaming stability was higher for emulsions produced with alginates and CAS compared to emulsions prepared with only CAS. Combined use of CAS + LCMA performed better in terms of physical stability compared to emulsions produced with only CAS. However, the oxidative stability of this emulsion was inferior probably due to the presence of an unsaturated carbon chain in LCMA structure. CAS + SCMA emulsions not only showed better physical stability such as smaller droplet size, lower creaming and higher viscosity, but also had an improved oxidative stability than emulsions produced with only CAS.

General information
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Organisations: National Food Institute, Research Group for Bioactives – Analysis and Application, Aarhus University, Division of Food Technology
Authors: Yesiltas, B. (Intern), Sørensen, A. M. (Intern), García Moreno, P. J. (Intern), Anankanbil, S. (Ekstern), Guo, Z. (Ekstern), Jacobsen, C. (Intern)
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BFI (2015): BFI-level 2
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Scopus rating (2014): SJR 1.557 SNIP 2.01 CiteScore 3.92
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ISI indexed (2013): ISI indexed yes
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ISI indexed (2012): ISI indexed yes
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Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.789 SNIP 2.023
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.47 SNIP 1.706
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.475 SNIP 2.087
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Scopus rating (2005): SJR 1.028 SNIP 1.526
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.077 SNIP 1.438
Scopus rating (2003): SJR 0.876 SNIP 1.248
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.966 SNIP 1.235
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Temperature-dependent adaptation allows fish to meet their food across their species’ range

In seasonal environments, timing is everything: Ecosystem dynamics are controlled by how well predators can match their prey in space and time. This match of predator and prey is thought to be particularly critical for the vulnerable larval life stages of many fish, where limited parental investment means that population survival can depend on how well larvae match the timing of their food. We develop and apply novel metrics of thermal time to estimate the timing of unobserved stages of fish larvae and their prey across the north Atlantic. The result shows that previously identified life-history strategies are adaptive in that they allow parents to “predict” a beneficial environment for their offspring and meet larval fish food timing that varies by 99 days across a species’ range.

Efficient Transport Simulation With Restricted Batch-Mode Active Learning

Simulation modeling is a well-known and recurrent approach to study the performance of urban systems. Taking into account the recent and continuous transformations within increasingly complex and multidimensional cities, the use of simulation tools is, in many cases, the only feasible and reliable approach to analyze such dynamic systems. However, simulation models can become very time consuming when detailed input-space exploration is needed. To tackle this problem, simulation metamodels are often used to approximate the simulators’ results. In this paper, we propose an active learning algorithm based on the Gaussian process (GP) framework that gathers the most informative simulation data points in batches, according to both their predictive variances and to the relative distance between them. This allows us to explore the simulators’ input space with fewer data points and in parallel, and thus in a more efficient way, while avoiding computationally expensive simulation runs in the process. We take advantage of the closeness notion encoded into the GP to select batches of points in such a way that they do not belong to the same high-variance neighborhoods. In addition, we also suggest two simple and practical user-defined stopping criteria so that the iterative learning procedure can be fully automated. We illustrate this methodology using three experimental settings. The results show that the proposed methodology is able to improve the exploration efficiency of the simulation input space in comparison with non-restricted batch-mode active learning procedures.
Stability of vitamin D\textsubscript{3} and vitamin D\textsubscript{2} in oil, fish and mushrooms after household cooking

Information on the retention of vitamin D in food following household cooking is scarce. So far the retention of its metabolites vitamin D\textsubscript{3}, vitamin D\textsubscript{2}, and 25-hydroxyvitamin D\textsubscript{3} has shown that the type of food and the cooking method are the essential determinants, and there is no significant difference between the metabolites. We investigated the retention of vitamin D\textsubscript{3} and vitamin D\textsubscript{2} in sunflower oil, vitamin D\textsubscript{3} in rainbow trout, and vitamin D\textsubscript{2} in button mushrooms. The investigated cooking methods were boiling at different pH, steam cooking, microwave cooking, pan-frying, and oven baking. There was no difference between the retention of vitamin D\textsubscript{3} and vitamin D\textsubscript{2} added to sunflower oil, which ranged from 70 to 99%. In rainbow trout, the retention of vitamin D\textsubscript{3} at 85–114% was not significantly different from 100%, except for pan-frying at 85%. However, the retention of vitamin D\textsubscript{2} in mushrooms at 62–88% was significantly different from 100% (p ≤ 0.05).
The mismatch between the in-country determinants of technology transfer, and the scope of technology transfer initiatives under the United Nations Framework Convention on Climate Change

Despite decades of international political emphasis, little is known about the in-country determinants of technology transfer for climate change mitigation. We draw upon the conclusions of a series of standardised, official governmental statements of technology priorities, coupled with questionnaire-based data collection, to shed light on the nature of those determinants. We find that there is a disconnect between what developing country governments perceive as the key enablers of, and barriers to, technology transfer, and what bilateral and multilateral technology transfer programmes can
offer, given budgetary constraints and the logic of development aid spending. We show that the well-established notion of making climate change mitigation actions an integral part of sound development plans is especially relevant for technology transfer. We offer pointers as to how this might be done in practice, in the context of the ‘technology action plans’ developed as part of the United Nations-sponsored technology needs assessment process.

