Seascape Genomics: Conservation Genetics of Elasmobranchs

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Seascape Genetics: Integrating Molecular data & Spatial Ecology

Genetic Structure Analysed in Relation to Landscape Features

Spatial and Genetic Data

GIS/Spatial Statistics

Seascape Ecology

Seascape Genetics

Conservation Genetics

Popn health, assessed by immune genes, pollution indicators etc

(Adapted from: Andrew Storfer)
Why elasmobranchs?

Predators are bellwethers of health. 'Endangered' stocks are heavily fished, slowing life histories. Spatial/social ecology and Philopatry/area association are vulnerable to local adaptation within Familial groupings. Evidence of marine stressors, plastics/EDCs (reproduction/feeding), and EMF? climate change.

Why elasmobranchs?
SEX BIASED DISPERSAL IN GREAT WHITE SHARKS?

tag recaptures indicate residential groups of spur-dog & common skate in sea lochs.

Proposed MPA's

Spur dogs in Loch Etive

Common skate in the Sound of Jura, Crinan loch
Thermal niches?

Image adapted from: Aleynik et al, 2012, Oxygen dynamics in basins with restricted exchange: A case study of a Scottish fjord (Loch Etive, NW Scotland)
Top predators
bellwethers of health

‘Endangered’
stocks heavily fished
slow life histories

Spatial/social ecology
Philopatry/area association = vulnerable
Local adaptation
Familial groupings
Ne

Evidence of marine stressors
plastics/EDCs
(reproduction/feeding), EMF?
climate change
Relatedness within aggregations

Average group relatedness higher than expected under random expectations

Familial Aggregations?

Higher level of relatedness

Lower level of relatedness
Why elasmobranchs?

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- Bellwethers of health
- ‘Endangered’
  - Stocks heavily fished
  - Slow life histories

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(reproduction/feeding), EMF?
climate change
Commercial
Potential important fisheries

Public interest
presently support MPAs; priority marine features eg west coast

Timely and current
increasing genomic/transcriptomic tools, integrating data with physical tagging
gene-environment interactions

Why now?
Cornish fishermen challenge ‘nonsensical’ EU spurdog management
Why now?

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The not so common skate

- World’s largest skate
- Life history characteristics mostly unknown
- Highly K-selected & vulnerable from time of hatching
- Critically endangered (IUCN 2011); UK BAP*; OSPAR List**; Scottish priority marine feature for MPA designation
- Distribution: NW Scotland, Celtic Sea & Rockall plateau

*UK Biodiversity Action Plan Priority Species, **OSPAR List of Threatened and/or Declining Species
MPAs: How will the common skate benefit?

- The sole presence of *D. intermedia* strengthened MPA proposal
- Area is now a designated MPA for the common skate
- Is there one connected & genetically uniform stock *or* a collection of isolated, unique populations?
- Will static MPAs protect the genetic diversity of a potentially highly mobile species?

Loch Sunart to Sound of Jura MPA
**Why now?**

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Potential important fisheries

*Public interest*
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*Timely and current*
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gene-environment interactions
What’s available?

Samples
gonads, blood, liver, muscle, fin clips, parasites, morphometrics, guts, slime
Overcoming the Problem – not so simple!

Tissue Samples
- Hard to get - Only 80 available

Mucus sampling – the way to go!
- Relatively non-invasive
- Cost-Effective
- Minimal Disturbance
- 400 global samples
- Allowed for the development of 19 microsatellite loci
- 44 SNPs (800+ available)


Basking shark connectivity, behaviour & condition
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World wide sampling
15 years investment

Ego?
GSoH, Gregarious
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Commercially important

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