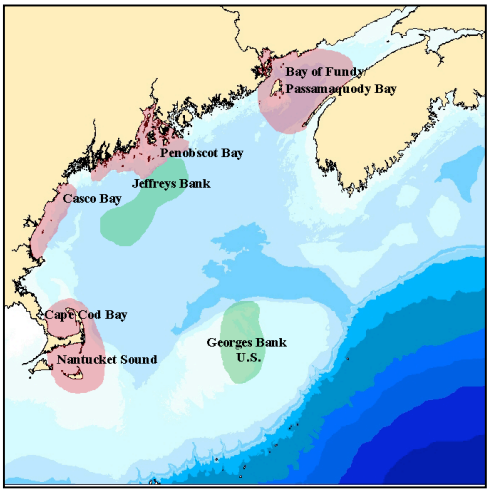

User Needs Assessment for the Gulf of Maine Mapping Initiative

Prepared for:
Gulf of Maine Mapping Initiative
Gulf of Maine Council on the Marine Environment

c/o Susan Snow-Cotter, Co-Chair
Massachusetts Coastal Zone Management
251 Causeway Street, Suite 900
Boston, MA
USA 02114-2151
and
Dr. Brian Todd, Co-Chair
Natural Resources Canada
Geological Survey of Canada-Atlantic
P.O. Box 1006
Dartmouth, Nova Scotia
Canada B2Y 4A2

Prepared by:
CEF Consultants Ltd.
Contact: Norval Collins
Phone: 902-425-4802
Fax: 902-425-4807
e-mail: ncollins@cefconsultants.ns.ca

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Executive Summary

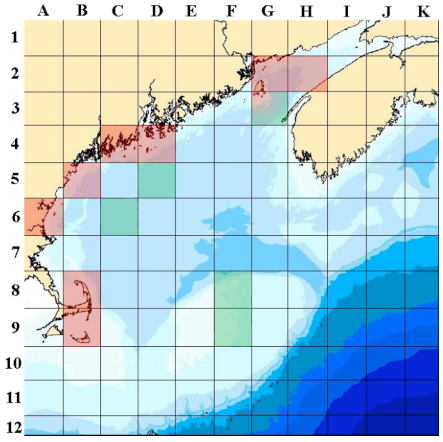
The Gulf of Maine Mapping Initiative (GOMMI) is a United States-Canadian partnership of government and non-government organizations that aims to undertake comprehensive mapping of the Gulf of Maine sea floor. The Gulf of Maine Council on the Marine Environment is the umbrella organization for GOMMI.

This report presents the results and analysis of the Seafloor Mapping Needs Assessment Survey and the GOMMI Workshop that took place in Maine in October 2004. The survey was conducted on behalf of GOMMI by CEF Consultants Ltd., Halifax, Nova Scotia, in the summer of 2004. The survey was the first component of an overall user needs assessment project; the second was the multi-stakeholder workshop. Together, the results define user needs and priorities and can guide implementation of GOMMI's Strategic Plan.

One hundred and sixty-eight (168) Gulf of Maine stakeholders completed a web-based survey on map user needs, capabilities, and priority areas for mapping. Two-thirds of respondents were American, and the rest Canadian. One-third were researchers, with the remaining two-thirds drawn from a wide variety of other occupations. The workshop was attended by about 50 stakeholders from diverse backgrounds, including academia, the fishing industry and coastal NGOs.

The GOMMI concept appealed strongly to most survey respondents. A majority thought that the availability of GOMMI maps would substantially affect their work. Almost all indicated that they needed Gulf of Maine maps that did not currently exist, and could cite specific instances when having them would have helped with planning or decision-making. Respondents indicated they would regularly use the maps and about half were willing to consider participating in the initiative in some way.

The overall results were uniform in terms of respondents' characteristics, their potential map uses, and where they thought mapping priorities should be. Most priority areas that respondents chose reflected an emphasis on coastal and inshore mapping needs (right). All priority areas were:



- Determined to be zones of high productivity;
- Determined to be important fish and shellfish habitats, including for spawning, settling, juvenile nurseries, or other uses.;
- Areas subject to human pressures, including for shipping, coastal development, pollution, aquaculture, and fishing, among others;
- Determined to be important marine mammal habitats, and
- Areas where more information is needed for coastal zone management planning.

A wide range of map users expressed clear support for GOMMI, and a number of respondents are willing to help with sampling, analysis or map production as the Initiative progresses. The survey findings helped focus discussions at the October workshop, and contributed to a greater understanding of GOMMI stakeholder needs.

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1 INTRODUCTION

Our ability to "see" the sea floor with acoustic and optical technologies has revolutionized our understanding of the ocean. Mapping the Gulf of Maine sea floor is one of the essential first steps for achieving effective management of the region's marine environments. The Gulf of Maine Mapping Initiative (GOMMI) is a United States-Canadian partnership of government and non-government organizations, which aims to conduct comprehensive sea floor imaging, mapping, and biological and geological surveys.

This Needs Assessment Survey Report presents the results and analysis of a Sea Floor Mapping Needs Assessment Survey and the results of the multi-stakeholder GOMMI workshop. The survey was conducted on behalf of GOMMI by CEF Consultants Ltd., Halifax, Nova Scotia, in the summer of 2004. The survey is the first component of an overall user needs assessment project. The second is the multi-stakeholder workshop that took place in October 2004 at the University of Maine's Darling Marine Center, in Walpole. Together, the survey results and the workshop summary report detail options to implement and fund GOMMI's Strategic Plan, and to define user needs and priorities.

This report documents what resource managers, scientists, fishermen, and other potential map users said about the kinds of maps they need, the locations of priority mapping areas in the Gulf of Maine, ways in which maps could be used, and how they could contribute to the GOMMI effort – among other items. GOMMI's guiding principles, as stated in Section 1.1 of its Strategic Plan, focused the analysis of the survey results.

The history of GOMMI is outlined in Section 2. Section 3 reviews the survey approach and methodology, and Section 4 presents an overview of results. A detailed needs analysis and discussion comprises Section 5, focusing on the broad themes that arose from the data, user needs by occupation, geography and nationality, a comparison of offshore and coastal user needs, how users were willing to contribute to GOMMI, and the priority areas for mapping. Section 6 summaries the input from workshop participants on the user needs analysis. Section 7 presents the conclusions from the user needs analysis.

1.1 GOMMI: A Snapshot

The goal of GOMMI is to produce, and make widely available, maps of the Gulf of Maine sea floor from the intertidal zone to the upper continental slope. These maps will provide a geospatial framework for managing the marine resources of this 63,778 square mile (165,185 square kilometer) region. The maps will present information on topography, surficial and subbottom geology, and habitat, providing essential tools for resource management, planning, and many commercial activities. Currently, GOMMI is working to secure funding to implement a mapping program of areas in the Gulf of Maine that have not already been covered by multibeam sonar or other swath coverage surveys.

GOMMI grew out of a mapping workshop in October 2001 that was sponsored by the Gulf of Maine Council on the Marine Environment (GOMC) and the National Oceanic and Atmospheric Administration (NOAA). The Gulf of Maine Council endorses GOMMI and the GOMMI Steering Committee is a subcommittee of the Council.

1.2 Why a GOMMI User Needs Study?

An essential principle underpinning GOMMI is the need to address the interests of Gulf of Maine stakeholders. Mapping cannot occur in a vacuum, but instead needs to be comprehensive to provide a useful tool to help manage the sustainable human use of GOM resources and to highlight sensitive habitats for conservation planning.

People use the waters of the Gulf of Maine for fishing, transportation and shipping, aquaculture, pipeline and cable construction, seabed mining, offshore oil and gas exploration and development, military operations, whale-watching, pleasure boating – the list is extensive. Only by consultation with users can the GOMMI Steering Committee appropriately prioritize the areas to be mapped, discover what types of maps stakeholders need, and justify the Initiative's requests for support. User needs will continue to drive the development of GOMMI, so it is essential to involve regional stakeholders from the beginning.

2 BACKGROUND: ABOUT GOMMI

In October 2001, the Gulf of Maine Council on the Marine Environment (GOMC) hosted the *Gulf of Maine Marine Habitat Characterization and Mapping Workshop* in Sebasco, Maine, sponsored by NOAA. The goal of the workshop was to develop a five-year regional strategy to map and characterize marine habitats in the Gulf of Maine. The workshop was organized in response to GOMC's "Action Plan 2001-2006" goal of developing a marine conservation strategy.

The main recommendations from the Sebasco Workshop were to: (1) identify data collection needs, standards and technologies; (2) engage end users in the assessment of data needs; (3) establish and maintain data management tools; (4) prioritize geographic areas; (5) identify useful habitat classification schemes, and (6) monitor and promote existing and developing technologies.

Responding to the call to action from the workshop, the GOMC endorsed the *Gulf of Maine Mapping Initiative* at the December 2001 GOMC meeting, and agreed to serve as the umbrella organization. The Steering Committee is comprised of the Geological Survey of Canada (GSC), the United States Geological Survey (USGS), Department of Fisheries and Oceans Canada (DFO), NOAA's National Marine Fisheries Service (NMFS), Massachusetts Coastal Zone Management (MCZM), and the Wells National Estuarine Research Reserve (NERR).

