Great Lakes Fisheries Vessels: Status of the Fleet and Evaluation of Assessment and Research Needs

September 20, 2001

By

Clifford P. Schneider
New York State Department of Environmental Conservation (Retired)

and

James Peck
Michigan Department of Natural Resources (Retired)

Prepared for the
Council of Lake Committees
Great Lakes Fishery Commission

Acknowledgements -- Dedication

We are very grateful to all of our colleagues at the vessel bases from Cape Vincent, NY on Lake Ontario to Ashland, WI on Lake Superior. To the 100+ individuals who were kind, generous and cooperative, we thank you and hope that we have accurately represented your thoughts and ideas. We also hope that this report may be both informative and helpful. We are also indebted to the Great Lakes Fishery Commission for their funding and support for this study.

From our past years working on large research vessels on the Great Lakes, we know this report will be read with interest by the crews currently working the lakes, especially on the long, slow steams to the next station. To those crews, we hope some of the information contained in this report helps you do a better job more safely, and for you we dedicate this effort.

Contents

Executive Summary

We conclude that recent concerns expressed by members of the Great Lakes Fishery Commission Council of Lake Committees regarding the present and future condition of the large-vessel (≥ 30 ft.) fleet maintained by agencies signatory to the Strategic Great Lakes Fisheries Management Plan (SGLFMP) are well founded. It is in some measure a credit to the agencies and in some measure amazing luck that the fleet has thus far been able to carry out most current programs. However, unless agencies act soon in perhaps a coordinated effort to better inspect, maintain, repair, or replace their vessels, the fleet will suffer significant attrition during the next 20 years and thus jeopardize continuance of the long-term data sets on Great Lakes fish populations. The following is a summary of salient points from sections of this report:

- Section 3. Nine of the 15 agencies signatory to SGLFMP maintain a large-vessel program on Great Lakes waters. SGLFMP agencies lacking a large-vessel program did not anticipate acquiring one between now and 2020.

- Section 3. Collectively, the 25 vessels that support these large-vessel programs operated or anticipate operating an average of 1,742 days annually during 1998-2001. Agencies with the most vessel days were the Ontario Ministry of Natural Resources (OMNR), which had the largest fleet, followed by the Michigan Department of Natural Resources (MIDNR) and the U.S. Geological Survey (USGS). The most vessel days were on Lake Erie (31%) and the least were on Lake Ontario (12%).

- Section 3. Most (87%) of this vessel time was devoted to maintaining long-term data sets, primarily for lake trout, percids, fish communities, and forage (prey) fish. Agency station personnel believed that maintaining these data sets would be the first-priority work during the next 20 years. Most vessel station personnel indicated a desire to take on new projects or expand old ones but cited staffing shortages, usually scientific staffing, as the roadblock to this expansion.

- Section 4. The average age of the fleet was 33 years, ranging from the 64-year-old BARNEY DEVINE operated by the Wisconsin Department of Natural Resources (WIDNR) to the newly acquired EXPLORER and KIYI operated by the Ohio Department of Natural Resources (ODNR) and USGS, respectively. Vessel size ranged from the 36-foot O. MYKISS operated by the Indiana Department of Natural Resources (INDNR) to the 107-foot KIYI operated by the USGS. Although the small aluminum-hulled O. MYKISS could reach speeds of 35 knots, the average cruising speed of the remainder of the fleet was around 10 knots.

- Section 4. Seventy-six percent of the vessels are meeting or are expected to meet current agency needs, but this decreases to 56% when meeting agency needs during the next 20 years are considered. Factors considered in meeting needs included maintenance costs, providing a safe work environment, and suitability of design for meeting current and future sampling requirements. OMNR, Pennsylvania Fish and Boat Commission (PFBC), and USGS had vessels not meeting current needs, and MIDNR, USFWS, USGS, and WIDNR had vessels that would meet future needs.

- Section 5. The number of dedicated vessel personnel ranged from one to four but the range increased to from three to six with the addition of scientific staff and other non-dedicated personnel. Some vessels operated without a second person that was licensed to operate the vessel, and some operated with only the captain as a dedicated crewmember. Among agencies, captain's salaries ranged from less than $30,000 for a starting salary (INDNR, OMNR, WIDNR) to a top salary of over $60,000 (USGS).

- Section 6. Most agencies' core programs for maintaining long-term data sets are supported by relatively stable funding, but some USGS stations have had to use "soft" monies from special projects and/or contracting to support core programs in recent years. Most agencies did not contract out their vessel because it was either fully occupied and/or contract money did not come back to the vessel program.

- Section 6. The median cost for operating a SGLFMP large vessel was around $27,000 annually, with most of this being staff salaries. The median maintenance cost was about $8,400 annually.

- Section 6. Maintenance and repairs were more often reactive than proactive. Most agency stations found it easier to get money for emergency repairs than preventive maintenance.

- Section 7 of this report provides a 12-point replacement protocol. Most of the vessels not meeting current or future agency needs will require replacement rather than retrofitting because they are old commercial fishing boats lacking the design characteristics amenable for retrofitting to increase safety (adding water-tight compartments) or provide sampling and crew amenities (labs and lavatories).

- In Section 8 of this report we identify 19 issues that surfaced during our interviews with agency station staff relating to programs, staffing, contracting, soft money, shipyards, inspections, maintenance, and safety.

- Numerous recommendations are included or alluded to in the text of this report but specific recommendations are pointed out in Section 9. Perhaps the most important recommendation is for regular fleet-wide comprehensive standardized inspections by a qualified non-agency inspector. Inspection results will help station personnel prepare preventive maintenance schedules and facilitate convincing administrators to find the money to do the necessary maintenance. A well-maintained vessel will better provide a safe work environment and ensure that the agency program is carried out without loss of survey time.

- Section 10. Although SGLFMP-agency vessel programs may utilize some individual aspects of the University-National Oceanographic Laboratory System (UNOLS), it is unlikely that UNOLS will be adopted as a model for vessel management in the Great Lakes. There has been and will continue to be some collaborative work among SGLFMP-agency vessels on compatible projects and programs.

1. Introduction

Over the course of managing the Great Lakes in the last 100 years, one of the principal needs has been accurate and timely fish community assessments. These assessments inevitably required field surveys in offshore and unprotected waters of the Great Lakes. Weather hazards and deep water sampling gear requirements mandated that agencies furnish large, seaworthy vessels operated by seasoned, professional crews. Without this capability, fish managers and researchers would know little about Great Lakes fishery resources, particularly the offshore fish community.

Although technology has significantly improved analytical capabilities, at the end of the next century agencies will still be sending people in research vessels offshore in the Great Lakes to collect information. Technology and future analytical requirements will likely increase the need for more and better information, e.g., broadening fish management perspectives. Surprisingly, future technology will not likely replace people sampling offshore, but will more likely require increased vessel and crew capabilities to meet the demand for more and better information.

The Lake Huron Committee recently outlined concerns regarding the aging fleet of Great Lakes fisheries research vessels:

> "MIDNR, OMNR, USFWS and USGS alike are faced with aging vessels that will soon need to be replaced…it would be useful to collectively decide on assessment, research and management needs, in order that these needs can be addressed as vessels are replaced…" (*LHC-00-1)*

More specifically, when should vessels be replaced, how can these replacements be financed, should vessels be retrofitted rather than replaced, and, if vessels are replaced, how much boat is required to meet program needs? Also, with an aging fleet there will be concerns with safety, e.g. at what point is safe operation being stretched to the limit with an old boat?

