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ABSTRACTS

Ffion Atkins
Winds of change, phytoplankton diversity and nitrogen cycling in the southern Benguela upwelling system.

Phytoplankton diversity and community structure play an integral role in the cycling of carbon and nitrogen in the marine environment. In coastal upwelling systems, wind is a main driver in phytoplankton dynamics, where the upwelling of nitrogen-rich waters to the well-illuminated surface drives phytoplankton growth and productivity.

Patterns in upwelling-favourable winds are predicted to change, posing many questions regarding the structuring of phytoplankton communities and how this may impact the integrity of marine environments. Biogeochemical models that aim to tackle such questions are challenged with finding appropriate representations of phytoplankton diversity. Case studies of phytoplankton blooms observed off Lamberts Bay and Saldanha Bay on the west coast of South Africa were used to test a size-based approach to quantifying nitrogen dynamics of natural, diverse assemblages.
By using a size-dependent Michaelis-Menten model, estimates of nitrogen uptake were calculated using particle size distributions, ambient nitrogen concentrations and size-dependent uptake parameters.

Estimates compared well to corresponding in situ uptake rates observed in diverse natural assemblages in the southern Benguela. Thus, size spectra are considered an ecologically sound means of representing phytoplankton diversity to study the dynamics of nitrogen in the marine environment. There is much scope for further application of such a size-based approach to satellite-derived algal products for large scale, system-wide studies in eutrophic systems.

Fannie W. Shabangu
Potential effects of climate change on the distribution and acoustic behaviour of Antarctic blue whales

Harvested to perilously low numbers by commercial whaling in the past century, the response and sensitivity of Antarctic blue whales, Balaenoptera musculus intermedia, to climate change is poorly understood. This study utilizes acoustic data collected from 586 sonobuoys deployed in the summer of 1997 through 2009, south of 38oS to the ice edge, coupled with visual observations of blue whales as part of line transect surveys. The characteristic Z-call and the feeding produced D-call of blue whales were detected using an automated template detection function and a manual verification method. Using generalised boosted regression tree and random forest models, the environmental preferences, spatial occurrence and acoustic behaviour of Antarctic blue whales were predicted.

Whales were observed to be more vocal active during the day than at night across all acoustic stations. Latitude, longitude, and distance from the nearest Antarctic shores were the main positional predictor of blue whale occurrence. Satellite-derived sea surface temperature, chlorophyll-a and wind speed were the most important environmental predictors of blue whale distribution. Vocalisation rates of both blue whale call types were majorly predicted by latitude, longitude, number of whales and whale groups in an area, and distance from the nearest Antarctic shore. Satellite-derived chlorophyll-a, wind stress, wind direction, depth, sea surface temperatures, sea surface height and wind speed were the important environmental predictors of blue whale call rates in the Southern Ocean.

Blue whales also responded to the significant interannual variabilities of those environmental predictors. This paper presents one of the first quantitative predictions of the potential vulnerability of Antarctic blue whales to interannual variabilities in environmental conditions and predicts suitable habitats for this poorly known blue whale population. Such emerging knowledge about the acoustic behaviour, environmental and habitat preferences of blue whales is critically important in improving the management and conservation of this heavily depleted whale species.

Marc S. Burman
Global climate changes cause complex responses in Palearctic barn swallows in South Africa, 1987–2012

European barn swallows breed from the United Kingdom to Siberia, and migrate mostly to southern Africa. Their lives are adapted to a wide range of climates and seasonal schedules. Compared to species with more restricted ranges, barn swallows could thus be better adapted to coping with rapid climate change.

Recent Northern Hemisphere climate changes have caused geographically complex changes in barn swallow life-cycles in South Africa. Analysis of South African citizen science bird ringing data has provided new evidence for changes. I will present a synthesis and interpretation of this evidence.

Stefaan Conradie
Does it matter where we've come from?: Influence of initial conditions on regional climate states in a climate system model.

On weather time scales, initial condition (IC) differences in climate model trajectories are known to diverge exponentially on average, so that memory of precise atmospheric state is "lost'' within weeks to months. However, the influence of various climate system component ICs on the evolution of subsequent model trajectories - from which model climates are quantified - is not well understood.

The influence of ICs on climate "quantifications" (quantitative characterisations of climate states), employing probability distributions, are investigated in a climate system model experiment. The experiment involves 11 50-member, 60-year constant forcing ensembles and 3 equivalent transient forcing ensembles.

A low-resolution version of the Community Climate System Model version 4 is used to perform the simulations. At least three distinct levels of IC influence are detected in ensemble regional atmospheric variable evolution: (a) microscopic influence, which decays rapidly, presumably due to atmospheric chaos; (b) interannual-scale influence, which controls decadal scale IC predictability and is induced by changes in more slowly varying components---or particularly unstable atmospheric perturbations; and (c) intercentennial-scale IC influence, which determines the climatological distribution to which ensembles converge.

Distinct patterns of IC influence attributable to aperiodic and quasi-periodic variability are identified.

The nature of ICs are found to play an important role in determining the extent and nature of interannual-scale IC influence.

Despite the rapid loss of predictable microscopic IC influence, it is found that, over certain domains, frequent significant differences in 60-year variable distributions occur due to round-off order IC differences.

It is suggested that IC ensemble experiments could play a valuable role in understanding climate variability and be preferable for quantifying model climates.

Kimenthrie Pillay
Crowd-sourcing Energy Poverty Data in South African Informal Settlements: The Opportunity of Mobile Phone Technology

Energy poverty undermines development on a large scale. It is most overtly experienced in informal settlements, where the use of fuels like paraffin, charcoal and wood prove hazardous and harmful to health and well-being. The expenditure on and use of energy services in informal settlements are largely undefined, which undermines the success of energy access and safety initiatives. Despite widespread poverty in informal settlements, mobile phone ownership is high in these areas. This research aims to explore the potential and applicability of a digital data collecting systems using a mobile application that is accessible on entry-level mobile phones with basic internet access to collect information about energy access, affordability and multiple fuel use in these areas.