In 2002, GOMMI produced a two-page fact sheet to help raise awareness of the value of sea floor mapping. The following year, the GOMC's Science Translation Project produced a four-page GOMMI summary, *Mapping the Undersea Landscape: Using sea floor maps to improve management of the Gulf of Maine*. The publication described the issue, specific case studies, approaches for solving the problem, and GOMMI's vision; it was extensively distributed in the region to generate support for the initiative, e.g., as an insert to the *Gulf of Maine Times* (Spring 2003).

The GOMMI Steering Committee worked through 2003 to develop a Strategic Plan for implementing the initiative. The Plan was peer-reviewed, and the final strategy, *Gulf of Maine Mapping Initiative: A Framework for Ocean Management*, was published in May 2004 by the GOMC and distributed to a broad contact list of stakeholders. The publication is available free on the web at http://www.gulfofmaine.org/gommi/, along with earlier GOMMI publications, appendices and sample images for media use.

In 2004, GOMMI issued a contract to CEF Consultants Ltd. to assist in the development and analysis of a Seafloor Mapping Needs Assessment project. The Needs Assessment Survey documents the needs for sea floor mapping in the Gulf of Maine, prioritized by managers, researchers, fishermen, and other potential users. CEF is also assisted with organizing and reporting on a follow-up GOMMI workshop in October 2004, sponsored by NOAA, at the University of Maine's Darling Marine Center in Walpole, Maine. The workshop addressed implementation and funding of the Strategic Plan; the results of this survey anchored many of the discussions at the workshop.

3 SURVEY APPROACH AND METHODS

3.1 Approach

GOMMI's guiding principles are:

- Stakeholders (map users) will have an active role in developing the strategic plan and implementation strategy.
- GOMMI will establish and maintain data management tools for the mapping products, emphasizing translating scientific data for a non-technical audience.
- Data classification is essential to ensure comparable and useful data. Classifications will describe habitats and their associated biota.
- GOMMI products will serve the public interest.

The design of the survey and the analysis of the results were based on these guiding principles.

The survey invitation was distributed via e-mail to a wide variety of stakeholders to ensure a broad cross-section of input. Responding was easy; with the click of a mouse respondents were taken to a web site. It was written in plain language, with clear-cut choices and interactive options. The survey focused on eliciting respondents' opinions on

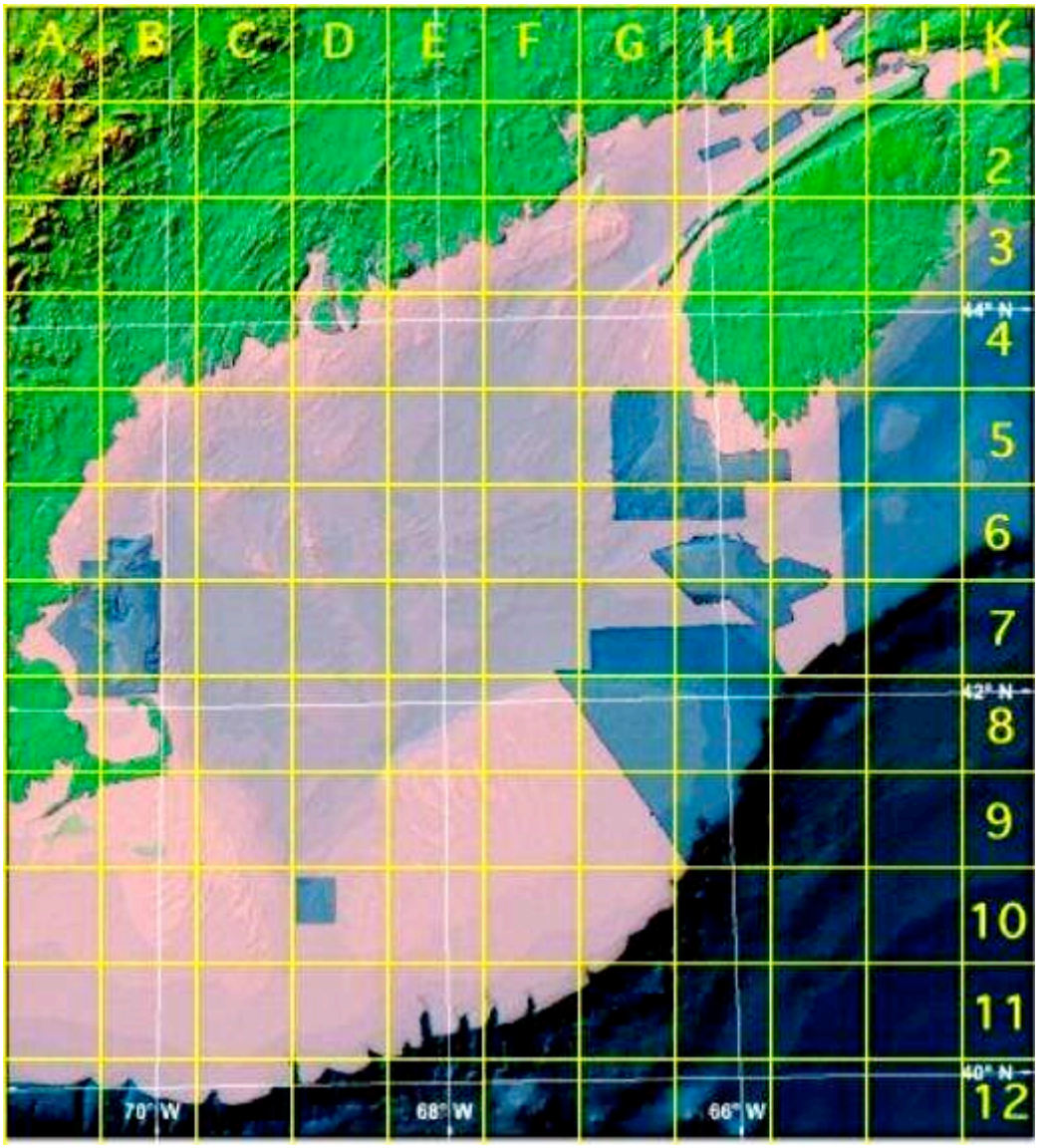
priority areas for mapping, but also covered a wide variety of other topics, from the types of maps preferred to the capabilities of respondents to participate in the initiative. To help ensure that GOMMI data and data management tools are comparable, useful, sustainable, and accessible to a wide variety of users, the survey reviewed respondents' capacity to manage, interpret, and provide mapping data.

This report uses GOMMI's guiding principles to focus its discussion of the results. It does not merely present the most popular answers to critical questions. Rather, to best represent the views of the wide variety of stakeholders who responded to the survey, it examines their needs through several different lenses, whether geographic, occupational, or political. The analysis began with no preconceptions about what users would require. Through the response categories, the analysis builds step-by-step to arrive at a ranking of GOMMI priority mapping areas that reflects stakeholder needs.

3.2 Methods

The GOMMI Steering Committee established the primary topics and developed a draft survey. CEF then refined these and developed a web-based survey tool administered through Survey Monkey, hosted at http://www.surveymonkey.com. The survey included an additional technical section for respondents who were directly involved in the technical aspects of mapping data acquisition and interpretation. Since the technical section was tailored for a specific population, it remained invisible to general respondents.

Most answers were a choice of yes or no; some questions used check boxes, which allowed for multiple answers, as desired. An 'other' answer text box allowed respondents to describe answers that did not fit into the given categories. In the questions dealing with priority areas, respondents were asked to choose from a grid of squares overlaid on a map of the Gulf of Maine (Figure 3-1). Respondents were asked to choose two coastal and two offshore priority areas, and indicate why these were important.



Note: Polygons shown in blue (within the pink area) have been mapped previously.

Figure 3-1: Map of the Gulf of Maine Used in the Survey

The GOMMI Steering Committee provided contact lists of American and Canadian stakeholders, most of whom had received a copy of the Strategic Plan in May of 2004. CEF supplemented those lists with additional marine and fisheries consultation contacts. On June 24, 2004, a total of 395 individuals were invited by e-mail to complete the web-based survey; another 25 invitations were sent to various fishermen's associations and other groups. As well, the survey invitation was posted to the e-mail lists for the Atlantic Coastal Zone Information Steering Committee (ACZISC), Fishermen and Scientists Research Society, Gulf of Maine Information Exchange (GOMINFOEX), FishFolk, Fundy Forum, and the Natural History of Nova Scotia.

The e-mail contained a link that took respondents to the first page of the survey. The survey was designed so that if a respondent did not complete it immediately, they would be returned to the same section of the survey where they left off.

On July 6, a follow-up e-mail was distributed to those who had not yet responded; a PDF of the survey was attached that respondents could print and submit via fax. Two more reminders were sent, on August 16 and August 19, before the survey was closed on August 20, 2004.