Research vessel programs provide critical pieces of information, but they also require major financial support. Many agencies are finding either fewer dollars to maintain program or they are expected to do more with the same dollars. During these periods of fiscal constraint and uncertainty, administrators and program managers need to know whether the expensive research vessel programs are worth the costs. Are they spending too much? Can they save money by supporting other programs? Can they find an optimal balance between information need and expense? Is there a cheaper way to run research vessel programs?

Along with budgetary concerns, managers also need to know if current vessel capabilities can meet future demands for information. Have we limited research and management activities with our current vessel capabilities? If we were not constrained with the current level of vessel capability, what other activities would we undertake? Or, if we had to cut our vessel program, what activities would be eliminated? Although there has been some sharing of information and services among agencies through the recently formed Great Lakes Science Vessel Coordination Committee of the Great Lakes Commission, can fisheries managers enhance and/or replace offshore data collection capability by cooperating more with other agencies?

The purpose of this project is to provide a comprehensive inventory and assessment of Great Lakes fisheries research vessels and vessel programs that will answer many of the questions posed above. In this report, we provide a synthesis of this inventory and assessment, and recommendations to agencies that we hope will assist in the management of their future large-vessel program on the Great Lakes.

2. Methods

The scope of this project was focused on agencies which were signatory to the Strategic Great Lakes Fisheries Management Plan (SGLFMP) and have had large-vessel programs within the past 20 years. The SGLFMP agencies include those who have been involved in management of Great Lakes fish populations for many years. They have used their vessels to maintain invaluable long-term data sets. A large-vessel program was defined as having a vessel 30 feet or more in length with a dedicated or designated vessel crew. We prepared two questionnaires, one directed at vessel administrators and one directed at vessel captains, engineers, or mates (Appendix C). The questions addressed areas including program, staffing, budget, maintenance, and replacement. Questions within each area were meant to identify current status, agency support, problems and concerns, safety, and whether the agency would continue to have a large-vessel program in the future (20 years from now.). We traveled to the agency vessel stations and interviewed vessel administrators and staff (captain, engineer, or mate). Vessel staff was also asked to complete a vessel description form that asked for specifics on vessel construction, mechanical system, deck machinery, pilothouse electronics, operation and maintenance, workspace and crew quarters, and safety gear. We used the information obtained from response to the questionnaires and the vessel description form to prepare a vessel program summary for each vessel (Appendix A). These summaries described the current program utilizing the vessel, a description of the vessel, vessel staffing, vessel operation and maintenance costs, vessel inspections and safety, vessel fitness and future, and the future vessel program for the station and/or agency. Agencies signatory to SGLFMP that did not have a large-vessel program were asked to respond in writing to an abbreviated questionnaire identifying their Great Lakes program, description of the vessels they use, whether they would continue to have a program in the future, and whether they were considering expanding to a large-vessel program. Response by these agencies is presented in Appendix B.

We were unable to obtain identical information from each agency due to a certain amount of individuality in our questionnaires and our interview strategies, and differences in record keeping, interpretation, definition, and on-hand knowledge among the agencies. Consequently, we obtained particular data for some vessels, but not for others, resulting in gaps in the tables and additional footnotes.

3. Status and Future of Agency Programs

Current Status: The twenty-five fisheries research vessels described in this report completed, or anticipate completing, 1,742 days of survey effort annually during 1998-2001 (Table 1). This summary used either past information for the 1998-2000 period or planned vessel effort for the 2001 season, depending on what information was readily available. Most vessel effort (26.8 %) was for assessing rehabilitation of lake trout populations. Other important uses of the large vessels were percid monitoring (20.8%), fish community monitoring (11.0%), prey fish monitoring (7.7%), fish (mainly lake trout) stocking (6.4%) and acoustic surveys (5.4%). Programs with the smallest amount of effort included: education (0.3%), sturgeon restoration (0.5%) and gear work (0.8%). Collectively, prey fish assessments represented 16.1 percent of effort (e.g. sum of prey fish monitoring, acoustic surveys and herring monitoring). Fish community and percid monitoring plus walleye studies were 36.7 percent of total effort, and predator index programs (e.g., sum of lake trout and salmon monitoring) represented 33.2 percent of large research vessel efforts.

A majority of current large-fisheries-vessel programs on the Great Lakes are directed toward maintaining long-term data sets. The percentage of vessel program dedicated to maintaining long-term data sets varied from 26 to 100 percent among vessels (Table 1). Vessel programs for the NAMAYCUSH, PERCA, SETH GREEN and STEELCRAFT were all (100%) directed at maintaining long-term data sets. The average amount of effort for long-term activities was 87 percent and twenty-two vessel programs exceeded 62 percent. Three vessel programs were oriented more toward short-term activities, the ATIGAMAYG, ERIE EXPLORER and MUSKY II allocated only 33 percent of their program effort toward maintaining long-term data sets.

Table 1. Summary of vessel effort (days) spent on various program activities by large (≥30 ft) fisheries vessels operated by SGLFMP-signatory agencies on the Great Lakes during 1998-2000 or planned for 2001. Information provided by agency personnel, Jan-Mar 2001.

VESSEL	AGENCY	*Limno-Water Quality*	*Habitat Mapping Study*	*Sturgeon Restoration*	*Fish Community Monitoring*	*Prey Fish Monitoring*	*Acoustic Surveys*	*Herring & Whitefish Monitoring*	*Percid Monitoring*	*Lake Trout Monitoring*	*Walleye Studies*	*Round Goby Studies*
O. MYKISS	INDNR								8	10		
CHANNEL CAT	MIDNR		9	9					103			
CHINOOK	MIDNR							7	17	37		
JUDY	MIDNR									40		
STEELHEAD	MIDNR		11				10		14	21		
ARGO	NYSDEC	15					13		28	22		
SETH GREEN	NYSDEC					20	20		5	20		
EXPLORER	OHDNR				20		5		35			
GRANDON	OHDNR						3		52			
ATIGAMAYG	OMNR				18					49		
ERIE EXPLORER	OMNR				24		10		20	10	35	
KEENOSAY/LOFTUS	OMNR	16							8		49	20
NAMAYCUSH	OMNR				25							
STEELCRAFT	OMNR				25							
WONDA GOLDIE	OMNR				80							
PERCA	PFBC	5					2		33	12		
TOGUE	USFWS									14		
GRAYLING	USGS	14				59	12			29		
KAHO	USGS					55				42		
KIYI	USGS											
MUSKYII	USGS	15							25	13		
SISCOWET	USGS						19			46		
BARNEY DEVINE	WIDNR							37	15	43		
HACK NOYES	WIDNR							5		58		
TOTALS		65	20	9	192	134	94	49	363	466	84	20
PERCENT		3.7%	1.1%	0.5%	11.0%	7.7%	5.4%	2.8%	20.8%	26.8%	4.8%	1.1%

Table 1 (continued)

