**Statement of Work**

**Vessel Operations and Compliance Statistical Analysis**

**Background**

Collisions with vessels are a principal threat to the recovery of the North Atlantic right whale. Attempts to reduce the magnitude of this threat include the establishment of a Mandatory Ship Reporting system and the implementation of vessel speed restrictions in certain locations along the U.S. eastern seaboard. A number of steps have also been taken to prompt adherence to the vessel speed restrictions and it appears these have had varying degrees of success in ensuring compliance. We wish to analyze the relative effectiveness of these agency outreach and enforcement actions.

***Vessel Speed Rule***

Two sources of data are available for analysis that will provide detailed information on U.S. East Coast vessel traffic patterns, speeds, and routes in regard to efforts to reduce the threat of ship strikes of right whales: the Automatic Identification System (AIS) and the Mandatory Ship Reporting systems. AIS data of all vessels transiting to and from U.S. east coast ports have been gathered and archived since November 2008. These data will be the primary data for the work described in this statement of work. Among other things, these data have been used to characterize vessel compliance with the December 2008 final rule requiring vessels to travel at 10 knots or less in certain areas and times to minimize the likelihood of fatal collisions with right whales. This included assessments of vessel compliance with the rule following various outreach and notification and enforcement programs. However, these past analyses have been on broad scales and have not specifically involved statistical analysis. Identifying appropriate statistical models and conducting an analysis of compliance with the vessel speed rule relative to various outreach and notification programs are the primary tasks for the work sought here.

In particular, multivariate or some related type of analysis may be needed to determine effect size of the various notification and outreach programs and enforcement actions. Other types of analysis may be appropriate (and may involve, for example, change-point or other types of analysis) and should be identified and discussed among the various analysts involved in the project.

The above is the primary task of this work order. However, as time and funding allow, additional analytical work *may* also be undertaken, as indicated below.

***Mandatory Ship Reporting Systems***

In 1999, the International Maritime Organization endorsed and the U.S. implemented two Mandatory Ship Reporting (MSR) system areas in key right whale calving and feeding areas. The systems require all vessels 300 gross tons and greater to report such things as location, time/date, speed, and destination to a shore-based station. In response an automated message is sent to the reporting vessel that provides information on avoiding collisions with whales and the latest right whale sighting locations. Incoming ships’ reports are parsed and archived. Therefore, over a decade of data involving inbound vessel data are available for analysis. Such analysis might include the amount of vessel use of these two areas, changes in vessel use patterns through time, and reported speeds of those vessels.

**Specific Tasks**

NMFS Office of Protected Resources (OPR) has developed capabilities to archive and conduct basic analysis of vessel AIS data. We have processed these data in a number of ways and can and will reduce and provide the data for the work described here in any way that lends itself to further analysis. Our staff can also assist in this analysis.

Therefore, specific tasks for this work are:

* Review existing data or reduced data to identify, in consultation with OPR staff, appropriate statistical models and analyses of (primarily) vessel AIS data.
* Once identified use all the data or a subset of the data, to conduct appropriate statistical analysis, and report and describe the results

**Deliverables, Funding, and Timelines**

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1. In consultation with PR staff, review the data and determine mutually agreed set of statistical models, that may also involve follow-up analysis depending on the initial results
2. Based on this consultation, propose a suggested analytical framework
3. Conduct analysis and provide the results of the various statistical tests and a description of the conclusions of that analysis
4. Work with PR staff to develop language suitable for publication that describes the analytical approach, analysis conducted, and the outcome(s) of the analysis.

***Timelines***

It is expected that all the work will be completed within 3-6 months from the initiation of this work order.

***Funding***

Funding for the work described here is expected not to exceed $15K. Payment will be made in three installments: following completion, and approval by PR staff, of Deliverables 2, 3, and 4, above.

This contract may be renewed or extended and the amount of funding devoted to it may be increased as *mutually agreed* by both parties.

**Additional Analysis**

**MSR**

If both time and sufficient funds allow, and at the mutual agreement of both the contractor and OPR staff, this work may include assisting with some basic descriptive or additional statistical analysis of MSR vessel data.

**Other**

If both time and sufficient funds allow, this work may include assisting with additional statistical analysis *as mutually agreed* by both the contractor and OPR staff. As noted above, the contract may be extended, and/or the amount of funding increased is mutually agreed.

**Conditions**

The data involved in this project shall not be distributed, transmitted, or provided to others in any manner, nor will they be used for any purposes other than those indicated in this work order.

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