Survey results were first analyzed to determine the most frequent answers for each question where the respondent had selected one of the given answers. In some cases, such as occupation, open-ended answers were later regrouped into broader categories for analysis. All people did not respond to every question; percentage results, presented graphically, were developed for illustration of the results. The file was then loaded into a statistical package, StatView, and broken down in a variety of cross-tabulations. For some questions, answers were grouped to see if patterns became apparent among categories.

4 OVERVIEW OF RESULTS

4.1 General Survey Responses

4.1.1 Number and Types of Respondents

One hundred and sixty-eight (168) people responded to the survey. Of the original 395 individual invitees, 77 responded, a response rate of 19.5%. The remaining 91 respondents comprised people who learned about the survey from the targeted e-mail lists, those who were delegated to respond to the survey on behalf of their agencies or departments, or others who had been referred to the site by their colleagues.

No individual occupational group formed a majority of respondents, although 32% were researchers; numerous other occupations were represented (Figure 4-1). No respondents indicated they were sports fishermen, legislators, politicians, or working in the oil and gas industry.

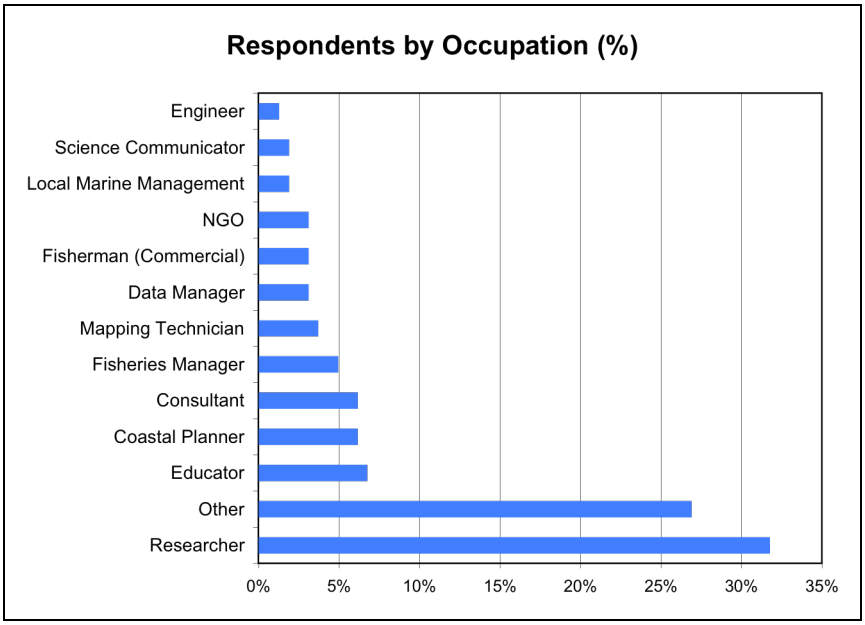


Figure 4-1: Survey Respondents, by Occupation

Of the 148 respondents who indicated where they worked, 34% were Canadian, and 66% were American. Most respondents worked in Massachusetts, with the next highest number in Nova Scotia, followed by Maine (Figure 4-2).

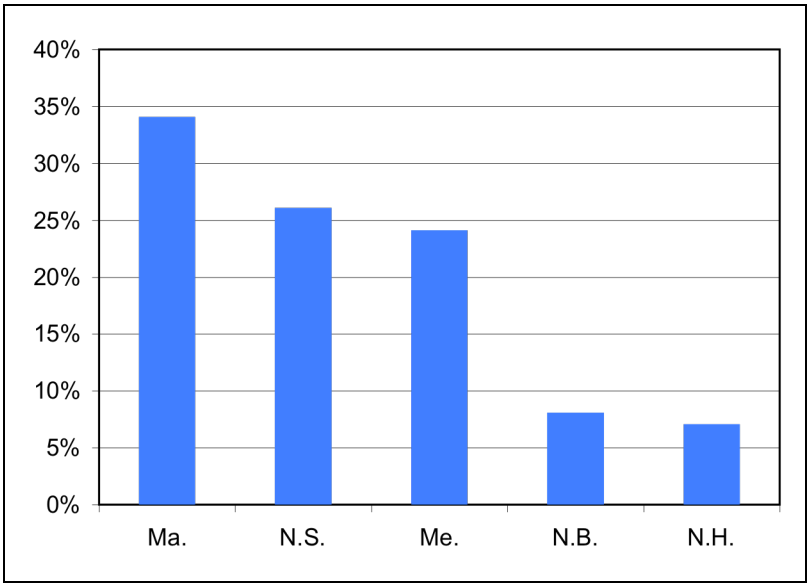


Figure 4-2: Percentage of Respondents by Location

A majority (62%) of respondents worked for government; of these, 64% worked at the federal level in either the United States or Canada.

4.1.2 Map use and needs

Most respondents, 162 out of 168, answered the query "Do you currently use or are you interested in marine maps that depict sea floor topography, surficial geology, or benthic

habitat?" An overwhelming majority, **94%**, responded **yes**. Ninety-five per cent of those not currently using these types of maps said they would use them, if available.

However, when asked if they had all the Gulf of Maine maps they needed, 141 out of 151 respondents, **93%,** answered **no.** The reason they overwhelmingly gave: **the maps don't exist.**

4.1.3 Priority areas respondents chose, and why

In the survey, the word 'coastal' was defined as from the shoreline out to 3 miles/5 km; 'offshore' extended from the 3 mile/5 km line out to the edge of the continental shelf. However, some confusion was evident in the responses to this section. A number of respondents selected all of their priority areas in the coastal section. Eighty per cent of respondents selected a first coastal priority area and 52% a second. Less interest was shown in the offshore region; only 44% selected a first priority and 33% a second.

The results are presented below with coastal responses in Figure 4-4 and offshore responses in Figure 4-5; each coloured square represents a grid square from the original map. Figure 4-6 combines the coastal and offshore results. The colours were assigned according to how frequently a grid square was chosen by respondents, ranging from grey (0) to deep red (34-40) (Figure 4-3). The figures not only show which squares were the most popular choices but also indicate the relative levels of interest in areas throughout the Gulf.

Tables 4-1 and 4-2, following, summarize the responses to the question of why these areas were of interest.

Figure 4-3: Priority Areas: Numbers of Responses Per Grid Square

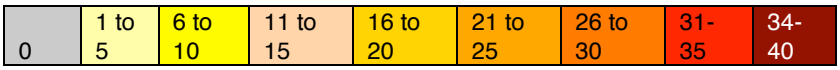


Figure 4-4 shows the frequency with which respondents selected different squares in response to the request for coastal priorities. Note the clustering of interest in the vicinities of grid squares A6, B5, B8/9 C4, D4, G2/3, and H2.

Figure 4-4: Priority Coastal Mapping Areas

	A	B	C	D	E	F	G	H	I	J	K
1	1	1	0	0	0	0	4	11	15	17	11
2	0	0	0	0	0	11	30	21	13	5	1
3	0	1	0	10	15	20	22	14	0	6	5
4	1	12	23	28	9	7	12	15	5	5	4
5	9	29	10	8	2	3	4	19	11	3	1
6	24	17	8	2	2	3	3	2	3	1	1
7	17	13	4	2	2	3	3	2	2	1	1
8	18	28	9	5	4	2	1	1	0	0	0
9	14	21	9	5	3	1	1	1	0	0	0
10	1	4	6	4	3	2	2	0	0	0	0
11	0	0	3	4	3	3	3	0	0	0	0
12	0	0	1	2	1	1	0	0	0	0	0

Table 4-1: Reasons for Selecting Coastal Priority Areas

	Area 1	**Area 2**
Under imminent threat	8	10
May have unusual habitat features	7	8
Highly productive	19	9
Main focus of work/research/management	**79**	**42**
I fish there	3	1
Other	17	15

Figure 4-5 shows the frequency with which respondents selected different squares in response to the request for offshore priorities. There are, overall, fewer responses; most interest is shown in grid squares C6, D5, F 8/9, and G3.

Figure 4-5: Priority Offshore Mapping Areas

	A	B	C	D	E	F	G	H	I	J	K
1	0	0	0	0	0	0	0	0	1	0	0
2	0	0	0	0	0	2	4	4	0	0	0
3	0	0	0	0	0	8	14	3	0	0	0
4	0	0	1	6	9	8	6	1	0	0	0
5	0	5	9	14	7	7	2	2	1	1	1
6	1	5	13	10	7	8	4	2	3	1	1
7	0	2	6	6	7	10	3	3	4	1	1
8	2	3	8	8	10	13	5	3	2	1	1
9	1	3	9	10	11	12	8	0	0	0	0
10	3	5	9	8	8	9	8	2	0	0	0
11	1	2	2	5	10	8	2	0	0	0	0
12	2	2	2	2	2	2	1	1	0	0	0

Table 4-2: Reasons for Selecting Offshore Priority Areas

	Area 1	Area 2
Under imminent threat	3	3
May have unusual habitat features	16	**16**
Highly productive	11	7
Main focus of work/research/management	**25**	15
I fish there	2	1
Other	12	6

Figure 4-6 combines the coastal and offshore responses.