VESSEL	AGENCY	*Stocking*	*Gear Work*	*Education*	*Salmon Monitoring*	*Miscellaneous*	**Total Vessel Effort**	**Percent Effort**	**Percent Long-Term**	**Proportion Agency Great Lakes Effort**	
O. MYKISS	INDNR				10		28	1.6%	90%	INDNR	1.6%
CHANNEL CAT	MIDNR						121	6.9%	85%		
CHINOOK	MIDNR						61	3.5%	99%		
JUDY	MIDNR						40	2.3%	99%		
STEELHEAD	MIDNR				84		140	8.0%	85%	MIDNR	20.8%
ARGO	NYSDEC	5					83	4.8%	76%		
SETH GREEN	NYSDEC						65	3.7%	100%	NYSDEC	8.5%
EXPLORER	OHDNR						60	3.4%	88%		
GRANDON	OHDNR						55	3.2%	95%	OHDNR	6.6%
ATIGAMAYG	OMNR	5					72	4.1%	26%		
ERIE EXPLORER	OMNR						99	5.7%	30%		
KEENOSAY/LOFTUS	OMNR						93	5.3%	63%		
NAMAYCUSH	OMNR	2					27	1.5%	100%		
STEELCRAFT	OMNR	2					27	1.5%	100%		
WONDA GOLDIE	OMNR	20				10	110	6.3%	73%	OMNR	24.6%
PERCA	PFBC						52	3.0%	100%	PFBC	3.0%
TOGUE	USFWS	77					91	5.2%	85%	USFWS	5.2%
GRAYLING	USGS		9				123	7.1%	85%		
KAHO	USGS						97	5.6%	92%		
KIYI	USGS						0	0.0%	72%		
MUSKYII	USGS						53	3.0%	43%		
SISCOWET	USGS		5				70	4.0%	93%	USGS	19.7%
BARNEY DEVINE	WIDNR				12		107	6.1%	99%		
HACK NOYES	WIDNR			5			68	3.9%	95%	WIDNR	10.0%
TOTALS		111	14	5	106	10	1742	100.0%			
PERCENT		6.4%	0.8%	0.3%	6.1%	0.6%	100.0%				100.0%

The agencies with the biggest vessel programs on the Great Lakes, based on percentage of total Great Lakes vessel-day effort, were Ontario Ministry of Natural Resources (OMNR 24.6%), Michigan Department of Natural Resources (MIDNR 20.8%) and United States Geological Service – Biological Resources Division (USGS 19.7%). Other agency effort composition included: Wisconsin Department of Natural Resources (WIDNR 10.0%), New York State Department of Environmental Conservation (NYSDEC 8.5%), Ohio Department of Natural Resources (OHDNR 6.6%), United States Fish and Wildlife Service (USFWS 5.2%), Pennsylvania Fish and Boat Commission (PFBC 3.0%) and Indiana Department of Natural Resources (INDNR 1.9%).

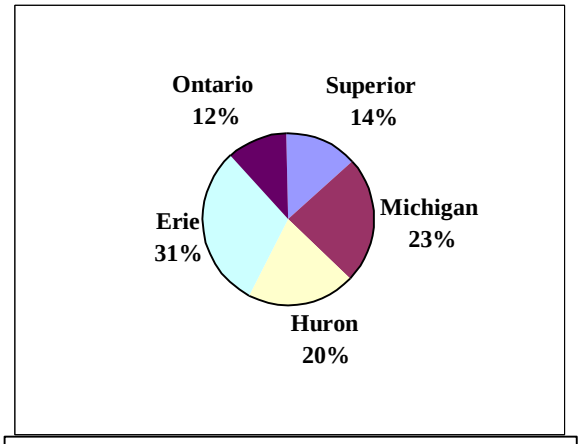

Figure 1. Distribution of large-vessel fisheries research effort (days) on the different Great Lakes for 1998-2001.

The research vessel effort described in Table 1 was also summarized to provide a lake-to-lake view of fisheries research vessel effort on the Great Lakes (Figure 1). The largest effort was expended on Lake Erie (31.3%) followed by Michigan (23.4%), Huron (19.7%), Superior (13.9%) and Ontario (11.6%). The effort expended on Lake Erie was not surprising, considering that nine of the twenty-five vessel programs examined (36%) were stationed on Lake Erie.

Future Program: In each of the individual vessel program summaries (Appendix A) there is a section on future program. We asked station administrators and biologists what kind of activities they envisioned their stations would be involved with in 20 years. We reviewed these sections and recorded and ranked the activities mentioned for each of the station programs in Table 2. Without exception, maintaining current, long-term data sets was the most frequently mentioned priority for future work. All agency staffs recognized how important these data sets have been for understanding the status of Great Lakes fish communities. Agencies also understand that these long-term data sets may be even more important in the future.

Another frequently mentioned activity was program expansion. This was mentioned with regard to expanding the geographic area of fisheries assessments, broadening the view of the system and moving away from single-species assessments (Table 2). Increasing efforts for habitat assessments and instituting acoustic assessment techniques were other items frequently mentioned by vessel station staff. Other future activities in order of frequency include: more cooperative programming, lower trophic level work, remote sensing, assessing exotics, using trawls, and increasing use of tagging studies (Table 2).

The universal factor limiting new or expanded future programming was the affect of staffing. Because so much of agency programs are tied to maintaining long-term data sets, taking on new programs or expanding existing ones in the future will have to be tied to new staff and additional support. Regrettably, most agencies were not optimistic about improvements in future staffing, consequently, most of their projections about future work were more wishful thinking than reality.

Table 2. Summary and ranking of SGLFMP-agency large-vessel (≥30 ft) programs during 2001-2020. Rankings were based on the nature and frequency of future programs described by vessel station staffs interviewed during January-March 2001.

Future Activities	Rank
Maintain current, long-term data sets	1
Expand current program in terms of species, scope and geographic area[1]	2

Future Activities	Rank
Improve and enhance habitat assessments	2
Initiate hydro-acoustic fish stock assessment techniques	4
Become more involved in cooperative programming and piggy-back research	4
Increase lower trophic level assessments	6
Investigate potential for remote sensing as a fish stock assessment tool	7
Expand efforts to assess the impacts of exotics	7
Include trawling capability in fisheries assessments	9
Increase tagging studies	9
Become more involved with non-lethal sampling of fishes	9

[1]Duplicate ranks indicate a tie in activity frequency. The rank following a tie includes all those activities that preceded it.

The small amount of effort expended on habitat was in contrast to its almost universal inclusion by many agencies in their plans for future work. Similarly, many agency personnel indicated they wanted to become more involved in hydro-acoustic assessments of fish populations in the future, yet only 5.6 percent of current effort is directed toward this activity. This discrepancy is due to the current lack of financial support necessary to acquire the relatively expensive remote-sensing technologies for habitat mapping and hydro-acoustics and additional staff necessary to collect and analyze the additional data.

4. Status of the Large Vessel Fleet

Inventory: We interviewed personnel at 21 stations from Cape Vincent, New York to Bayfield, Wisconsin. These stations operated 25 vessels over 30 ft. in length that were used primarily in fisheries research and assessment activities (Table 3). The OMNR operates the largest fleet on the Great Lakes (7 vessels; 3 in Lake Erie, 2 in Lake Ontario, 2 in Lake Huron), while the PFBC, INDNR and USFWS operate the smallest fleets, a single vessel each. Many of these vessel programs were instituted within the last 20 years. Prior to 1980, the Great Lakes Science Center and its biological field stations were the principal offshore fisheries assessment and research operative within the Great Lakes. Since then, many state and provincial agencies inaugurated or expanded their programs to include offshore fisheries sampling capability.