**General information**

State: Accepted/In press
Organisations: Technical University of Denmark, Department of Management Engineering, UNEP DTU Partnership
Authors: Puig, D. (Intern), Haselip, J. A. (Intern), Bakhtiari, F. (Intern)
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BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.654 SNIP 0.732 CiteScore 1.12
BFI (2013): BFI-level 1
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ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.628 SNIP 1.248 CiteScore 2.06
ISI indexed (2012): ISI indexed yes
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ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.652 SNIP 1.075
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.525 SNIP 0.739
BFI (2008): BFI-level 1
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Scopus rating (2007): SJR 0.345 SNIP 0.592
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The prehistoric peopling of Southeast Asia

The human occupation history of Southeast Asia (SEA) remains heavily debated. Current evidence suggests that SEA was occupied by Hoabinhian hunter-gatherers until ~4000 years ago, when farming economies developed and expanded, restricting foraging groups to remote habitats. Some argue that agricultural development was indigenous; others favor the “two-layer” hypothesis that posits a southward expansion of farmers giving rise to present-day Southeast Asian genetic diversity. By sequencing 26 ancient human genomes (25 from SEA, 1 Japanese Jōmon), we show that neither interpretation fits the complexity of Southeast Asian history: Both Hoabinhian hunter-gatherers and East Asian farmers contributed to current Southeast Asian diversity, with further migrations affecting island SEA and Vietnam. Our results help resolve one of the long-standing controversies in Southeast Asian prehistory.
Mortality of *Calanus helgolandicus*: Sources, differences between the sexes and consumptive and nonconsumptive processes.

While losses from mortality are as important as gains from reproduction in zooplankton population dynamics, the former are more challenging to quantify. We used two approaches to provide complementary insights into the mortality of a biomass-dominant copepod, *Calanus helgolandicus*, at Station L4 in the English Channel. Using a neutral-red staining method, we found that dead carcasses represented a mean of 9% of the *C. helgolandicus* copepodites sampled. The resulting nonconsumptive mortality rates are the first that have been derived for *C. helgolandicus*; and estimates suggest a contribution of 0–54% (median of 4.4%) to the total mortality rate. Consumptive mortality (i.e., that due to removal by
predation), dominated for most of the year and contributed a mean of 89% to total mortality. Nonconsumptive mortality
increased during summer and winter, and was positively related to maximum wind speed during the preceding 72 h,
indicating that extreme weather events may lead to increased mortality. Using the Vertical Life Table approach, mortality
rates across the CV-adult male stage pair were on average ~2.5 times greater than those of CV-adult females. Adult male
consumptive mortality rates were ~6 times greater than those for females; adult male nonconsumptive rates were twice
those of females, suggesting that predation is of greater significance to male loss rates. Summer CV-adult mortality rates
were positively correlated to temperature, and to the abundance of predatory chaetognaths and siphonophores,
suggesting that the gelatinous predator assemblage is the dominant agent for population control of late stage copepodites
of C. helgolandicus at L4.

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Organisations: Centre for Ocean Life, Technical University of Denmark, Plymouth Marine Laboratory, University of
Liverpool
Authors: Maud, J. L. (Ekstern), Hirst, A. G. (Intern), Atkinson, A. (Ekstern), Lindeque, P. K. (Ekstern), McEvoy, A. J.
(Ekstern)
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Web of Science (2012): Indexed yes
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Scopus rating (2010): SJR 2.395 SNIP 1.436
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Scopus rating (2009): SJR 2.342 SNIP 1.697
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Validation of a novel one-step reverse transcription polymerase chain reaction method for detecting viral haemorrhagic septicaemia virus