Figure 4-6: Combined Priority Areas

	A	B	C	D	E	F	G	H	I	J	K
1	1	1	0	0	0	0	4	11	16	17	11
2	0	0	0	0	0	13	34	25	13	5	1
3	0	1	0	10	15	28	36	17	0	6	5
4	1	12	24	34	18	15	18	16	5	5	4
5	9	34	19	22	9	10	6	21	12	4	2
6	25	22	21	12	9	11	7	4	6	2	2
7	17	15	10	8	9	13	6	5	6	2	2
8	20	31	17	13	14	15	6	4	2	1	1
9	15	24	18	15	14	13	9	1	0	0	0
10	4	9	15	12	11	11	10	2	0	0	0
11	1	2	5	9	13	11	5	0	0	0	0
12	2	2	3	4	3	3	1	1	0	0	0

In absolute terms, the highest-ranking priority areas, with over 30 listings, were:

- B5;
- B8;
- D4;
- G2, and
- G3.

The areas adjacent to these five squares also tended to be highly ranked. Thus, the top nine coastal areas and top five offshore areas were selected for the statistical analysis discussed in Section 5.

These highest-ranking priority grid squares were transferred to a map (Figure 4-7) to identify their geographic locations. The pink squares represent the top coastal priority areas, and the green squares represent the highest priority offshore areas. Survey respondents chose grid square G3, at the mouth of the Bay of Fundy, as a priority area in both the coastal and offshore categories.

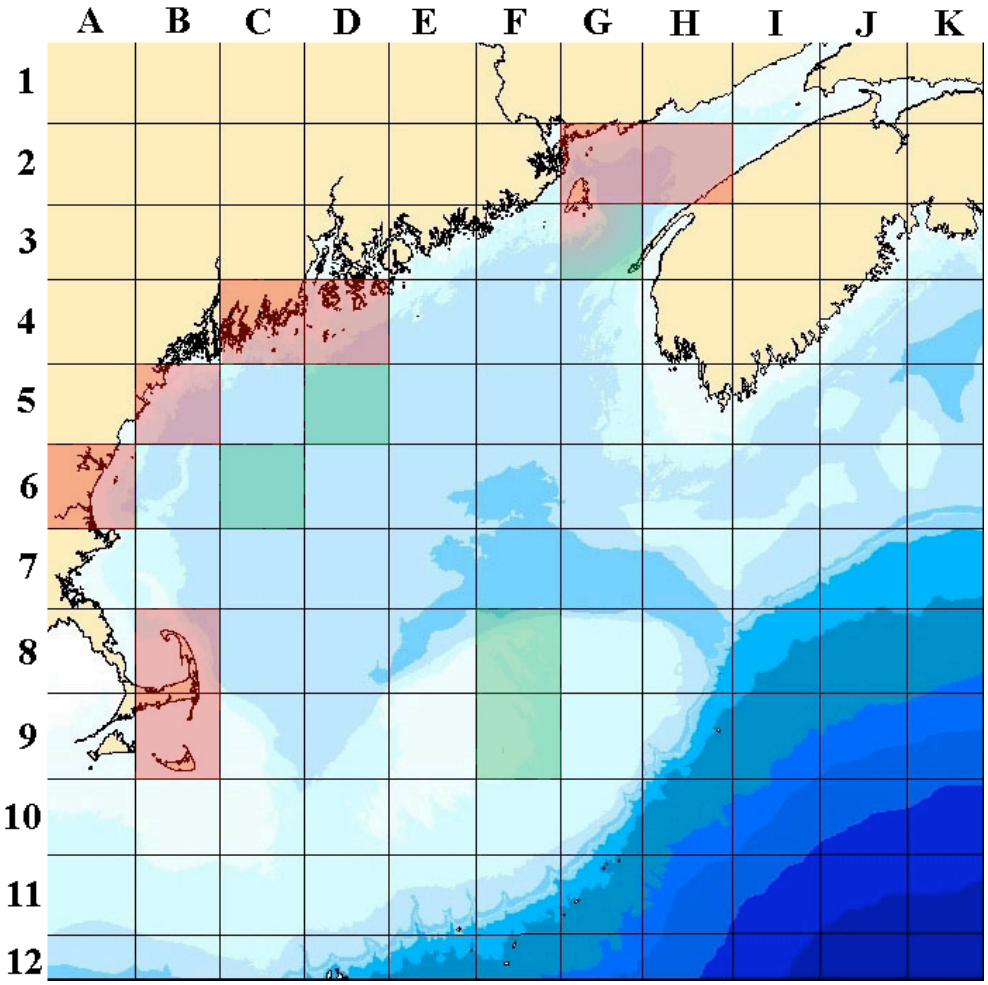


Figure 4-7: Map of the Gulf of Maine Showing the Priority Area Grid Squares Most Frequently Chosen by Survey Respondents

4.1.4 Respondents' Work in the Gulf of Maine

Respondents were asked to indicate on what part or parts of the Gulf their work currently focused. The 130 respondents to this question among them chose 430 locations, including general 'Estuary' and 'Other' categories. Table 4-3 shows the most popular chosen from the 22 options; because more than one option could be chosen, overall percentages are greater than 100.

Table 4-3: Most Common Locations of Respondents' Work in the Gulf of Maine

Stellwagen Bank	24%
Bay of Fundy	28%
Georges Bank	29%
Estuary	29%
Massachusetts Bay	30%
Other	**49%**

When the 'Other' category was analysed, and responses distributed in appropriate categories, the most popular answers focused on work in the coastal zone (Figure 4-8).

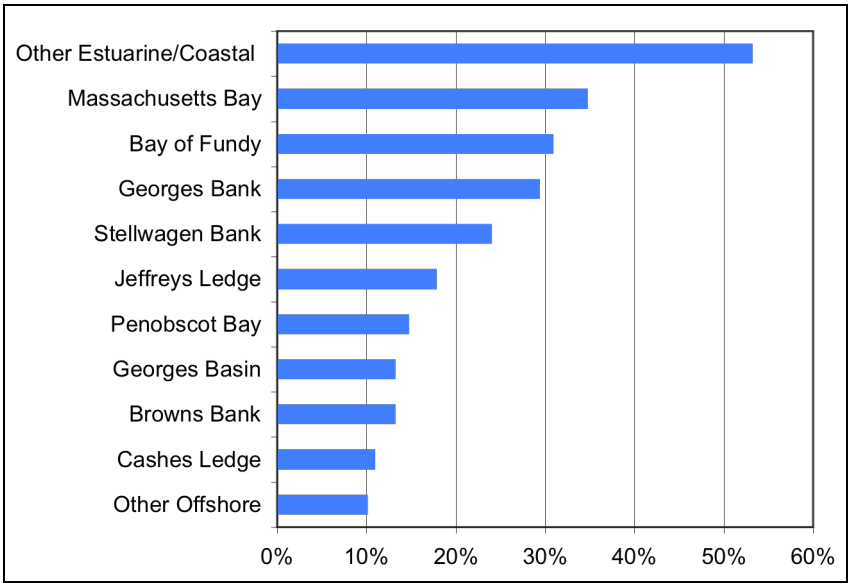


Figure 4-8: Work Locations in the Gulf of Maine with Greater than 10% of Responses

When all responses were aggregated into either coastal or offshore zones, however, it became clear that respondents focused their attention fairly evenly between coastal zone and offshore locations (Figure 4-9).

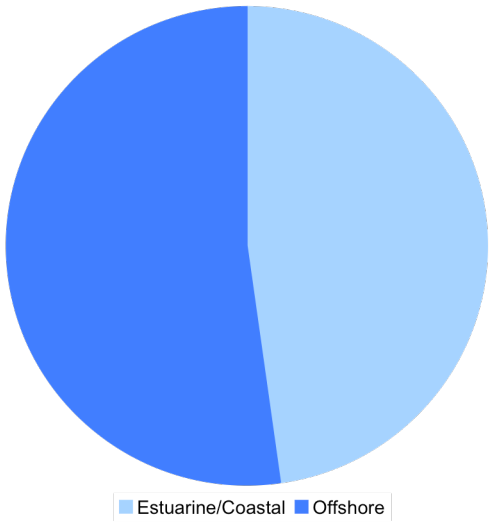


Figure 4-9: Breakdown of Coastal and Offshore Areas of Work in Gulf of Maine

4.1.5 Desired map types

Respondents were able to select more than one answer to the question "What maps or data would you use?" The most popular response was **benthic habitat maps**, selected

113 times out of 132 responses, closely followed by **sea floor topography,** at 106 (Figure 4-10).