Age: The oldest fisheries vessel currently operating in the Great Lakes is WDNR's BARNEY DEVINE, stationed in Sturgeon Bay, Wisconsin (Table 3). The 64-year old BARNEY DEVINE was built by Burger Boat in Manitowoc, Wisconsin in 1937. The newest vessels are USGS's KIYI, operating on Lake Superior, and OHDNR's EXPLORER stationed at Sandusky, Ohio on Lake Erie. The average age of the fisheries fleet is 33 years, which suggests that half the fleet was operating prior to 1968. However, many of the boats older than 20 years were purchased by agencies through commercial buyout programs, and many of the older boats have had several major refits and overhauls.

Size: The smallest of the large fisheries vessels operating on the Great Lakes is Indiana's 36 ft. O. MYKISS (Table 3). The O. MYKISS has two other unique features among the fisheries research vessel fleet on the Great Lakes – it has two of the largest engines and it is the fastest vessel in the fleet (35 kt speeds). The largest vessel, both in length and displacement, is the USGS's KIYI, which is 107 ft. long and displaces 369 tons. The median size of the fisheries research vessel fleet is 50 ft. and 47 tons. Most of these vessels are steel, some use steel in the hull and aluminum for the superstructure, and two vessels are entirely aluminum. Nearly all these vessels have the ability to haul gillnets and plankton nets, and many others, mostly in the lower Great Lakes, also have trawling capability.

Meeting Needs: Seventy-six percent of the fisheries research vessels are meeting, or expect to meet, the current program needs of their agencies (Table 3). OMNR has three vessels that are not meeting current needs, the NAMAYCUSH and STEELCRAFT on Lake Ontario and the WONDA GOLDIE on Lake Huron. Two of the five

vessels in the USGS research vessel fleet are not meeting current needs, the SISCOWET on Lake Michigan and the MUSKY II on Lake Erie. OHDNR's new EXPLORER on Lake Erie has not yet successfully completed trials; consequently, Ohio staff are uncertain that the new vessel will meet their program needs.

Table 3. Description of Great Lakes fisheries research and assessment vessel size, age and usage by agencies signatory to SGLFMP.

AGENCY-VESSEL	LAKE	LENGTH (ft)	DISPLACE-MENT (tons)	AGE	MEETS NEEDS
INDNR					
O. MYKISS	Michigan	36	10	13	YES
CHANNEL CAT	Erie	46	26	33	YES
CHINNOK	Huron	50	26	54	YES
JUDY	Superior	40	20	49	YES
STEELHEAD	Michigan	62	70	34	YES
NYSDEC					
ARGO	Erie	42	36	15	YES
SETH GREEN	Ontario	46	50	16	YES
OHDNR					
EXPLORER	Erie	53	53	1	UNKNOWN
GRANDON	Erie	47	50	10	YES
OMNR					
ATIGAMAYG	Huron, Superior	57	75	47	YES
WANDA GOLDIE	Huron	50	35	51	NO
KEENOSAY	Erie	58	68	12	YES
K. H. LOFTUS	Erie	42	27	11	YES
ERIE EXPLORER	Erie	62	64	19	YES
NAMAYCUSH	Ontario	49	28	47	NO
STEELCRAFT	Ontario	45	23	56	NO
PFBC					
PERCA	Erie	50	20	42	NO
USFWS					
TOGUE	Upper Lakes	85	175	26	YES
USGS					
GRAYLING	Huron	79	133	24	YES
KAHO	Ontario	65	83	40	YES
KIYI	Superior	107	369	2	YES
MUSKY II	Erie	45	27	41	NO
SISCOWET	Michigan	57	43	55	NO
WINDNR					
BARNEY DEVINE	Michigan	50	37	64	YES

AGENCY-VESSEL	LAKE	LENGTH (ft)	DISPLACE-MENT (tons)	AGE	MEETS NEEDS
HACK NOYES	Superior	56	50	55	YES

5. Vessel Staffing

A well-trained and experienced crew is one of the most important attributes of a safe and efficient large-vessel program on the Great Lakes. The operational crews on SGLFMP agency large vessels are generally made up of dedicated vessel personnel and scientific personnel, but some agencies (OMNR, PFBC) have eliminated dedicated crews. Dedicated vessel personnel are those assigned to the vessel, have vessel-related job classifications, and/or whose primary duties pertain to the operation, safety, and maintenance of the vessel. Tiers of supervision and/or responsibility within these vessel personnel from the top down are the first tier that includes the boat captain or boat operator, the second tier that includes the mate, engineer, or assistant boat captain, and the third tier that includes the deckhand, seaman, fisheries technician, or fisheries assistant.

First-tier personnel are the first-line supervisors of the other vessel personnel and are responsible for readiness of the vessel and crew. They are generally required to have a Coast Guard Masters License or comparable license with a tonnage rating equal to or greater than the vessel they are operating. Second-tier personnel are responsible for deck or mechanical operations, and some serve as vessel operators during shift work or temporary absence of the boat captain. They are generally required to have or be qualified for a Coast Guard Masters or similar license if boat operation is part of their duties. They sometimes have engineer or mechanic certifications but these are not generally a requirement. Third-tier personnel handle much of the deck work and gear involved in biological sampling, and assist first- and second-tier personnel in the operation and maintenance of the vessel. Although they are not required to have licenses or certifications, some have Coast Guard Masters or comparable licenses and may serve as back-up operators. Their knowledge, skills, and abilities are often evaluated during the hiring process, expanded through on-the-job training, and are important in vessel operation. Personnel from all three tiers, especially the second and third, participate in collection of biological data. Some agency vessels do not regularly have scientific staff on board so one of the dedicated vessel crew is usually assigned responsibility for data collection. Some agencies also supplement the designated crew with a fourth tier of temporary employees or volunteers who may or may not have any knowledge of vessels and vessel operations. These personnel are usually relegated to unskilled tasks, are closely supervised, and learn on the job.

Most, but not all, vessel operations include scientific staff made up of fisheries biologists and/or technicians, but who are not dedicated vessel crew. These personnel are generally responsible for data collection protocol, collect data from the biological samples, and collaborate closely with the vessel captain/operator in determining daily on-the-water work schedules and overtime. In some cases they function as dedicated vessel crew assisting with vessel operation, maintenance, and operation of deck machinery. In one instance (OHDNR), biologists made up the entire crew except for the captain. Most vessel crews appreciated having scientific staff onboard to collect the scientific data so they could focus on operating the boat and deck gear, to operate sophisticated computer-based gear such as used for substrate mapping, or to make the call on difficult fish identifications.

The total number of personnel staffing SGLFMP-agency vessels ranged from three to six, dedicated crew ranged from one to four, and scientific staff ranged from zero to three (Table 4, Appendix B). All agency vessels had first-tier dedicated captain or operator positions, but four vessels had vacant positions at the time of the interviews, three vessels have temporary captains hired for the vessel-operating season, and two vessels are currently captained on a part-time basis by personnel from other agency vessels. Most vessel captains or operators are required to have a license such as a Coast Guard Masters license with a tonnage rating equal to or greater than the vessel they are operating. Captain's annual salaries ranged from less than $30,000 for a starting salary (INDNR, OMNR, WIDNR) to a top salary of over $60,000 for the captain of the USGS vessel KIYI who was recently (April 2001) hired under the General Service Series as a GS-12.