Viral haemorrhagic septicaemia (VHS) is one of the most serious viral diseases in salmonid and olive flounder farms. Various diagnostic methods for detecting VHS virus (VHSV) are described in the VHS chapter of the World Organization for Animal Health (OIE) Aquatic Diagnostic Manual. A conventional reverse transcription-PCR (cRT-PCR) targeting the viral nucleocapsid gene is recommended for the detection of VHSV and, to some extent, for genotypic classification. However, the recommended assay exhibits low sensitivity for the detection of VHSV genotype IVa isolates and often shows non-specific amplicons when the RNA template is extracted from non-infected fish cell lines. For these reasons, it is necessary to develop a new RT-PCR method for the foolproof detection of all VHSV genotypes and elimination of non-specific results. In this study, we selected five candidate primer sets that target the VHSV nucleoprotein (N) gene, and selected the most sensitive among them (3F/2R). We then established the optimal reaction conditions for these primers, and ensured that no non-specific amplification had occurred in the fish tissues, fish cell lines, or heterologous viruses. The analytical sensitivity of the novel cRT-PCR was compared to that of cell culture assays, real-time RT-PCR, and other cRT-PCR methods and was found to be as sensitive as or superior to the other methods for detecting all VHSV genotypes worldwide. Clear and unique amplicons were amplified from all 80 VHSV isolates. The reproducibility, and partly the robustness, of the assay were confirmed by an inter-laboratory proficiency tests including nine laboratories. A high diagnostic sensitivity and specificity was confirmed on tissue material from affected fish. In conclusion a highly robust, sensitive and specific cRT-PCR for detection of VHSV was developed and validated.

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Authors: Kim, H. J. (Ekstern), Cuenca, A. (Intern), Olesen, N. J. (Intern)
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Original language: English
Evolution of complex asexual reproductive strategies in jellyfish

Many living organisms in terrestrial and aquatic ecosystems rely on multiple reproductive strategies to reduce the risk of extinction in variable environments. Examples are provided by the polyp stage of several bloom-forming jellyfish species, which can reproduce asexually using different budding strategies. These strategies broadly fall into three categories: (1) fast localized reproduction, (2) dormant cysts, or (3) motile and dispersing buds. Similar functional strategies are also present in other groups of species. However, mechanisms leading to the evolution of this rich reproductive diversity are yet to be clarified. Here we model how risk of local population extinction and differential fitness of alternative modes of asexual reproduction could drive the evolution of multiple reproductive modes as seen in jellyfish polyps. Depending on environmental parameters, we find that evolution leads to a unique evolutionarily stable strategy, wherein multiple reproductive strategies generally coexist. As the extinction risk increases, this strategy shifts from a pure budding mode to a dual strategy and finally to one characterized by allocation into all three modes. We identify relative fitness-dependent thresholds in extinction risk where these transitions can occur and discuss our predictions in light of observations on polyp reproduction in laboratory and natural systems.

General information
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Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Technical University of Denmark, Okinawa Institute of Science and Technology (OIST)
Authors: Schnedler-Meyer, N. A. (Intern), Pigolotti, S. (Ekstern), Mariani, P. (Intern)
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Scopus rating (2015): SJR 2.841 SNIP 1.356 CiteScore 3.52
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 3.283 SNIP 1.6 CiteScore 4.22
Web of Science (2014): Indexed yes
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Scopus rating (2013): SJR 3.206 SNIP 1.638 CiteScore 4.52
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 3.446 SNIP 1.666 CiteScore 4.68
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 3.911 SNIP 1.703 CiteScore 4.72
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Composition Engineering in Two-Dimensional Pb-Sn-Alloyed Perovskites for Efficient and Stable Solar Cells

Environmentally friendly tin (Sn)-based metallic halide perovskites suffer from oxidation and morphological issues. Here, we demonstrate the composition engineering of Pb-Sn-alloyed two-dimensional (2D) Ruddlesden-Popper perovskites, \((\text{BA})_2(\text{MA})_3\text{Pb}_3\text{Sn}_1\text{I}_{13}\), for efficient and stable solar cell applications. Smooth thin films with high surface coverage are readily formed without using any additive owing to the self-assembly characteristic of 2D perovskites. It is found that Sn plays a significant role in improving the crystallization and crystal orientation while narrowing the bandgap of Pb-Sn 2D perovskites. Photophysical studies further reveal that the optimal Sn ratio (25 mol %) based sample exhibits both minimized trap density and weakened quantum confinement for efficient charge separation. Consequently, the optimized \((\text{BA})_2(\text{MA})_3\text{Pb}_3\text{Sn}_1\text{I}_{13}\)-based solar cells yield the best power conversion efficiency close to 6% with suppressed hysteresis.

General information
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Organisations: Department of Chemistry, NanoChemistry, Organic Chemistry, Fudan University, Lund University
Authors: Chen, Y. (Ekstern), Sun, Y. (Ekstern), Peng, J. (Ekstern), Chábera, P. (Ekstern), Honarfar, A. (Ekstern), Zheng, K. (Intern), Liang, Z. (Ekstern)
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Population genetic structure after 125 years of stocking in sea trout (Salmo trutta L.)