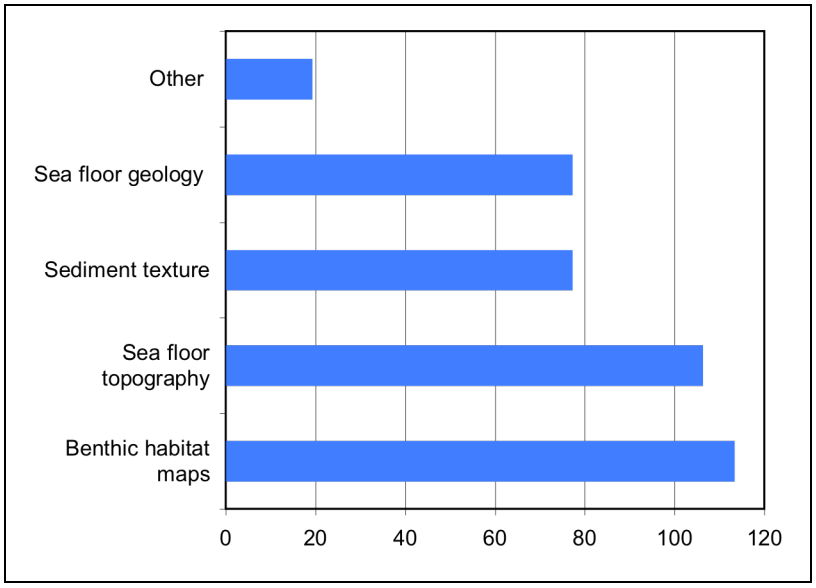


Figure 4-10: Desired Map and/or Data Types

Electronic map files (that respondents could load into their own GIS systems) was the most commonly chosen response to the question of preferred map format (Table 4-4). Paper maps were unpopular, receiving only one-fourth as many mentions even though multiple answers were possible.

Table 4-4: What Format Would You Prefer For Your Maps?

Paper	22
CD-ROM	60
Web-based	70
GIS files	**84**
Number of responses	132

Most respondents preferred maps with detailed resolution, showing features as small as 1 m long (Table 4-5).

Table 4-5: What Is The Smallest Size Feature You Need To Detect?

1 m/3.3 feet long	**74**
25 m/82 feet long	34
100 to 1000 meters/330 to 3300 feet long	12
>1 km/.6 mile long	2
Number of responses	122

4.1.6 How Respondents Might Use GOMMI Maps

Respondents were given 13 different use categories to choose from when asked how they would use GOMMI maps, as well as an 'other' option. Research was by far the most popular choice, cited in 91 of 133 direct responses. Categories dealing broadly with environmental management issues, planning, and marine resources management received roughly equivalent support.

When asked if having maps would have helped them in past planning or decision-making, **91% of the 129 respondents answered yes.** Respondents were able to choose more than one way that maps could have assisted them. "Better able to define the problem" was the most popular choice, with two-thirds of respondents selecting it (Table 4-6).

Table 4-6: How Would Maps Have Helped Your Work?

Better able to define problem	**80**
Clearer idea of where to focus	68
Easier to show other people what the issue was	66
Better tool for persuading decision-makers	55
Better ability to locate construction areas/corridors	17
Greater fishing efficiency	11
Other (please specify)	24
Number of responses	119

Respondents were asked who they thought would benefit from having GOMMI maps available. Researchers and resource managers were cited most often from the 15 available categories (Table 4-7). However when responses were grouped into resource users (RU), research and advice (RA), and resource management (RM), it became clear that overall, respondents chose resource users most often (Figure 4-11).

Table 4-7: Who Could Benefit From Having GOMMI Maps Or Data?

Medical/pharmaceutical industry (RU)	10
Other (please specify)	21
Seabed mining interests (RU)	31
Coastal infrastructure contractors (RU)	39
Oil and gas industry (RU)	43
Pipeline laying companies (RU)	43
Cable laying companies (RU)	50
Aquaculture industry (RU)	51
Teachers	63
NGOs (RA)	71
Fishermen (RU)	77
Environmental impact consultants (RA)	80
Local decision-makers/politicians (RM)	84
Resource managers (RM)	100
Scientific researchers (RA)	**111**
Total respondents	132

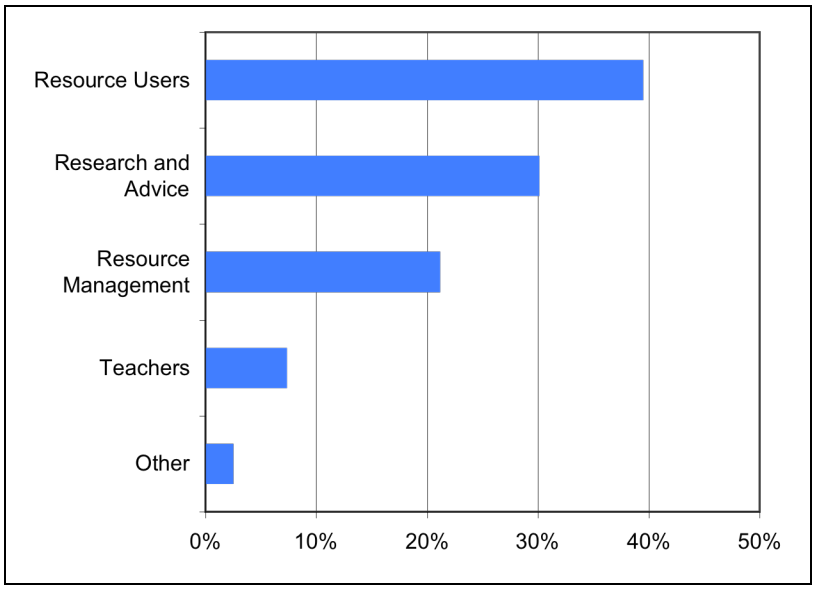


Figure 4-11: Probable Users of GOMMI Maps, by Category

A clear majority of respondents, **53%,** thought they would routinely use GOMMI maps. Confidence was high in their ease of use; **73%** of respondents foresaw no problems using them. Of those who thought they might have trouble, 27 people, or **68%,** felt that training would improve their ability to accurately interpret the maps.

Respondents were asked to rank how having GOMMI maps would affect their work, or that of their organization. They used a 1 to 5 scale where 1 was ‘not at all’, through to 5, ‘very much’. A majority, 53%, of the 132 respondents ranked the usefulness of GOMMI

maps to them as either **4** or **5**, indicating that the maps would substantially improve their ability to do their jobs (Figure 4-12).

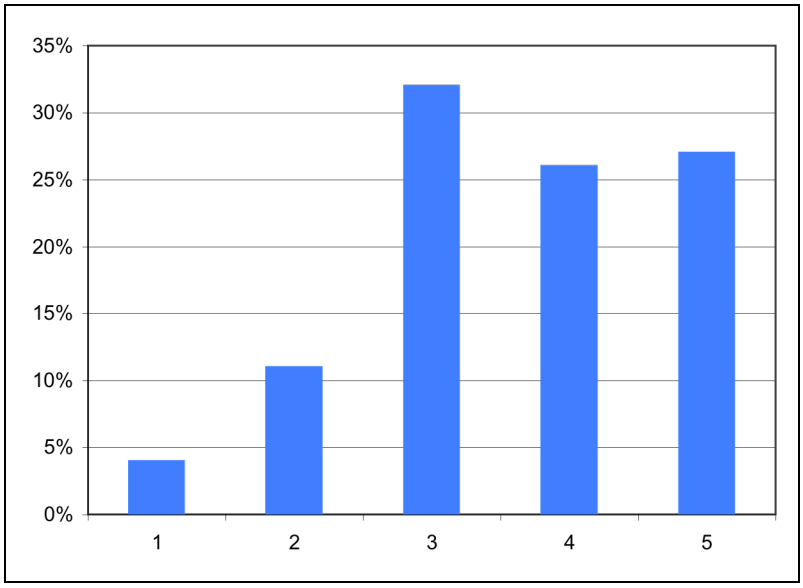


Figure 4-12: Projected Usefulness of GOMMI Maps to Respondents, on a Scale of 1 (Not at All) to 5 (Very Much)

4.1.7 Support for GOMMI

Seventy-one respondents indicated they would consider contributing to GOMMI, primarily through facilitating partnerships (Table 4-8).

Table 4-8: Would You Be Willing To Consider Contributing To The Project?

Yes – direct funding	4
Yes – in kind	26
Yes – helping to set up partnerships with the private sector/government/academia/NGOs	**41**
No	13
Total respondents	84

Sixty-nine respondents indicated that they had in-kind or staff resources to assist GOMMI; staff time was offered as the most common response (Table 4-9).

Table 4-9: Do You Have Any Equipment/Personnel That Could Be Used?

CASI	1
Aircraft	1
LIDAR	4
Seismic equipment	5
Multi-beam sonar	11
Side-scan Sonar	16
Ship time	19
Grab or core samplers	21
Video or photographic equipment	30
Boats	44
Staff	**51**
Total respondents	69

Over half of all respondents – **75%** of the 120 who answered that question – had the capacity to acquire, analyze, and interpret spatially referenced data. Of those who answered yes, a plurality (**38%**) had over 10 staff working in the field.

4.2 Technical Survey Responses

Almost half (48%) of all respondents indicated that they are involved in the technical aspects of mapping (Table 4-10). These respondents were asked to answer 13 additional questions relating to desired information, data formats, sampling and equipment.

Table 4-10: Are You Involved In Technical Aspects Of Mapping?