Table 4. Number of dedicated vessel crew members by responsibility tier, first-tier (boat captain/boat operator) salary range, and usual scientific staff complement for large vessels operated by SGLFMP-signatory agencies[a] on the Great Lakes, based on interviews of agency personnel, Jan-Mar 2001.

Agency and vessel	Vessel staff total, by tier, and scientific[b]							Percent vessel[c]	1st-tier salaries	
	Total	1st	2nd	3rd	4th	Bio.	Tec.		Start	Top
INDNR										
O. MYKISS	5	1[d]		1	1	2		25	$22,000	$30,000
MIDNR										
CHANNEL CAT	5	1	1	1		1	1	75	$33,400	$47,500
CHINNOK	5	1	1	1		1	1	80	$33,400	$47,500
JUDY	4	1		2		1		50	$33,400	$47,500
STEELHEAD	4	1	1	2				95	$33,400	$47,500
NYSDEC										
ARGO	4	1		3		1			$32,076	$39,860
SETH GREEN	4	1	1		1	1			$32,076	$39,860
OHDNR										
EXPLORER	4	1[d]				3			$33,488	$47,632
GRANDON	4	1		1		2			$33,488	$47,632
OMNR										
ATIGAMAYG	4	1		3?					$28,428	$32,782
WANDA GOLDIE	3	1		2?					$28,428	$32,782
KEENOSAY	4	1	1	2?					$28,428	$32,782
K. H. LOFTUS	4?	1[e]		3?					$28,428	$32,782
ERIE EXPLORER	3-5	1		2-4					$28,428	$32,782
NAMAYCUSH	5	1		1	3			75	$28,428	$32,782
STEELCRAFT	5	1[e]		1	3			75	$28,428	$32,782
PFBC										
PERCA	4	1		1?		2			$27,900	$42,093
USFWS										
TOGUE	4-6	1[e]	1			1-2	1-2	90		
USGS										
GRAYLING	4	1	1			1	1	95	$49,473	$57,815
KAHO	4	1	1			1	1		$49,473	$57,815
KIYI	6	1[d]	2	1		1	1		$51,900	$67,500
MUSKY II	4	1[f]	1[e]			1	1		$49,473	$57,815
SISCOWET	4	1[f]	1			1	1	95	$49,473	$57,815
WIDNR										
BARNEY DEVINE	5	1	1			2	1	75	$28,804	$41,367
HACK NOYES	5	1[d]	1	1		1	1	65	$28,804	$41,367

[a] Strategic Great Lakes Fisheries Management Plan signatory agencies in this table are Indiana Department of Natural Resources (INDNR), Michigan Department of Natural Resources (MIDNR), New York Department of Environmental Conservation (NYSDEC), Ohio Department of Natural Resources (OHDNR), Ontario ministry of Natural Resources (OMNR), Pennsylvania Fish and Boat Commission (PFBC), U.S. Fish and Wildlife Service (USFWS), U.S. Geological Survey (USGS), and Wisconsin Department of Natural Resources (WINDNR

[b] Total = total number of staff onboard during core assessments. Number of designated crew by responsibility tier (1st – boat captain or operator; 2nd – mate, engineer, or assistant boat captain; 3rd – technician, seaman, or fisheries assistant; 4th – non-classified seasonal personnel. Scientific staff are number of biologists and technicians onboard for 50% or more of the operation days who are not vessel designated but may perform many vessel operational functions.
[c] Percent of total annual work time that designated crew spends on vessel-related projects.
[d] Vacant at the time of the interviews (Jan-Mar 2001).
[e] Seasonal position.
[f] Currently operated by personnel on loan from other agency vessels.

A little over half of the vessels had second-tier personnel. Most of these were assistant boat captains or mates that were licensed or otherwise trained and qualified to operate the vessel if necessary. Some vessels, generally the biggest ones, had engineer positions. Few of the vessel engineers were licensed but many had been trained and certified for their vessel engines, and all had or were getting on-the-job training regarding vessel maintenance. Most designated crew personnel were in the third tier as a number of vessels had two or more of these positions. Although most agency vessels have students, seasonal workers, or volunteers on board for some operations, few agencies (OMNR and PFBC) utilized these fourth-tier personnel as regular components of the vessel crew.

Although data were not available for all agencies, dedicated vessel crew spent most of their time on vessel-related work such as vessel operation, vessel maintenance, and vessel fishing gear maintenance, with the exception of INDNR. State and provincial agency vessel personnel generally spent more time on non-vessel related projects than did federal agencies (USFWS, USGS). Vessel personnel in all tiers did work such as maintenance of smaller vessels, non-vessel equipment, and station facilities, and some functioned as station technicians sampling commercial-fish catches, doing fish aging, participating in inland lake and stream fisheries work, and doing data entry.

Staffing Issues: A number of staffing issues were raised during the interviews including staffing level, pay, and appreciation of the duties and responsibilities of vessel crew from higher administrative levels. Regarding staffing, some agencies were dealing with filling vacant positions (INDNR, OHDNR, USGS, WIDNR), adding a new position or restoring a lost one (MIDNR), or changing a part-time position to full-time (OMNR, USFWS). Acquiring approval for the positions and finding qualified people to fill them was the issue in these cases. Interviewed personnel indicated that they usually have good support for filling positions from their immediate supervisors but getting approval from higher level administrators to fill positions can take months or years depending on the agency's budgetary or political situation. Even if the budget is adequate, agencies must at times deal with hiring freezes imposed at the executive level. Since all of the agencies are governmental, established hiring procedures must be followed once permission to fill the position has been granted. The process included advertising the position and sometimes soliciting for candidates, reviewing applications for required licenses and knowledge, skills, and abilities to select candidates for interview, and conducting interviews to rate the candidates and make the final selection. The interview committees included one or more vessel administrators, boat captains, and gender/racial appropriate at-large members to minimize bias in the selection process. This process for first-, second-, and third-tier vacancies were reported to take from 3 months to a year but usually 6 months or less.

A common complaint heard at nearly every station we visited was inadequate scientific staffing. Although some station's vessel crews and budgets were adequate to operate more days and the stations would have liked to do more Great Lakes work, they did not because the station lacked adequate scientific staff to process additional data. Many vessel programs were less active (e.g. fewer vessel days) than in previous years, and scientific staffing reductions and new responsibilities for scientific staff were noted as the principal reasons for these cutbacks in effort. At some stations the vessel crew was already being used as technicians to process data collected by the vessel and on non-vessel projects, and aptitude and/or ability for scientific/technical work was considered when filling vessel crew positions. Surprisingly, we found a considerable capacity for growth in fisheries vessel programming within the Great Lakes vessel fleet. For example, the six most ambitious vessel programs averaged 113 days per year compared to a 54 vessel-day average for the remaining fleet (Table 1). We view this staffing issue as the major impediment to any future growth of the Great Lakes fisheries program by SGLFMP agencies.

