

# Quantitative Marine Science



Thesis Abstract

## **Understanding the movement of animals in time and space, and its implications for the abundance and distribution of populations, is a pivotal problem in ecology**

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Animal migration is often interpreted as a response to environmental heterogeneity, particularly in dynamic ocean environments where prey resources tend to be patchily distributed. In juvenile animals, since migration is not associated with travel to breeding sites, movement is expected to be more tightly coupled to food resources.

This study is concerned with the migratory patterns of the juvenile animals of a large, predatory, widely distributed temperate marine species, the southern bluefin tuna (*Thunnus maccoyii*, hereafter SBT). The long-distance migrations of this predator are investigated directly within the oceanographic context, with environmental influences on movement and behaviour determined through the integration, analysis and interpretation of telemetry-based and oceanographic data.

In this thesis I present data and analyses for:

- (1) *Seasonal ocean processes* – remotely sensed ocean data were used to identify oceanographic features, and their cycle of development and/or productivity, that may provide important seasonal feeding habitats.
- (2) *Plasticity in vertical behaviour* – oceanographic habitats were characterized on the basis of water column structure, using temperature-at-depth data from archival tags, and vertical movements of SBT examined in response to habitat type and other factors.
- (3) *Feeding and foraging ecology* – temporal feeding patterns were determined from visceral warming patterns and used to evaluate the relationship between feeding success and time spent in an area.
- (4) *Factors predictive of feeding success* – were investigated using an integration of telemetry, environmental data and statistical modelling techniques.

*General discussion* – the integration of biological and oceanographic data provide a significant advancement to our current knowledge on movement, habitat use and foraging ecology in migratory marine animals, and an increased appreciation for the diversity and complexity of biological phenomena. In particular, the ability to detect feeding events provided critical, and sometimes unexpected, insights into the motivations for the observed movements and behaviours, challenging some existing ecological concepts.