Yes	49 (48%)
No	53 (52%)

Respondents were asked if they are currently doing any seabed mapping in the Gulf of Maine, and **32%** said they were. Mapping efforts were focused primarily on coastal areas, but German Bank, Stellwagen Bank, Browns Bank, Jeffreys Ledge, and the continental margin between the 2000 and 5000 m isobaths were included.

4.2.1 Desired Information and Formats

Participants were told that GOMMI plans to produce four maps for each area surveyed, including sea floor topography, sediment textures, surficial geology and benthic habitat. They were asked to rate each map type as ‘very’, ‘moderately’, ‘slightly’ or ‘not useful’. The majority of respondents indicated that all map types were very useful with sea floor topography rating the highest (Table 4-11).

Table 4-11: Usefulness of Planned Maps

Map Type	Per cent of Respondents			
	Very Useful	**Moderately**	**Slightly**	**Not Useful**
Seafloor Topography	**80**	12	8	0
Sediment Textures	**55**	27	14	4
Surficial Geology	**57**	27	12	4
Benthic Habitat	**71**	10	15	4

When asked what GIS data formats are the most useful, the majority of respondents (78%) indicated shape files (Table 4-12). Others indicated that coverages, raw data, raster data and gridded data are also useful. Eight per cent also indicated 'other', and specified MID/MIF (MapInfo) format.

Table 4-12: What GIS Data Formats Are Most Useful To You?

Data Format	Response
Shape Files	78%
Coverages	43%
Raw Data (ASCII)	53%
Raster Data	43%
Gridded Data	49%
Other	8%

When asked what type of coverage respondents need from the acoustic surveying equipment, **78%** indicated full coverage, and the remaining 22% indicated that they required partial coverage with interpolation between the survey tracks.

Participants were asked what level of accuracy they require for bathymetry data and the majority **(54%)** selected the middle resolution, 1 meter (Table 4-13). Of the remaining 46%, most indicated that they require finer resolution.

Table 4-13: Accuracy of Bathymetry Data Needed

Resolution	Response
Nearest 10 cm (0.33 feet)	38%
1 m (3.3 feet)	54%
Tens of meters (> 33 feet)	8%

Participants were asked what types of biological data would be useful to them. The largest response **(36%)** was for the 'other' category (Table 4-14), which was commonly selected for 'all of the above'. The distribution of a particular species also received 34% of votes.

Table 4-14: Types of Biological Data Most Useful

Type of Biological Data	Response
Density	5%
Biomass	5%
Number of Species	5%
Species Composition	15%
Distribution of a particular species	34%
Other	36%

4.2.2 Sampling Methods and Equipment

Participants were asked which sampling methods they thought were best for groundtruthing sediment and benthic habitat maps. Individual questions were asked in regard to sampling sediment texture and chemistry, infaunal organisms (living in the sediments), epifaunal organisms and mobile benthic organisms.

The majority of respondents **(65%)** answered that grab samples were best for groundtruthing sediment texture and chemistry, although 63% also indicated that cores would also be useful. The use of sediment-profiling photography was also suggested. Similarly, **84%** of respondents thought that grab sampling was the best method for groundtruthing infaunal organisms, and 40% thought that cores were also useful.

The majority **(73%)** of respondents thought that video was a good way to groundtruth epifaunal organisms (e.g., mussels, barnacles) and 63% also thought that photography was useful.

The majority **(87%)** of respondents thought that video and photography were good ways to groundtruth mobile benthic organisms (e.g., groundfish, lobster, crabs) and 41% also thought that trawling was useful. Other suggestions included trapping and baited video traps.

Eighty-two per cent of respondents agreed that subbottom profiling should be done to investigate the thickness of various sediment layers.

Participants were asked what types of equipment they use to acquire spatially referenced data. Respondents listed different types of equipment relating to biological collection methods, sediment, positioning, elevation and bathymetry (Table 4-15).

Table 4-15: Equipment Used To Acquire Spatial Data

Type of Data	Equipment Used
Biological	Grabs, cores, transect tapes, trawling, Acoustic Doppler Current Profiler, Conductivity Temperature Depth Profiler, bottle samples, satellite remote sensing, plankton tows, video drop camera, MOCNESS BIOMAPPER-II, SCUBA
Elevation	Lidar, air photos
Positioning	GPS/DGPS, Trimble GPS interfaced with geometrics cesium vapour marine magnetometer, Trimble ProXL GPS
Bathymetry/ Physical characteristics	Acoustic remote sensing, digital fathometer, personal watercraft with depth sounder and real time kinematic GPS, moving vessel profiler, seismic profiling, SCUBA diving, video and photographic systems (operated remotely or by divers), grabs, bathythermograph, visual transects, water level gauges
Sediment	Multibeam sonar with backscatter, sediment samplers, box coring, gravity coring

5 NEEDS ANALYSIS (DISCUSSION)

5.1 Broad Themes in the Data

The GOMMI concept appealed strongly to most respondents. A majority thought that the availability of GOMMI maps would substantially affect their work. Almost all indicated that they needed Gulf of Maine maps that did not currently exist and could cite specific instances when having them would have helped with planning or decision-making. A majority thought that the availability of GOMMI maps would substantially affect their work. Two-thirds of those who responded to the frequency of use question indicated they would use the maps routinely, or at least once a month. About half of all respondents were willing to consider participating in the initiative in some way.

A broad spectrum of locations, interests, and occupations were represented among the respondents.

More respondents indicated that coastal areas were their mapping priorities, rather than offshore locations. This held despite the roughly even split of current work locations between offshore and coastal zone areas. In the survey, the word ‘coastal’ was defined as from the shoreline out to 3 miles, or 5 km; ‘offshore’ extended from the 3 mile/5 km line out to the edge of the continental shelf. However, some respondents appeared to be unclear as to what constituted a ‘coastal’ versus an ‘offshore’ priority, highlighting a need to discuss the scale of mapping efforts.

Most entered their priority areas in the coastal section, whether close to shore or not. The additional information provided in the offshore section did not substantially alter which priority areas were most commonly selected, but did identify some additional areas of

interest. Differences in responses to the two sections are most closely examined in Section 7.3.

GOMMI is a joint American and Canadian Initiative, and this was reflected in the nationality of respondents, one-third of whom were Canadian –more than might have been expected given the population differences between the Canadian and American Gulf of Maine regions.

The motives for wanting GOMMI maps, and for prioritizing particular areas, varied among respondents. Generally, respondents fell into one of three interest categories: pure research, applied research, or practical users. Some respondents were simply interested in research and the use of mapping technology, and felt that the more areas of the seabed that were completely mapped, the better. Others had particular research interests or regulatory reasons for identifying priorities, ranging from investigating areas known for productivity, to identifying potential conservation areas, to furthering marine mammal studies. Others had commercial motives, and wanted maps that would show them how to fish more efficiently or to identify potential aquaculture locations.

5.2 User Needs by Occupation Group

The occupation group for a respondent was examined in relation to where the respondent worked, the jurisdiction or type of agency where they worked, and the type of applications where they felt GOMMI data could be used.

Statistical analysis indicated that respondents represented a variety of user types, relatively equally spread throughout the Gulf of Maine region.

The value respondents placed on GOMMI maps and information was compared to their occupation. Analysis showed that respondents placing a high value on the information were not specifically from an individual occupation group. Similarly, the jurisdiction or type of agency did not appear to affect how a respondent perceived the value of GOMMI to their work.

A respondent's occupation group was also compared to the types of applications where GOMMI data could be used, such as scientific research or the identification of aquaculture sites. Analysis found that the kinds of applications respondents selected varied between occupation types, but in a consistent way. For example, researchers selected applications at a consistent level to other occupation groups and identified scientific research as the most relevant application area.

5.3 Comparison of Offshore and Coastal User Needs

While respondents work equally in coastal and offshore areas, eighty per cent of respondents selected priority areas in the coastal section and included offshore areas in their responses to that section.

A comparison of responses to areas defined by a grid over the Gulf of Maine showed that priority areas selected in the offshore section were generally in deep water and/or far offshore, including both the central Gulf and Georges Bank. To evaluate potential differences between coastal and offshore priorities, user needs in the top five offshore areas were compared to those in the top nine coastal areas. Only one of the priority areas, G3, was common to both coastal and offshore selections.

The type of map (e.g., benthic habitat, topography, etc.) applicable to work in coastal and offshore areas was examined. Differences in preference for the type of map were small among all areas. However, preferred map types between coastal and offshore areas differed by an even smaller amount – no more than 2 responses between any of the top 13 priority areas.

5.4 Political Boundaries: Focus on Canada and The US

Canadian respondents tended to select areas closer to the coast than their American counterparts, probably because a substantial portion of the Canadian offshore is already mapped, including the Canadian side of Georges Bank. The highest priority areas for Canadians were in the entrance to the Bay of Fundy, close to the international border. A high priority of American respondents is the U.S. side of Georges Bank. Overall, American and Canadian respondents were similar in terms of the type of information desired and potential applications of GOMMI products, as well as ranking nearshore coastal areas as a general priority.

5.5 Types of Maps Preferred by Respondents

The type of map preferred did not vary by more than one or two respondents out of a total range of 69 to 100 respondents for priority areas. Benthic habitat maps were the most desired.