The commercial fishing industry has been the primary source for vessel-crew staffing among SGLFMP agencies because a lot of the agency vessels are converted commercial fishing boats and much of the gear used to sample fish populations is comparable to commercial fishing gear (gill nets, trawls, etc). Some agencies, e.g. NYSDEC, that primarily trawl, have recruited staff from the East Coast commercial fishing industry. However in recent years, it has been more difficult to attract and hold commercial-fishing people for agency vessel positions because there are fewer people in the industry, they prefer self-employment, or the pay offered by agencies is less than what they can get elsewhere. The requirements for first-tier vessel positions especially are being broadened from just the knowledge of navigation and fishing to include management, computer, and even scientific skills. It will likely be even more difficult to find personnel with all or most of those skills willing to work as a boat captain for the salaries currently being paid by most SGLFMP agencies. Some agencies admitted they have to focus on such things as health insurance and the ambiance of the Great Lakes when soliciting candidates for vessel positions. The lowest salaries were for vessel positions with the INDNR, but that vessel operated for less than 30 days a year, the boat operator was not required to have a Coast Guard license, and the vessel personnel spent only 25% of their time on vessel-related work. Boat captains and mates on WIDNR vessels are classified as research technicians. The research technician classification and salary does not reflect the training and responsibility necessary for safely operating and maintaining a large vessel on the Great Lakes. A number of agencies operate their vessels with only one licensed captain or operator. Although certainly cheaper, this situation does raise safety and liability issues if something happens to the captain and a non-licensed or otherwise non-qualified person operates the boat. In some recent case where the captain position became vacant and there was no qualified backup boat operator (MIDNR), a survey was canceled and another postponed until a captain could be borrowed from another MIDNR station. Some agencies (MIDNR, OMNR, USFWS, USGS) filled dedicated vessel crew positions with part-time personnel hired for the vessel-operating season or a specified number of months that included the operating season, or utilized personnel from one vessel to serve on their other vessels as needed during the operating season (OMNR, USGS). Problems associated with these practices included lack of familiarity between captain and crew or vessel, ability to retain a part-time person from year to year, and ability to fill the position from year to year in the wake of budget shortfalls and agency-wide hiring freezes.

Overtime pay or compensatory time off was also an issue with some vessel administrators and crew. Vessel operations usually require more than an 8-hour day and it is much more efficient and often a necessity to complete the sampling according to a standard protocol. However when budgets get tight, overtime is one of the first items that gets cut, even though our analysis of vessel operation costs indicates that overtime is a small component of the total vessel operating expense. Cuts in overtime makes it difficult to maintain a standard sampling schedule from year to year. In at least the OMNR, boat captains do not get overtime or compensatory time off but lower-tier personnel do, which could result in the boat captains making less money than some of the people under their supervision if a lot of overtime is involved.

6. Vessel Budgets and Operation Expenses

Most agency vessels and core programs are supported by dedicated funding from the sale of fishing licenses, allocation of Federal Aid for Sport Fish Restoration funds from the excise tax on fishing and boating equipment, or direct legislative appropriation. Federal agencies, particularly USGS, receive “soft” money for special projects or contract out their vessel and crew to other agencies. State and provincial agencies generally do not solicit soft money or contract out their vessels because special legislative approval is usually required for these funds to come back to their program. Agency station administrators usually work with first- or second-tier vessel staff to prepare annual, or in case of WIDNR stations, biennial budgets for their vessels. These budgets are submitted for approval up the hierarchy of their agencies where they must compete with other vessel budgets and/or other programs for funding.

Although most vessel administrators and crew indicated that budgetary support for their vessel was good or adequate, this support was more reactive than proactive. Many agencies either did not have a long-term maintenance schedule or were in the process of developing one, but even those with a schedule reported that maintenance was sometimes postponed due to budget shortfalls and/or allocation of available funds to other

projects or programs. However when breakdowns occurred, even stations that indicated less than adequate budgetary support reported that their agency usually found money for the emergency repairs necessary to put the vessel back in operation. Unfortunately, these emergency repairs usually cost much more than the preventive maintenance and the time required to complete the repairs sometimes resulted in cancellation of all or part of a survey. The USGS is developing a new strategy that classifies each vessel as a facility with its own maintenance budget and includes a 5-year maintenance plan and annual Condition Assessment Inspections by either the Great Lakes Science Center Chief of Vessel Management or a marine surveyor. It is hoped that this new strategy will more clearly convey to USGS administrators the budgetary and safety support needed for the five vessels they operate on the Great Lakes.

The information in Table 5 provides a rough sketch of operating costs for many of the SGLFMP-agency large vessels. Information was not provided for all vessels and the cost figures are not strictly comparable among agencies. Maintenance cost figures, averaged for 1998-2000, are based on a number of variables including repairs, new equipment, and haul-outs. Some vessels had undergone major maintenance during the 3-year reference period and some had experienced only normal maintenance. In addition, not all agencies had or were willing to provide maintenance-expense information at the time of the interviews.

Operating Costs: The cost to run these vessels (fuel use) is primarily associated (r^2=0.97) with weight, albeit some smaller vessels (e.g. O. MYKISS and LOFTUS) designed for speed are more expensive to operate. OMNR's NAMAYCUSH and STEELCRAFT are the most economical vessels in the fleet, using roughly 14 gallons per day of operation, or about $20 per day for fuel (Table 5). USGS's KIYI, on the other hand, consumes nearly 60 gallons per hour, or 480 gallons per day, assuming an 8-hour day. Fuel cost for the KIYI, depending on use and cost, could approach $750 per day or nearly $70,000 per season. Median fuel use and cost for the fleet, however, is 32 gallons and $48 per day. For a typical survey season of 63 days, seasonal fuel use and cost would be 2,016 gallons and $3,024, respectively. These median values support the view by most agencies that fuel costs are not a major budgetary constraint for the majority of fisheries research vessel fleet. However, operating the largest fuel consuming vessels in years where funds are limited could inhibit some agency operations.

Table 5. Comparison costs associated with the use and operation of Great Lakes fisheries research vessels by resource agencies signatory to SGLFMP.

AGENCY-VESSEL	DAYS[1]	FUEL USE[2]	FUEL COST[3]	MAINT COST[4]	STAFF COST[5]	TOTAL COST[6]	COST/ DAY[7]
INDNR							
O. MYKISS	28	20	$30	$6,533	$200	$12,973	$463
MNDNR							
CHANNEL CAT	121	24	$36	$5,428	$284	$44,148	$365
CHINNOK	61	18	$27	$6,349	$284	$25,320	$415
JUDY	40	28	$42	$7,783	$284	$20,823	$521
STEELHEAD	140	51	$77	$16,390	$284	$66,860	$478
NYSDEC							
ARGO	71	32	$48	$11,051	$249	$32,138	$453
SETH GREEN	59	43	$65	$10,993	$264	$30,375	$515
OHDNR							
EXPLORER	65				$312	$20,280	$312
GRANDON	39	46	$69	$3,900	$312	$18,759	$481
OMNR							
ATIGAMAYG	50	62	$93	$11,200	$218	$26,750	$535
WANDA GOLDIE	110	20	$30	$14,828	$218	$42,108	$383
KEENOSAY	56	38	$57	$11,717	$218	$27,117	$484
K. H. LOFTUS	21	86	$129	$3,407	$218	$10,694	$509
ERIE EXPLORER	99	64	$96		$218		
NAMAYCUSH	25	14	$21	$3,245	$218	$9,220	$369
STEELCRAFT	28	13	$20	$3,245	$218	$9,895	$353
PFBC							
PERCA	30	20	$30	$3,200	$198	$10,040	$335
USFWS							
TOGUE	91			$22,250	$298	$49,368	$543
USGS							
GRAYLING	98		$235		$396		
KAHO	86	53	$80	$45,000	$396	$83,528	$971
KIYI	94	480	$720	$11,500	$587	$134,358	$1,429
MUSKY II	31	32	$48	$9,000	$396	$22,764	$734
SISCOWET	80				$396		
WINDNR							
BARNEY DEVINE	107				$305	$46,718	$437
HACK NOYES	78	31	$47	$6,833	$305	$32,300	$414
MEDIAN	63	32	$48	$8,392	$284	$27,117	$463