As part of this research, a mobile application platform and data collection platform was developed which enables survey design and data collection in real time. The platform allows for creation of weekly surveys that question energy use, expenditure and affordability; it also offers other functions that are designed to increase awareness of fuel safety and efficiency.

The application was piloted in Imizamo Yethu in Cape Town. Six weeks of continuous data was extracted from 200 users using airtime incentives.

The quality and quantity of data received was high. The results indicate that the potential for using this system and mobile phones as a data-collecting tool in Africa is great.

Emily Tyler
Considering a complexity theory lens for climate mitigation policy in a development context

The climate change mitigation community of practice has approached the challenge of mitigation policy from a paradigmatic perspective that is largely positivist in its underpinnings.

This is argued to be inherently constraining to effectively pursuing a low carbon policy agenda, and complexity thinking is proposed as an alternative underpinning more appropriate to observations of the policy making context of developing countries.

The presentation will elaborate on this proposition, and suggest some ways in which a complexity view may provide the beginnings of a framework for considering policy activity in this area going forward.

Ngaya Munuo
Towards the design of a Reflexive Regulatory Framework to 'Reduce and Control Emissions from Land Deforestation and Degradation and Enhancing Carbon Stocks' (REDD+): A perspective from Select Developing Countries

REDD+ has emerged as one of the governance approaches to address climate change. It calls for developing countries to take part in a second commitment period for a post-2020 climate change regime under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC) and outside the UNFCCC. The goal of REDD+ is that host countries will receive inter alia, financial compensation if they choose to conserve their forests rather than convert them to non-forest land use. Such compensation is for significant emission reductions which are reasonably attributable to human activities. This implies that REDD+ implementation at a domestic level will require allocation of burdens and benefits. In light of this implication, many scholars suggest that the design of the policy and legal framework to this effect must strike a balance between equity, environmental effectiveness and cost-effectiveness (commonly referred to as the 3Es) to be deemed successful.

Against this background, this thesis questions: what is the optimal (and feasible) model legislative framework sufficient to implement REDD+? It argues that REDD+ should be defined as self-regulatory system. This view directs attention toward a distinct regulatory framework. Thus the thesis suggests that one possible legal framework that holds that potential in Tanzania and Indonesia is reflexive law. The research draws international best practice and numerous innovative governance models from different fields and proposes essential elements to substantiate its position.

Louise Gammage
Considering one's options when the fish leave: A case study of the commercial handline fishery of South Africa's southern Cape.

Many pressures make small-scale fishers and communities vulnerable on a variety of fronts. Fishers need to cope with local and global change and require systems that enhance their strategies in order to achieve resilience. The impact and interplay of stressors at multiple scales need to be taken into account in order to understand social-ecological linkages if sustainable livelihoods are to be achieved. There is however, a shortage of appropriately scaled, context-specific data, needed to inform various decision-making processes. This study researched vulnerabilities, coping and adaptation in the small-scale commercial handline fishery in six communities of South Africa's southern Cape region. Faced with multi-scalar changes to the broader fishery system, fishers are forced to employ a wide range of strategies to cope with and adapt to change. The variability of adaptation, coping and reaction strategies employed is presented in the place-based context.

The fishers' coping and adaptation strategies falls into three main groups. Cognitive and reflexive decision-making processes are shaped by the experience of past and present environments and cannot be understood by the direct impacts of stressors alone. Practical implications of actions are not always the overriding concern in decision-making and underscores the importance of culture and belief systems. Whereas one group of fishers have modernised their business strategies and intensified their fishing by going further offshore on larger but economic craft, the second and third group of fishers navigate the status quo because it is "what they know". The second group; characterised by low formal education, poverty and political marginalisation; mostly waits for help from the outside. The wide array of alternative income options displayed by the third group has so far allowed them to make it through hard times whilst always resuming fishing with businesses and strategies remaining largely unchanged.

Steffanie Musingarabwi
Time-use and wellbeing in semi-arid regions: A case study of Onesi, Namibia

Semi-arid areas are amongst the most vulnerable to climate-related weather events, particularly drought. However, there has been limited research into the gendered experiences of time-use and wellbeing within the context of vulnerability to climate change and particularly so in semi-arid areas. As a result, failure to appreciate how time-use and wellbeing are experienced in semi-arid areas limits vulnerability understanding and subsequently challenges the effectiveness of adaptation efforts in rural communities. The study aimed to make a contribution to the knowledge gap on time-use and wellbeing by exploring and assessing how time-use relates to the experiences of material, subjective and relational aspects of wellbeing in a semi-arid area. It hypothesised that time-use adversely impacts the material, subjective and relational aspects of male and female household head's wellbeing.

The study adopted a quantitative approach to primary data collection, analysis and interpretation of results. A questionnaire survey consisting of 93 male and female headed households was conducted using randomly stratified sampling techniques. Data was analysed using Microsoft Excel and SPSS software from which descriptive and statistical results were presented in tables and graphs. The study found that time spent in personal care negatively impacts material wellbeing while improving subjective wellbeing thus indicating a trade-off in wellbeing; leisure time-use significantly improves relational wellbeing and highlights the importance of social connections particularly for widows/widowers; and spending time in domestic work and not being the household breadwinner improves material wellbeing which is suggestive of role division and the importance of social capital within the household. Overall, the study highlights time-use related opportunities and constraints for improving the quality of life for rural inhabitants in Onesi, Namibia.

Key words: time-use, wellbeing, gender, climate change vulnerability, semi-arid areas