Stocking can be an effective management and conservation tool, but it also carries the danger of eroding natural population structure, introducing non-native strains and reducing genetic diversity. Sea trout, the anadromous form of the brown trout (Salmo trutta), is a highly targeted species that is often managed by stocking. Here, we assess the present-day population genetic structure of sea trout in a backdrop of 125 years of stocking in Northern Germany. The study area is characterized by short distances between the Baltic and North Sea river watersheds, historic use of fish from both watersheds for stocking, and the creation of a potential migration corridor between the Baltic and North Sea with the opening of the Kiel Canal 120 years ago. A survey of 24 river systems with 180 SNPs indicates that moderate but highly significant population genetic structure has persisted both within and between the Baltic and North Sea. This genetic structure is characterized by (i) heterogeneous patterns of admixture between the Baltic and North Sea that do not correlate with distance from the Kiel Canal and are therefore likely due to historic stocking practices, (ii) genetic isolation by distance in the Baltic Sea at a spatial scale of < 200 km that is consistent with the homing behaviour of sea trout, and (iii) at least one genetically distinct Baltic Sea river system. In light of these results, we recommend keeping fish of North Sea and Baltic Sea origin separate for stocking, and restricting Baltic Sea translocations to neighbouring river systems.

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Authors: Petereit, C. (Ekstern), Bekkevold, D. (Intern), Nickel, S. (Ekstern), Dierking, J. (Ekstern), Hantke, H. (Ekstern), Hahn, A. (Ekstern), Reusch, T. (Ekstern), Puebla, O. (Ekstern)
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Probabilistic structural assessment of conical grouted joint using numerical modelling

Conical grouted joints have been proposed as a solution for the relative settlement observed between the sleeve and the pile on monopiles for wind turbines. In this paper, the influence of the design parameters such as steel wall thicknesses and conical angle on the failure modes associated to continual loadings are assessed based on finite element analysis. It is found that both the sleeve's and pile's wall thicknesses have a significant impact on the grouted joint health. Namely, the larger are the wall thicknesses, the more vulnerable the grout is with respect to fatigue and material degradation but the more limited the progressive settlement is, and inversely. This implies that the appropriate wall thicknesses should be chosen by designers having in mind that neither extreme is conservative. Based on statistical modeling, the grout length is found to be the most influential parameter of the settlement caused by extreme loadings: longer grout significantly contributes to the reduction of extreme settlement. To ensure that the inevitable settlement does not jeopardize the joint's structural integrity, a probability-based method has been developed to estimate the minimal gap between the pile top and the brackets required to achieve a targeted annual reliability index (of 3.3).
Microbial electrolytic disinfection process for highly efficient Escherichia coli inactivation

Water quality deterioration caused by a wide variety of recalcitrant organics and pathogenic microorganisms has become a serious concern worldwide. Bio-electro-Fenton systems have been considered as cost-effective and highly efficient water treatment platform technology. While it has been extensively studied for recalcitrant organics removal, its application potential towards water disinfection (e.g., inactivation of pathogens) is still unknown. This study investigated the inactivation of Escherichia coli in a microbial electrolysis cell based bio-electro-Fenton system (renamed as microbial electrolytic-Fenton cell) with the aim to broaden the application of microbial electrochemistry. Results showed that a 4-log reduction of Escherichia coli (10^7 to hundreds CFU/mL) was achieved with an external applied voltage of 0.2 V, 0.3 mM Fe^{2+} and cathodic pH of 3.0. However, non-notable inactivation was observed in the control experiments without external voltage or Fe^{2+} dose. The disinfection effect was enhanced when cathode air flow rate increased from 7 to 41 mL/min and was also in proportion to the increase of Fe^{2+} concentration from 0.15 to 0.45 mmol/mL. Fatal cell membrane destruction by [rad]OH was identified as one potential mechanism for disinfection. This study successfully demonstrated the feasibility of bio-electro-Fenton process for pathogens inactivation, which offers insight for the future development of sustainable, efficient, and cost-effective biological water treatment technology.
Gaze typing in virtual reality: Impact of keyboard design, selection method, and motion

Gaze tracking in virtual reality (VR) allows for hands-free text entry, but it has not yet been explored. We investigate how the keyboard design, selection method, and motion in the field of view may impact typing performance and user experience. We present two studies of people (n = 32) typing with gaze+dwell and gaze+click inputs in VR. In study 1, the typing keyboard was flat and within-view; in study 2, it was larger-than-view but curved. Both studies included a stationary and a dynamic motion conditions in the user’s field of view. Our findings suggest that 1) gaze typing in VR is viable but constrained, 2) the users perform best (10.15 WPM) when the entire keyboard is within-view; the larger-than-view keyboard (9.15 WPM) induces physical strain due to increased head movements, 3) motion in the field of view impacts the user’s performance: Users perform better while stationary than when in motion, and 4) gaze+click is better than dwell only (fixed at 550 ms) interaction.

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Organisations: Department of Management Engineering, Technology and Innovation Management, Transport DTU, Copenhagen Center for Health Technology, Texas A and M University
Authors: Rajanna, V. (Ekstern), Hansen, J. P. (Intern)
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