5.6 Support for GOMMI: Help and Expertise

Seventy-two respondents indicated their willingness to consider helping with the Initiative in response to the direct question. Nearly half said they would help with networking (i.e., setting up inter-sectoral or inter-agency partnerships). Another 26 respondents said they might help with in-kind contributions; only four, all American, indicated they might supply direct funding.

However, a similar question, “Do you have any equipment/personnel that could be used?” drew 70 affirmative responses, which might be considered a better indication of the level of in-kind support available. The most common answers included staff time, boats, and video or photographic equipment.

The GOMMI steering committee will receive a data file of all survey responses identified by individual respondent. To preserve confidentiality, the names of respondents and their agencies are not provided in this report.

5.7 Priority Areas

Priority areas were selected by a majority of respondents, and included a wide range of water depths, sediment types, and jurisdictions. Characteristics of respondents and their preferences for the use of GOMMI information varied only slightly among priority areas.

In absolute terms, the locations of the highest ranked grid squares were:

- B5 – Casco Bay;
- B8 – Cape Cod Bay and seaward of the outer Cape;
- D4 – Penobscot Bay;
- G2 – Passamaquoddy Bay, and
- G3 – outer Bay of Fundy.

The grid squares adjacent to these also received considerable support.

Thus, the highest-ranked priority areas for future mapping efforts are in the Bay of Fundy off coastal Maine and around Cape Cod. Farther offshore, the highest rankings were given to Jeffreys Ledge, Jeffreys Bank, and the American side of Georges Bank (Figure 5-1). The areas shown on the map in Figure 5-1 were generalized based on the primary geographic features of the top priority grid squares chosen by the survey respondents. These areas are an approximation of the priority areas chosen by the stakeholders, and do not necessarily reflect the only features of interest in a particular grid square.

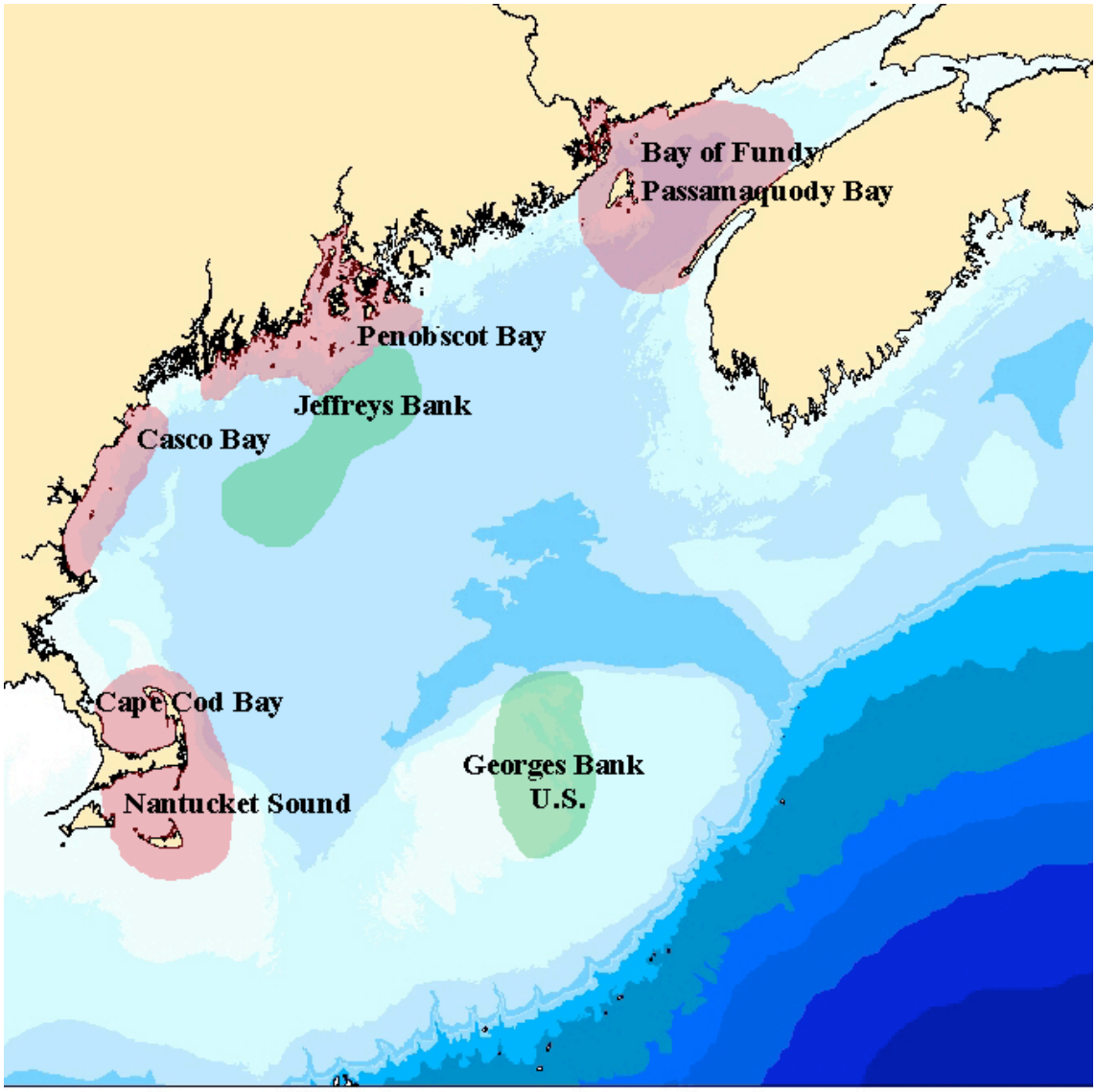


Figure 5-1: A Map of the Gulf of Maine with Interpretation of the Coastal Priority Areas (Pink) and Offshore Priority Areas (Green)

Respondents had the chance to elaborate on why they chose particular priority areas. These responses were examined to determine main themes, commonalities between priority areas, and characteristics that set certain areas apart from others. Respondents identified a wide variety of reasons for their choices but almost no unique features of specific priority areas were cited.

5.7.1 Shared Traits Among Priority Areas

Perhaps not surprisingly, most respondents chose their priorities according to where their work focused. Most areas were relatively close to shore, reflecting an emphasis on the need for additional coastal mapping.

All the priority areas shared these characteristics:

- Determined to be zones of high productivity;
- Determined to be important fish and shellfish habitats, whether spawning, settling, juvenile nurseries, etc.;
- Determined to be important marine mammal habitats;
- Areas where more information is needed for coastal zone management planning, and
- Areas subject to human pressures, whether from shipping, coastal development, pollution, aquaculture, fishing, etc.

Conversely, almost no priority areas were singled out by respondents for important characteristics not mentioned in relation to the others. In the Casco Bay area, though, a concern was raised about the impacts of sea floor mining, including effects on the nourishment of sand beaches. Although all areas were subject to human pressures, no others were mentioned as vulnerable to this type of resource extraction. The Cape Cod National Sea Shore was noted in relation to the Cape Cod Bay area. Grid squares G2 and G3 contain a substantial portion of the Bay of Fundy Right Whale Conservation Area.

6 GULF OF MAINE MAPPING INITIATIVE WORKSHOP, 2004

The Gulf of Maine Mapping Initiative Workshop, sponsored by NOAA, was held on October 4 and 5, at the University of Maine's Darling Marine Center in Walpole, Maine. The workshop reviewed the results of the needs assessment survey and addressed the implementation of GOMMI's 2004 Strategic Plan, *A Framework for Ocean Management*.

The workshop was attended by about fifty participants from the United States and Canada, drawn from government, academia, the fishing industry and coastal NGOs.

The opening plenary reviewed the background to GOMMI and the results of the needs assessment survey. Presentations were made on NOAA's Integrated Ocean Management and National Marine Sanctuary Program, Canada's Geoscience for Oceans Management Program, and the Irish National Seabed Survey. An announcement was made of a new Gulf of Maine mapping program covering Cashes Ledge and adjacent areas, to be carried out by NOAA and the Joint Hydrographic Center.

Breakout groups then reviewed and critiqued the results of the needs assessment, focusing on its strengths and weaknesses. The identification of priority areas was reviewed, and participants were asked to identify their potential champions, funding sources, and cooperative ventures.

The results from the breakout groups were briefly summarized and handed out to participants at the beginning of the second day. The summary (Appendix A) included the responses of the steering committee to particular issues and questions that were raised.

Day two's discussions, all in plenary, began with a review of day one's summary, followed by discussions focused on the need for GOMMI. The GOMMI Steering Committee emphasized that the project had reached a crossroads. Initial planning for the project has been done, and implementation must have broad support if the Initiative is to be successful. The participants concurred that sea floor mapping is essential for the Gulf of Maine and is advantageous to a range of management issues. Discussion focused on potential political and funding strategies. This report incorporates the workshop discussions that dealt with the needs assessment.