1- Vessel days per season; 1- seasonal fuel use divided by day use; 3- fuel cost assumed to be $1.50 US; 4- maintenance costs usually included a 3-year average and adjusted for haul-outs and equipment replacement; 5- includes captain and one other staff (excepting three staff for the KIYI) annual salaries divided by 260 workdays per year; 6- includes fuel and maintenance costs plus staff costs expanded by vessel day use; and 7- total cost divided by vessel day use.

Maintenance Costs: We tried to characterize the costs associated with maintaining the fisheries research vessel fleet by using a 3-year average maintenance cost and adding annualized costs for haul-outs and new equipment (Table 5). This information was not complete, readily available, or provided for a few vessels. Annual maintenance costs varied from $3,200 for the PERCA to $45,000 for the KAHO. These figures only represent the period from 1998 to 2000. Typically, a vessel may go five years without any major maintenance expenses, then

have to repair a major system (e.g., WONDA GOLDIE and KAHO). Our use of a 3-year estimate period was not sufficient to capture vessel-to-vessel differences, and we found no significant associations between maintenance costs and age, length or displacement. Had it been possible to examine maintenance costs over a longer period, we would expect that larger and older vessels would cost more to maintain than smaller, newer vessels.

The median maintenance expense of $8,392 probably is a reliable estimate of the cost associated with keeping a fisheries vessel operational. This median-expense estimate includes those vessels that were lucky and required little maintenance within the last three years, and it also includes the unlucky agencies that had big maintenance expenses. Collectively, these factors probably offset one another and provide a good approximation of maintenance expenses. Compared to the median fuel costs of $3,024 per season, the estimated annual maintenance expense of $8,392 shows that for every dollar spent on fuel, agencies spend three dollars on maintenance.

Staff Costs: For each of the vessels, we estimated staff costs to operate these vessels by calculating a daily cost for the captain and a mate/technician[1]. We recognize that these vessels usually never operated fishing gear with a two-person crew, but we assumed the captain and mate had primary responsibilities for the vessel operation and maintenance. Other crewmembers were usually biologists or technical people not assigned directly to the vessel. We tried to simulate staff expenses based on ten years of service and calculated a daily expense by assuming a 260-day work-year. Each vessel's seasonal staff costs were the daily expense expanded by the number of days each vessel operated.

Staff costs varied from $198 per day for Pennsylvania's PERCA to $587 for the KIYI. The median staff cost was $284 per day (Table 5). Combining fuel, maintenance and staff expenses yields a total operating cost of $27,117 per vessel per season. Of this amount, roughly 10 percent is spent on fuel, 30 percent on maintenance and 60 percent on staff. The high proportion allocated to staff expense does not, however, include expenses for other crewmembers, overtime and travel costs, nor does it include the time the captain and mate spend on vessel maintenance during the off-season. Considering these items would add significantly to our estimated staff costs and would further minimize the proportion of assets that are needed for fuel and maintenance.

Table 6 provides a summary of other maintenance information related to inspections, engine status, haul-out cycles, hull maintenance, and stability. Aside from OMNR and MIDNR, vessel inspections are not done regularly, and roughly half the fleet has not had any type of stability test. Most vessels, 13 of 25, are hauled-out and dry-docked each winter, while the two NYSDEC vessels are on a two-year cycle and 10 others are hauled from 3-5 years. Apparently as funding tightens, haul-out periods become lengthened, especially for the larger vessels.

[1] The KIYI requires a backup captain; therefore for comparative purposes we calculated staff expense based on a three-person crew.

Table 6. Inspections and maintenance of SGLFMP-agency[a] vessels. Information provided by agency personnel, Jan-Mar, 2001.

	Inspections[b]		Engine overhaul[c]		Haul-out[d]		Hull sandblast[c]		Stability	Winter
Agency/Vessel	Freq.	Last	Freq.	Last	Freq.	Last	Freq.	Last	Test	Storage
INDNR										
O. MYKISS		None	MR, AN	1998	Annual	2000	AN	1998	None	Dry
MIDNR										
CHANNEL CAT	5 yr.	2000	MR	1995	Annual	2000	AN	1990	None	Dry
CHINNOK	5 yr.	1996	AN	None	Annual	2000*	AN	2000	Unknown	Dry
JUDY	First	2000	AN	1976?	Annual	2000*	AN	2000	None	Dry
STEELHEAD	5 yr.	1995	AN	1984-87	4-5 yr.	2000**	4-5 yr.	2000	Unknown	Wet
NYSDEC										
ARGO		None	AN?	None	2 yr.	2000	AN	None?	1986	Wet
SETH GREEN		2000	AN	None	2 yr.	2000*	AN?	?	1993	Wet
OHDNR										
EXPLORER		None		New		2000		New	2000	Dry?
GRANDON		None	AN	None	4-5 yr.	1996	AN	None?	1991	Wet
OMNR										
ATIGAMAYG	4 yr.	?	AN	2000	Annual	2000*			None	Dry
WONDA GOLDIE		None	AN	None	Annual	2000**	?	?	1985	Dry
KEENOSAY	4 yr.	?	MR	None	Annual	2000*	?	?	None	Dry
K. H. LOFTUS	4 yr.	?	MR	None	Annual	2000	?	?	1990	Dry?
ERIE EXPLORER	4 yr.	1998	MR, AN	1998	5 yr.	1996*	?	?	None	Wet
NAMAYCUSH	4 yr.	?	MR, AN	None	Annual	2000	?	?	1990	Dry
STEELCRAFT		None?	MR, AN	None	Annual	2000	?	?	1990	Dry
PFBC										
PERCA		None	AN	1993	Annual	2000*	5 yr.	?	None	Dry
USFWS										
TOGUE	10 yr.	1991	MR, AN	1988	5 yr.	1999	5 yr.	1999	1989	Wet
USGS										
GRAYLING	?		MR, AN	2000	3-5	?			1976	Wet
KAHO	First	1997	MR, AN	None	5	1999	?	?	None	Wet
KIYI	2 yr.	1999	ABS	New	5	New	5	New	1999	Wet
MUSKY II	?	?	AN	1993	Annual	2000**	?	?	None	Dry
SISCOWET	?	?	AN	1994	3-5	1997*	AN	1993	1958	Wet
WIDNR										
BARNEY DEVINE	First	1999	MR, AN	1998	3 yr.	1999*	First	1999	None	Wet
HACK NOYES		None	MR, AN	1988	3 yr.	2000	AN	2000	Unknown	Wet

[a] Strategic Great Lakes Fisheries Management Plan (SGLFMP) signatory agencies in this table are Indiana Department of Natural Resources (INDNR), Michigan Department of Natural Resources (MIDNR), New York Department of Environmental Conservation (NYSDEC), Ohio Department of Natural Resources (OHDNR), Ontario ministry of Natural Resources (OMNR), Pennsylvania Fish and Boat Commission (PFBC), U.S. Fish and Wildlife Service (USFWS), U.S. Geological Survey (USGS), and Wisconsin Department of Natural Resources (WINDNR).
[b] Formal comprehensive inspections by a marine surveyor, marine architect, or U.S. or Canadian Coast Guard.
[c] Manufacturer's recommendation (MR), American Bureau of Shipping standards and recommendations (ABS), or as needed (AN).
[d] Hull ultrasound performed or otherwise wastage determined (*), or major hull repair or replacement done (**).

