1. **Project title and contract number**

   Exploring the potential inadvertent effects of Gulf of Maine and Georges Bank area closures on cod life-history variation

   Prime Award No. NA06NMF4720095

   Subaward No. 08-008

2. **PI contact information**

   Graham D. Sherwood, Ph.D.  
   Research Scientist  
   Gulf of Maine Research Institute  
   350 Commercial Street  
   Portland, ME 04101  
   (v) 1-207-228-1644  
   (f) 1-207-772-6855  
   gsherwood@gmri.org

   Jonathan H. Grabowski, Ph.D.  
   Research Scientist  
   Gulf of Maine Research Institute  
   350 Commercial Street  
   Portland, ME 04101  
   (v) 1-207-228-1628  
   (f) 1-207-772-6855  
   jgrabowski@gmri.org

3. **List of project participants with contact information**

   Kelo Pinkham, F/V Bad Penny  
   167 West Side Road  
   Trevett, ME 04571  
   Phone: 207-633-6315

   John Shusta, F/V Special J  
   7 Foxtail Drive  
   York, ME 03909  
   Phone: 207-351-6738

   Bruce Kaminski, F/V Never Enough  
   1138 Old Queen Anne Road  
   Chatham, MA 02633  
   Phone: 508-945-5382

   Proctor Wells, F/V Tenacious  
   PO Box 16  
   Phippsburg, ME 04562  
   Phone: (207) 389-1835

   Tim Caldwell, F/V C.W. Griswold  
   6 Curtis Road  
   Swanville, ME 04915  
   Phone: 617-797-6849

4. **Project objectives**

   The primary objectives of this project are as follows:

   1) Demonstrate the existence of life-history variants (i.e. ecotypes or morphotypes) in Atlantic cod from the Gulf of Maine and Georges Bank.
2) Examine whether Gulf of Maine and Georges Bank closed areas favor sedentary cod types over migrant cod types.

3) Examine whether closed areas alter cod feeding and growth.

5. Major accomplishments and milestones (last 6 months)

Since beginning sampling in summer of 2007, we have made great progress towards achieving these objectives. The following is a list of milestones and accomplishments for this project achieved over the last 6 months:

1) An additional 8 charter days were carried out to sample at Cashes Ledge and in midcoast Maine for red and normal cod.

2) The total number of cod sampled now stands at 1,392. All of these have been processed for the following:
   a. Length, weight, liver weight, gonad weight, gutted weight
   b. Sex
   c. Age (from otoliths)
   d. Photos for morphometric analyses
   e. Color; we have developed a red/green ratio (RGR) measurement from digital images as a robust way of quantifying color in cod
   f. Stable carbon and nitrogen isotope signatures (subset of 307 cod)
   g. Diet (from stomach contents)
   h. Parasite loads

3) An in-depth analysis of red versus normal (olive) colored cod has been completed, presented at the ICES Annual conference in Berlin, and submitted to the ICES Journal of Marine Science as a contribution to a special session on life-history variability in fish. This manuscript included updated analyses of diet and morphometric differences between red and olive cod.

5. Unexpected difficulties and project alterations

No major difficulties have been encountered and no alterations have been made to our work plan (other than continued directed sampling for red cod) since submission of the previous annual report.

6. Next steps, tasks for next 6 months

1) Complete field sampling: funds remain for 3 charter days to be completed. This will allow us to complete 1-2 more trip(s) to Cashes Ledge.

2) Analyze all data to test for effect of closure status on cod life-history, feeding and growth.

3) Write final report and submit second manuscript to the primary literature.

7. Signature and date

____________________  January 15, 2010
Graham Sherwood