6.1 Strengths and Weaknesses

Strengths and weaknesses of the Needs Assessment Survey were the focus of initial discussions at the GOMMI workshop. Both survey design and analysis of the data were reviewed. A more thorough gap analysis, including a discussion of who did and did not respond to the survey, was suggested. The survey was sent to individuals with prior knowledge of the Gulf of Maine, such as fishermen and researchers whose work focuses on the Gulf, to ensure that respondents had an interest in, and an understanding of, GOMMI. The survey was not designed for the general public. Those who were on the initial GOMMI contact list had already received the GOMMI Strategic Plan and others were told how to find it easily on the Internet.

The User Needs Assessment will serve as a foundation for more detailed identification and prioritization of areas that are to be mapped, but it is simply one tool being used to communicate and further identify GOMMI priorities. In general, the working groups supported the validity of the Needs Assessment. It was generally felt that the survey and its analysis was a good starting point for the project. GOMMI will focus now on establishing a clear rationale for specific priority areas.

Workshop participants felt that certain user groups were missing from the response groups, including politicians and oil and gas industry representatives, as stated in the report. An effort was made to include politicians in the survey and both the survey invitation and background information were sent to US senators and congressmen and to Canadian federal cabinet ministers and Members of Parliament. Oil and gas industry groups in Canada were also sent the survey invitation.

GOMMI will focus on map products and not the specific applications of these maps such as resource mapping. Cultural and historical resources, such as shipwrecks and archaeological sites, will not be specifically addressed.

In particular, participants had asked if the selection of priority areas had been biased by the occupation or location of the respondents who selected the most popular areas. For example, did fishermen predominately select one area while researchers selected another one?

Norval Collins, from CEF Consultants Ltd., described the statistical analysis that examined correlations between responses and preferences for particular priority areas. A

specific analysis looked for correlations between respondents' occupation type and the top thirteen priority areas, including both coastal and offshore selections. No correlation was found between a respondent's selection of a priority area and the type of work they did. The range and distribution of occupations for those respondents who selected a particular priority area was similar to that for the survey respondents overall. The only apparent preference respondents showed was a broad tendency to select areas near where they lived or worked.

6.2 Review of Priority Areas Identified By the User Needs Survey

Overall, participants agreed that the identified priority areas were reasonable. There was some concern that small areas of special interest might have been missed due to the coarse size of the grid squares, and others felt it had been difficult to select estuaries and inter-tidal areas.

However, there was a general consensus that the areas selected seemed realistic, especially given that everyone would have their own particular concerns and interests. The coastal priority areas were described as more productive and containing more critical habitats compared to those not selected.

In response to participant concerns, the steering committee noted that survey boundaries would not be defined by grid square lines. A participant suggested that mapping in coastal areas extend to the 60 fathom (~ 110 m) contour, to assist with fisheries management. It was also suggested that the results from the user needs survey should be correlated with the priority areas that NOAA has identified for hydrographic surveys on the American side; NOAA will consider adding extra science surveys to these cruises.

Participants were asked to narrow the areas to two offshore and two coastal priorities. The final consensus:

- *Passamaquoddy Bay and the outer Bay of Fundy*, extending from the Maine/New Brunswick coast across to Nova Scotia. Its advantages include the fact that it is a cross-border area and already a high priority for both the United States and Canada. Mapping it through GOMMI could be an important political tool for increasing the Initiative's visibility and support.
- *Penobscot Bay*, including both the inner Bay and the immediate offshore area. This area integrates well with both the GoMOOS and PennBay projects, and mapping would aid in ecosystem management.
- *Cashes Ledge and adjacent areas*. The identification of this highly productive area as a priority was strongly reinforced by the announcement of the NOAA/UNH $1 million CCOM mapping initiative on day one.
- *Inner Edge of Georges Bank.* The survey of the American side of the Bank should focus on the inner edge, where productivity is greatest, and should tie some lines into the completed survey of the Canadian side, to ensure consistent data.

Participants and the steering committee agreed that GOMMI should work to coordinate surveys in cooperation with existing agencies.

7 CONCLUSIONS

The overall results from the User Needs Assessment are uniform in terms of the characteristics of respondents, potential applications of the GOMMI maps, and priority areas for mapping. The subsequent workshop supported the validity of the User Needs Assessment and the general priority areas identified. This report also describes the fine-tuning of some of these areas through detailed discussion with key stakeholders at the workshop.

There is clear support for GOMMI from a wide range of information users, and a number of respondents are willing to help with sampling, analysis or map production as the Initiative progresses. Support for the Initiative is exemplified by an announcement at the beginning of the workshop that a new survey would be done on one of the areas identified as a priority in the Needs Assessment.

Additional information on GOMMI can be found on its website, http://www.gulfofmaine.org/gommi/, and in the strategic plan *A Framework for Ocean Management*, available free of charge on the website.

Appendix A

GOMMI User Needs Assessment

Summary of Discussion on Monday, October 4th

Strengths and Weaknesses of the Needs Assessment Survey

- Need for a clearer definition of 'mapping'
- May need more thorough gap analysis
- Survey and analysis was a good starting point
- Some stakeholders, e.g., oil and gas, were missing. Private developers will probably fund the work they need
- Survey should not be the basis for product definition
- Was the needs assessment representative of overall stakeholder needs?
- Was there a correlation between respondent types and priority areas? Focus should be on why specific users selected particular priority areas
- A subcommittee could be set up to analyze why specific users selected priority areas
- Responses are from the converted – need to know how the broad base of stakeholders feel, as well as the general public
- More effort should have been made to get politicians to respond
- Historical and cultural resources data were not fully described
- Shipwrecks and archeological records are not necessarily included

Steering Committee Responses

- The User Needs Survey is only one tool being used to inform GOMMI priorities
- Focus of GOMMI will be on establishing a clear rationale for selecting priority areas
- User groups like the oil and gas industry (in Canada) were canvassed, and chose not to reply
- Effort was also made to include politicians in the user needs survey. For example, US senators and congressmen, as well as Canadian federal cabinet ministers and MPs were sent background information and the survey invitation
- Statistical analysis was used to explore correlations between types of respondents and priority areas. The profile of respondents for each top priority area was similar to that of the overall respondents – i.e., researchers dominated, and priority area choices did not vary among user types
- The emphasis of GOMMI is map products and not specific applications, such as cultural resources mapping
- Overall, responses from the working groups supported the validity of the Needs Assessment
- The User Needs Assessment will serve as a foundation for more detailed area prioritization.

Rationales for Priority Areas

Coastal Areas

- *Passamaquoddy Bay* – cross-border, extending across the Bay of Fundy; is a high priority area in both US and Canada; could be important for increasing visibility and possible funding, broadening support for GOMMI
- *Penobscot Bay* – including the inner Bay, and the immediate offshore area; would augment GoMOOS and PennBay project data, and aid ecosystem management
- Coastal priority should extend to 20 m (60 fathoms) for fisheries management
- The coastal areas not included as priorities were not seen as especially productive – important, but not critical areas
- User Needs areas seemed realistic, but outer Cape Cod areas are quite productive and might want to be evaluated again in more detail
- The grid selection process should not be used to define the final areas
- Should consider areas of special interest that might have been missed in the larger areas or grids
- Should correlate high priority areas of this survey with NOAA priority areas for hydrographic surveys – NOAA is considering doing extra surveys for science
- Some people wanted focus on habitat types rather than geo-focused areas
- It was difficult to select estuaries and inter-tidal areas, thus reducing the apparent importance of these areas
- Available funding is an important factor in selecting priorities

Offshore

- Concurred with *Cashes Ledge* as priority area
- Focus should also be on *inner edge of Georges Bank* where highly productive – deeper and productive areas are much more cost-effective
- Should tie some lines into the Canadian survey of Georges Bank
- CCOM vessel can't extend to Georges Bank, but other programs will be considered

Steering Committee Responses

- GOMMI will work to coordinate surveys and work with other groups like NOAA
- GOMMI can help influence funding priorities and ensure biological productive areas are the focus, not only political ones

Champions and Partners

- Bay of Fundy – salmon industry, Penobscot Bay, First Nations, DMR, whale interests, Canada's Oceans Act, LNG promoters, Eastport port authority
- Penobscot Bay – DMR, Shipping industry, SEARS port, GoMOOS, lobster industry, Island Institute, USGS
- Cashes Ledge – New England Management Council (NEMC), NMFS, DMR, Coast Survey
- Georges Bank – Minerals Management Service, NEMC, NMFS, USGS
- Co-operative Research Partners (NMFS coordinated)
- Oil Pollution Act (1990) allows individual states to tax inter-state commerce; Portland charges a port import tax on oil and this money could be redirected

- Summer hydrographic camp out of University of New Hampshire (NOAA) has 45' vessel available for nearshore survey work for a few weeks each year
- GOMMI may partner with GoMOOS for access to major federal funding (IOOS)

Funding and Cooperative Ventures

- Priorities for GOMMI must reflect political realities
- Projects will need to proceed in pieces when funding is available
- More education is required of upper management
- International (cross-border) issues may be more likely to be funded
- American fishing industry has not been as supportive as in Canada
- What is private industry's role in GOMMI?