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BSc (Biology), Universidade Estadual de Campinas, 2008
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DEPARTMENT OF BIOLOGY

TITLE OF THESIS: ON THE INTERPLAY BETWEEN SOCIETY
AND CULTURE: CAUSES, CONSEQUENCES
AND STABILITY OF SPERM WHALE CLANS

TIME/DATE: 1:30pm, Tuesday, July 26, 2016

PLACE: Room 429/430, The Goldberg Computer Science
Building, 6050 University Avenue

EXAMINING COMMITTEE:

Dr. Louis Lefebvre, Department of Biology, McGill University (External
Examiner)

Dr. Boris Worm, Department of Biology, Dalhousie University (Reader)

Dr. Glenn Crossin, Department of Biology, Dalhousie University (Reader)

Dr. Hal Whitehead, Department of Biology, Dalhousie University
(Supervisor)

DEPARTMENTAL Dr. Daniel Ruzzante, Department of Biology,
REPRESENTATIVE: Dalhousie University

CHAIR: Dr. Graham Gagnon, PhD Defence Panel, Faculty of
Graduate Studies

ABSTRACT

The overarching goal of my thesis is to formalize the interplay between animal society and culture, using sperm whales as a model. Sperm whales live in multilevel societies, characterized by cooperation and social learning. Females form nearly-permanent social units and communicate using codas, stereotyped patterns of clicks. Units temporarily group with other units that use similar codas, forming vocal clans—whales of the same population with distinct coda dialects. I investigate the causes, consequences and temporal stability of the sympatric sperm whale clans in the Pacific Ocean. First, I explore the relationship between social structure and social learning as a phenomenon non-exclusive of human societies. Social relationships demarcate how information flows among individuals, as well as its content, while social learning affects who interacts with whom. Second, I show that culture affects sperm whale society by creating clans. With computer models mimicking the dynamics of empirical populations, I test multiple mechanisms of coda transmission—individual learning, genetic inheritance, pure and biased social learning. Clans with different dialects emerge only when whales learn codas from each other, conforming to the most similar individuals around them. Third, I evaluate the consequences of clan membership. Using a long-term dataset, I show differences in social behaviour among clans: members of one clan dived more synchronously and had more homogeneous, briefer relationships than the other. Cultural drift may explain such divergence, with whales replicating within-clan social norms. Finally, I investigate temporal stability of clans by studying the Galápagos population over 30 years. I document a complete population turnover leading to cultural shift: sperm whales studied in 2013-2014 do not belong to two clans that used the area between 1985-1995; instead they are members of clans previously found in other areas of the Pacific. In conclusion, culture gave rise to sperm whale clans, which in turn drives social behaviour, in a two-way relationship that is stable over time but dynamic over space. These findings strengthen the evidence for culture among sperm whales, highlighting that processes driving behavioural flexibility in humans—information transmission through biased social learning and cultural drift—also operate in non-human animal populations.