

## **Animal Movements: Ecosystems and Societal Impacts**

**Thematic Workshop, 5-6<sup>th</sup> October 2016**

**Venue:** Faculty of Forest Sciences, SLU Umeå, Swedish Univ Agricultural Sciences

Jointly Organized and funded by SSEESS and SLU.

### **Aim**

The aim is to bring together an interdisciplinary group of experts to address important ecological and societal issues related to animal movements across terrestrial, freshwater and marine systems.

Sweden is well poised to take a lead in a cross-disciplinary effort in this field, bringing together leading expertise from many disciplines and using this knowledge to tackle problems of global scale, in both the developed and the developing world.

### **Background**

Animal movements are a feature of all ecosystems. Movements link ecosystems by transporting nutrients, energy, genetic material, reproduction, foraging and being eaten. On the other hand, movements also allow populations to access the best areas round the year and become abundant. Many migrations and movements have been lost and many are under threat of being lost, due to rapidly occurring global changes, both in land and water use and climate. The loss or hindrance of movements has implications; both on species persistence and the ecosystems they link, as well as the human society. A crucial example is the loss of ecosystem services such as pollination, due to extinction and curtailment of insect pollinators attributed to land use change and use of insecticides. Similarly, by movements, numerous animals collide with roads and railways, hydroelectric power plants, fishing vessels, windmills, power lines, and other human made infrastructure. As habitats are modified and humans also move closer to animals, the likelihood of transmission of zoonotic diseases also increases rapidly. This makes movement an important societal issue with many social, human health, political, and economic dimensions. Such issues indeed form societal opinions as well as form attitudes towards nature and developments. However, we still know relatively little about the movements of most species; when the human impacts on movements are high and conservation and management is need of the hour. Moreover, movements such as migrations have affected humans (pastoralists, hunters, trappers and fishermen) for millennia, and these

lifestyles are being affected dramatically. This warrants a multidisciplinary approach to tackle issues arising from animal movement.

During the last two decades, our understanding about the causes and consequences of animal movements has begun to increase dramatically through the developments in science, monitoring and improvements in technology for tracking animals as well as remote sensing and genetic sequencing techniques. As a result, we are today in a strong position to study the underlying causes and consequences of animal movements at a resolution never studied before. Moreover, because of these powerful new technologies, movement data is simultaneously in transition towards the '**Big data**' category, meaning data collection and handling occurs in large databases with complex structures such as encountered within 'Google search', 'Amazon Inc.', or 'Facebook Inc.'. This has important implications for future natural resource conservation and management.

### **Problem**

The changes in animal movements requires us to improve our ability to understand and predict how animals will move and adapt to global change and develop management and conservation measures. However, animal movement is a complex process resulting from interactions between – internal mechanisms (such as memory, cognition, systematic search, motion and navigation capacity, life history) and external environmental conditions including human interventions, which makes it difficult to predict.

There are several additional challenges that include:

1. Lack of historical and current knowledge on how, where and when do animals move.
2. Lack of means in the past to address the basic question of 'why' move?
3. Existing knowledge is widely distributed across different groups and fields and there is little exchange of knowledge across taxa, fields and experience sharing.
4. Little exchange of success and failures learned in one ecosystem with another.
5. Relatively little exchange of knowledge between ecology, economics and sociology
6. Enormous existing infrastructure and expertise to improve knowledge but severely underused and uncoordinated.
7. Lack of recognition for the severity and the scale of the problem.

### **Why Sweden?**

- Sweden has the infrastructure and interdisciplinary expertise and knowledge to be a global leader in movement ecology research on both humans and animals.
- Cross taxonomic overview: A number of research groups, agencies and organizations in Sweden are currently directly or indirectly engaged in research, policy and management on animal movements across land, water and air. Immense national potential for exchange of knowledge and state of the art in different systems, which is of global relevance.

