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Preface

Biologists who, in the 1960s and early 1970s, pioneered wildlife tracking with radiotelemetry devices had a brilliant intuition. Those biologists understood that observations of animals in their environments provided an invaluable foundation for behavioural and evolutionary ecology. They also understood, however, limitations of direct observations of animals. Human eyes can only peer into animals' lives, gathering only a partial picture. Direct observations are biased by our senses, animals' reactions to human presence, and animals' habits that make most of them secretive and unseen. Those biologists understood that it was time to move the observation point from the observer to the observed.

This understanding has spurred the use of technological innovations at a rapid pace. During the era of VHF radiotelemetry, researchers had to be close enough to the animals to be able to record telemetry data. The more distant researchers were from their animals, the smaller their potential effect on the animals' behaviour but the less precise were their location data. The advent of telemetry using geographic positioning system (GPS) has freed researchers from the search for this trade-off. GPS, together with other remote data-logging systems (such as Argos, or depth-sensors for the marine environment), has revolutionized both the data that can be collected from individual animals and the allocation of research funds.

GPS telemetry can provide large, continuous, high-frequency data of animal movements—precise maps of animals on the move—that can be complemented by other information on behaviour, physiology and the environment. This development provides tremendous opportunities to answer behavioural and ecological questions, and to promote quantitative and mechanistic analyses. Conversely, these abundant data challenge scientists with their complexity, require appropriate theory on error, demand efficient handling of data and beg for advanced analytical tools.

These considerations prompted us to organize a meeting of scientists spanning a wide range of skills and disciplines, including behavioural ecology, movement ecology, population dynamics, mathematical and statistical modelling, statistical physics, mathematical biology, biometrics, wildlife management and information technology. The papers included in this Theme Issue were written by authors following the stimulating and fruitful discussion that took place during a workshop 'GPS-Telemetry data: challenges and opportunities for behavioural ecology studies', held at Edmund Mach Foundation, Viote del Monte Bondone, Trento, Italy, in September 2008.

As technological developments make GPS telemetry accessible to an increasing array of species, and as multi-sensor devices become available that can measure multiple behavioural variables at a time, we hope this Theme Issue will serve as a guide for present and future studies and applications. This Theme Issue offers viable solutions to practical and theoretical issues and sets the stage for exiting, new scenarios of a multi-disciplinary understanding of ecological interactions and ecosystem complexity.

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One contribution of 15 to a Theme Issue 'Challenges and opportunities of using GPS-based location data in animal ecology'.