Using the Vemco Mobile Transceiver to inform on the nature and spatiotemporal distribution of species interactions

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Objective: to examine interactions between grey seals (*Halichoerus grypus*) and their potential prey and/or competitors in two large marine ecosystems, the Eastern Scotian Shelf and Gulf of St. Lawrence.

Rationale: Species interactions play a key role in shaping the behaviour and spatio-temporal distribution of marine predators; however, quantifying this field is a challenge. The outcome is a limited understanding of the contribution top predators have on the mortality of fish of conservation and commercial interest.


GPS transmitter & VMT provide time-stamped, geo-referenced records of seal-fish interactions

Methods: 2009 – 2013: 89 adult grey seals on Sable Island and 8 in the Gulf of St. Lawrence were fitted with a VMT and GPS transmitter.

In collaboration with OTN user groups, several species of fish were tagged with Vemco transmitters.

Travel and Area-Restricted Search (ARS, i.e. foraging) behaviour were identified using a hidden Markov model. The broken stick method was used to define an encounter (i.e., cluster of detections).
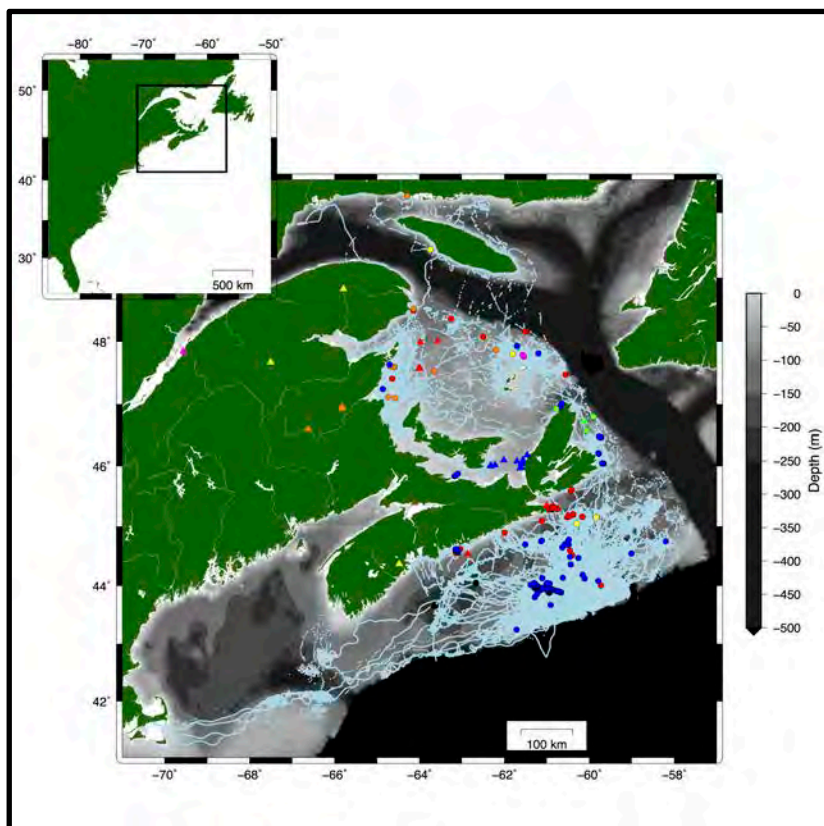
▲ Fish captures ● Distribution of seal-fish detections

Species	years tagged	# tag	# fish detected	# encounters	# seals
Atlantic cod	09 – 13	832	37	60	13
Atlantic salmon	09 – 13	1660	7	10	3
kelt	09 – 13		4	4	3
Atlantic sturgeon	10 - 12	160	1	1	1
American eel	10 – 12	562	2	2	2
Atlantic bluefin tuna	09 – 13	91	28	322	19
Blue shark	13	20	5	7	1
Porbeagle shark	13	17	3	3	1
Snow crab	13	27	3	3	3

Thirty of 73 VMTs recovered from adult grey seals recorded 414 seal-fish encounters (2,422 detections) from seven species of fish and one invertebrate from nine different OTN projects. Data on the detection of fish by grey seals provides an understanding of their distribution, movement and identification of highly productive areas, as shown here by the detections between bluefin tuna and grey
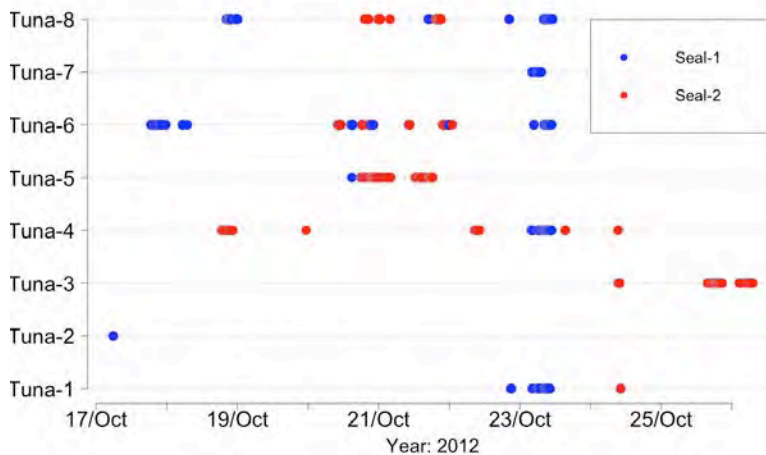
Interactions between grey seals and bluefin tuna were common (78% of seal-fish encounters) and in several cases involved extended periods of time, as shown here by two grey seals interacting with eight individual tuna.
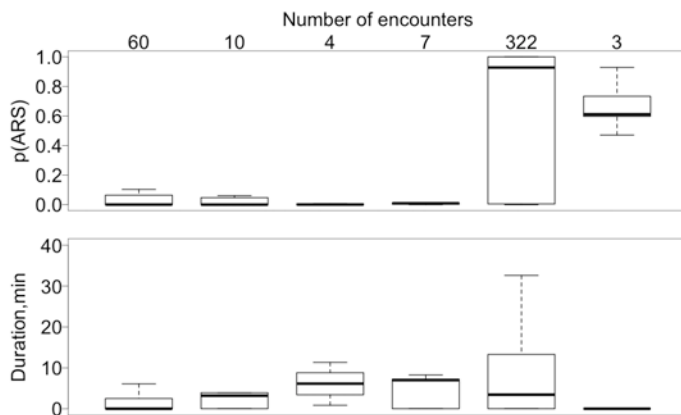
Encounters between grey seals and potential prey (cod and salmon) were short with a low probability of Area Restricted Search (ARS). Encounters between grey seals and potential competitors (bluefin tuna) were more variable in duration with a high probability of ARS.

Conclusion: This study has improved our understanding of the nature of interactions between grey seals and various fish species.

Our results suggest grey seals were likely not foraging during encounters with cod or salmon. During encounters with bluefin tuna, seals were likely foraging, suggesting tuna are an important competitor and/or their presence indicates foraging "hotspots".

We are collaborating with Maritime Biologgers to deploy accelerometers on grey seals to examine episodes of fish predation during seal-fish encounters.