7. Vessel Refits or Replacements

Six of twenty-five large (≥30 ft) fisheries research vessels are not meeting the current program needs of their agencies (Table 7). Three of these vessels are operated by OMNR, two by USGS and one by PFBC. With the exception of the TOGUE (age 26 years), these vessels are all 40+ years old and are limited in some way to provide a safe, effective work platform on Great Lakes waters. Both the PFBC and OMNR recently took the first steps in the process of replacing their vessels, e.g., formal talks, funding reviews etc. The USGS has a plan to replace the SISCOWET on Lake Michigan with a refitted vessel, the LAKE STURGEON, but does not have a firm plan for replacing the MUSKY II with a new vessel on Lake Erie. In addition to these six vessels, five other vessels are not expected to meet future program needs (Table 7). MIDNR has two vessels that will need to be replaced in the future, the JUDY and the CHINOOK, the USGS wants to replace the KAHO, the USFWS the TOGUE, and the WIDNR will need to replace the oldest vessel in the fleet, the BARNEY DEVINE (age 64 years). MIDNR has established an internal ad hoc committee that has documented the status of their vessels and needs for special maintenance, retrofit, or replacement. They are also developing specifications and design criteria for replacement of the JUDY and the CHINOOK. However, immediate replacement of these vessels is unlikely given the current MIDNR fiscal environment. Replacement of the TOGUE is budgeted for 2004. Replacement of the KAHO and the BARNEY DEVINE has not gone much beyond the recognition by agency personnel that these vessels should be replaced sometime soon.

Table 7. SGLFMP-agency large fisheries research and assessment vessels that are not meeting current and/or agency program needs.

Name	Agency	Home Port	Current Needs	Future Needs
STEELCRAFT	OMNR	GLENORA	NO	NO
NAMAYCUSH	OMNR	GLENORA	NO	NO
WONDA GOLDIE	OMNR	OWEN SOUND	NO	NO
PERCA	PFBC	ERIE	NO	NO
MUSKYII	USGS	SANDUSKY	NO	NO
SISCOWET	USGS	CHEBOYGAN	NO	NO
KAHO	USGS	OSWEGO	YES	NO
JUDY	MIDNR	MARQUETTE	YES	NO
CHINOOK	MIDNR	ALPENA	YES	NO
BARNEY DEVINE	WIDNR	STURGEON BAY	YES	NO
TOGUE	USFWS	CHEBOYGAN	YES	NO

For those agencies that are currently considering replacing a vessel in the near future, there is one common characteristic of all those successful vessel-replacement programs that have occurred in recent years – public and legislative support. The reason that outside-the-agency public support is crucial to the procurement of a new vessel is because normal internal agency budgets are usually inadequate to cover the costs of new vessels large enough to operate in offshore waters of the Great Lakes. This has been particularly true in recent years because many agencies have had less than optimal funding for their large-vessel programs. Constituents who understand the importance of a new vessel to a program can help make the case to legislators and other officials, immeasurably helping the agency's vessel replacement project gain access to capital improvement and other large-fund sources. Before making any of these contacts it would be advisable to do the necessary homework. With the assistance of a marine architect, develop a vessel-replacement package that includes preliminary design specifications with projected costs (see the replacement protocol described below). This vessel-replacement package will help others inside and outside your agency better understand what you need and it will provide an accurate cost of the new vessel, which is critical for any funding request. This is not the time to casually throw out the idea for a new vessel and guess at how much the new vessel will cost. When you are ready to sell your new vessel-replacement project,

make sure you are well prepared and have excellent written materials to leave with your agency administrators, constituents, and legislators.

Based on an array of both good and bad experiences that agencies have had with their vessel purchases, we developed a Replacement Protocol that we hope may be helpful to those agencies that may be considering acquiring a new vessel:

1. Immediately after program administrators make a decision to acquire a new vessel, they should appoint a small team of individuals who will oversee the project to its completion. Team members should include first and foremost the person likely to be the captain of the new vessel. Other team members should include an interested biologist or administrator, with a close, immediate association with the program and ultimate use of the new boat. It is crucial that this team be involved in all the decisions that affect the project.

2. The team should outline all the characteristics they need in their new boat. The better job the team does in defining what they want, the easier it will be to work with the vessel designer. Not only should they describe what they want in a new boat, but they should also include those features they do not want. Also, give serious consideration to any requirement for high-speed operation. Experience has shown that it is difficult to combine speed with the other desirable characteristics needed in an effective fisheries research vessel. Moreover, if high speed is required, make the yard responsible for the design. This will ensure that if speed requirements are not realized, there will be only one responsible party (compared to designer and builder finger pointing).

3. The team should choose a vessel designer. This is a critical step in the process and the marine architect/marine engineer is key to a successfully completed vessel – choose carefully. Contact other agencies that have had positive experiences with marine architects, study boat and fishing trade magazines and journals, and interview designers. Ask for the names of the owners of their last 4-5 fishing[2] vessels and contact them to determine their experience with each designer. Ask to see examples of plans and specifications from each architect. Also, ask to see their standard contract they use with builders. Using an independent marine architect is preferable to using the design staff from a shipyard. Avoid any potential ties between designers and a specific shipyard.

4. Shortly after a marine architect is selected, the first priority should be to develop a preliminary plan in order to approximate a cost of construction. Administration staff and fiscal officers can then review this information so they can put together a financial plan. This would be the stage where some negotiation may be required to balance program needs with financial resources. Designer, team members and fiscal/admin people should all meet and work together at this stage. It would be valuable if a fiscal/admin person could be assigned to the team, if any financial or budget issues arise during subsequent stages of the project.

5. After a level of funding is arranged, the designer and team can move ahead finalizing the design. This is an iterative process; generally, the better the team understands what they want, the fewer iterations are needed to finalize the design.

6. Toward the end of the design process, designer and team members should visit shipyards. The team should rely on the experience and expertise of the architect to recommend a few capable shipyards. Again, ask for the names of vessel owners and contact them regarding construction quality and their experience with the builder. For Great Lakes agencies, this may require having the boat built on the east or Gulf coasts. Do not consider a nearby yard because of proximity to your facility; in the long run the only issue that really matters is getting the best boat for your program dollar.

7. The designer will then prepare a series of detailed plans and specifications that can be used during the

[2] Make sure each designer under consideration has extensive experience designing fishing boats, not yachts!