Some of them include but are not only restricted to:

Institution	Expertise
Swedish University of Agricultural Sciences	Cross-taxonomic focus; Human dimensions of wildlife, Mandate for Applied ecological Research and hosts Wireless Remote Animal Monitoring Data Platform (WRAM).
Lund University	Centre for Animal Movement Research (CanMove) – Terrestrial and aquatic systems with focus on birds and fish; Conducts basic ecological research.
Umeå University	Dept. of Ecology and Environmental Science and Political Science) – Aquatic animal movements, Human attitudes and perceptions to Natural Resource Management.
Stockholm Resilience Centre	Interdisciplinary Research, Mobility of humans, history and present.
Bird Ringing Centre	Natural History Museum: 12 million records, 158 000 recoveries since 1911

Therefore, there is a massive scope and potential for cooperation within the country and to combine efforts and lead a global programme to produce innovative solutions to the problem.

- Large infrastructure currently exists, spread across the country at different universities, departments and agencies, and greatly underused. National Data platforms such as the Wireless Remote Animal Monitoring, GBIF Sweden, Swedish Life Watch, High Performance Computing Centers, Remote sensing labs (Air Borne and Ground Based Laser Scanning, Drones and Satellites), Genomics, Isotope labs, field monitoring and experimental sites included in SITES, and Falsterbo Fågelstation along with many more.
- The Swedish National Environmental Protection Agency has identified 16 environmental goals<sup>1</sup> that include sustainable management of natural systems and conservation of biodiversity, and managing animal movements are fundamental to these goals.

### **Thematic Workshop – Animal Movements: ecological and societal impacts**

There is potential to create a national and global research programme/platform on animal movement research, where cross-taxonomic comparisons can be made and synergies and common solutions can be found to general societal problems arising from movements. These problems are global. Many of the societal issues related to animal movement are especially urgent in developing countries (few data, vulnerable societies, vulnerable individuals, scarcity of resources for mitigation/adaption). The thematic workshop will be a great opportunity to bring together the researchers, stakeholders, funders and policy makers to encounter the issue heads on and develop a path for future work and urgent needs on the topic and its global appeal.

<sup>1</sup> <http://www.miljomal.se/sv/Environmental-Objectives-Portal/Undre-meny/About-the-Environmental-Objectives/>

## Ecological and Societal Issues

- Ecological and Societal impacts of changes in animal and human movement patterns
- What are the crucial research questions in addressing these issues?
- What are the challenges in producing that research and how to overcome these challenges? Putting biology and ecology into the GPS positions.
- Existing infrastructure – field, lab, databases, monitoring methods and techniques?
- Which additional data providers could be mobilized?
- Which are the immediate stakeholders and how can they be connected?
- Bridging the gap between natural and social sciences to answer questions such as human wildlife conflicts, transmission of zoonotic diseases, invasive species management, impacts of infrastructure, and conservation and management of wildlife

## Challenges in managing moving animals and looking into future

### Discussion Forum

*Guiding notes: What are the main challenges faced by natural resource managers in terrestrial and aquatic systems with regards to animal movement? Scientists, practitioners, funders and policy maker's perspective – Human wildlife conflicts, disease spread, invasive species, land use and infrastructure that hinders movements, how to achieve the balance between conservation and sustainable use.*

- How do the research questions discussed here link to Future Earth and other global initiatives?
- Where are the knowledge gaps in our fields?
- Are there exchangeable common approaches and methods, and readily transferable across systems and disciplines? – Data collection, types, analyses, storage.
- How can animal movement data be combined with other datasets such as genetics, stable isotopes, remote sensing and landscape analysis?
- What are the stakeholder's views?

## **WORKSHOP OVERVIEW**

### **Day 1 - afternoon session, lunch and dinner included**

- SCIENTISTS SHARE EXPERIENCE AND KNOWLEDGE (Present case studies)
- STAKEHOLDER'S PERSPECTIVES (Costs and Benefits to business and society)
- FUTURE EARTH EXPERIENCE
- Q&A SESSION

### **Day 2 - morning session, lunch included**

- DISCUSSIONS AND WORKING GROUPS ON TACKLING THE ISSUE AND FUTURE PATH (including reflections from Day 1)