MASTS PECRE Final Report: Dr. Shane Gero

Host institutions:
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Hosting Faculty:
Dr. Luke Rendell
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Dr. David Lusseau
MASTS Senior Lecturer
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Background:
This fellowship aimed to study vocal communication and social relationships among individual and social units of sperm whales. This fellowship combined the experience of two MASTS lecturers, who are leaders in their own fields, with the fellow's skillsets and an unparalleled dataset derived from the fellow's longterm study, The Dominica Sperm Whale Project. This fellowship has contributed to MASTS research goals and created new collaborative links with two MASTS institutions to a long-term, integrative study of a marine top predator.

Interactions with the MASTS community:
During this fellowship, I was an active member of the research community at two MASTS institutions. I interacted with faculty, graduate students, and other fellows at both universities. I gave a departmental talk at the University of Aberdeen and intend on giving a webcast lecture to the wider MASTS community shortly after my fellowship ends. I am also writing a summary of my work for the MASTS newsletter Kelpie. Finally, I will also present the findings of this work more broadly at the International Meeting for Marine Mammalogy in December in New Zealand for which MASTS will be credited.

Outputs completed and expected:

1. **Individuality vs. Conformity in communication signals: patterns of variation in sperm whale codas**
   During work at the University of St. Andrews, the fellow completed analysis and manuscript preparation on a study of sperm whale vocal communication. The manuscript is in preparation for submission to *Proceedings of the Royal Society B*.

2. **Behavioural Asymmetries**
   During my time at the University of Aberdeen, Prof. David Lusseau and I investigated behavioural asymmetries in sperm whale diving and vocal production. This manuscript is in preparation with an expected submission to *Biology Letters*.

3. **Global synthesis of sperm whale coda repertoires**
   This fellowship allowed for the initiation of a large-scale, inter-institutional collaborative study which aims to synthesize our current knowledge of sperm whale coda repertoires from around the world. Currently the list of collaborators include, Dr. Hal Whitehead (Dalhousie University) and Dr. Luke Rendell (University of St. Andrews) with their work from the Eastern Tropical Pacific, Dr. Luke Rendell and his fellow colleagues and their pooled dataset from the Mediterranean Sea, Dr. Masao Amano (University of Nagaski) with his work from off the coast of Japan, and Dr. Ricardo Antunes (University of St. Andrews) and Dr. Jonathan Gordon (University of St. Andrews) with their work from the Gulf of Mexico, The Azores, and Iceland. I am also currently speaking with several other potential participants in order to include addition datasets from areas including the South Pacific, the Southern Atlantic, the Indian Ocean and Ocean. The initiative is in its founding stages, but will be an unparalleled look into geographic variation of culturally-transmitted dialects in a pan-global marine species. During this fellowship, I was able to contact collaborators, initiate the pooling of the datasets, and search for outlying data for geographic areas which are currently data depauperate.

4. **Development of new method for categorizing sperm whales vocalizations using network methods**
   This fellowship has allowed me to trail new developments in using a network approach to the categorization of sperm whale codas. This method uses community division techniques involving modularity maximization to divide calls into clusters; and thereby, defining call "types" quantitatively. This method will hopefully replace the current k-means methods which have several limitations.

5. **Invited Commentary on Social Networks Review in *Behavioural Ecology***
   Co-authored, with Dr. Rendell, a commentary on a review paper on the use of social network analysis in studies on animal societies for the journal *Behavioural Ecology*.

6. **Proposals**
   - European Commission Marie Currie Action EU incoming international fellowship
   - University of St. Andrews MASTS research fellowship
   - Moss Landing Marine Laboratories post-doctoral research fellowship
   - Moss Landing Marine Laboratories tenure-track assistant professorship
   - University of Exeter associate research fellowship
   - National Geographic Committee for Research and Exploration grant proposal

Plans for building on the PECRE:
My interactions with the wide field of experts during my time at both of these institutions will hopefully lead to future continued pursuits including multi-species comparative studies, population modelling, or applied conservation. During the tenure of this fellowship, I have also applied for four international fellowships and one faculty position, in Europe and abroad; as well as, one external grant for studies which would further the partnerships developed during this MASTS PECRE. These would allow me to potentially return to Europe, but also extend collaboration with MASTS institutions through continued partnerships.

Award Size and Expenditures:
Total award: £6451, of which Salary: £5455, Travel (flights from Canada plus train to Aberdeen): £996