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

September 20, 2001

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Prepared for the
Council of Lake Committees
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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%).

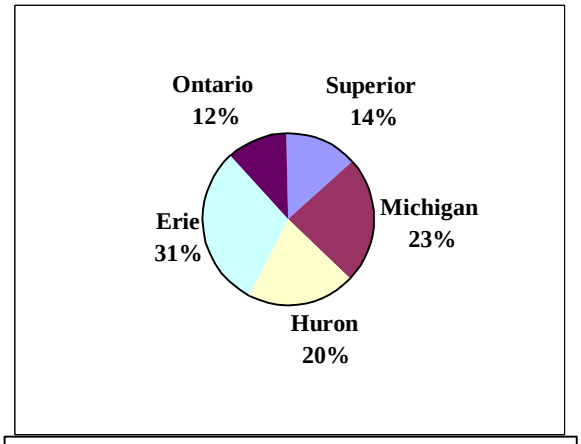

Figure 1. Distribution of large-vessel fisheries research effort (days) on the different Great Lakes for 1998-2001.

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!

bid process. It is important to also include a copy of the contract in each bid packet. The contract will have to meet legal guidelines for each of the State, Provincial and Federal agencies, but it should also include those items the architect deems important. For example, there should be progressive payments geared to construction progress and paid pending inspection by the architect. There should be a holdback, paid after the boat is delivered or at completion of sea trials. This may vary among architects. There should also be some provision for either removing the vessel if there is a breech of contract, or some provision for stopping payment and litigating if the vessel is not constructed according to specifications. Furthermore, agency's legal staffs should be apprised of this provision and they should be willing to act on the architect's recommendation – this is one of the important levers your architect and you have if you need to deal with an uncooperative and unscrupulous builder. For example, because of construction problems, the Napier Company (marine architects) recommended the transfer to another shipyard for New York's SETH GREEN and Ohio's EXPLORER. New York acted on the architect's recommendation and had a successful construction project, whereas Ohio did not and the EXPLORER was three years late and has required substantial repairs to correct a number of construction flaws.

8. The architect should oversee, or at least be involved in, the bidding process. His expertise at this point may be critical in determining the eventual outcome of the project. He should know of any qualifications or adjustments vendors may make to any of the specifications. He may also need to do some last minute checks and validations before the bid award is finalized.

9. The designer should supervise vessel construction. It may seem expedient to hire a local marine surveyor, close to the construction yard to minimize travel expenses, but there is no better assurance that the builder will comply with the design and specifications than by using the designer for these inspections. The vessel's captain should also make as many visits to the yard during construction as is financially practicable. But the captain should at least accompany the architect during his inspections of the vessel. As previously mentioned, the architect will inspect the vessel during various stages of construction, and pending his recommendation payments will be made at predetermined phases in the construction.

10. Once construction is completed the boat can be launched and the architect can conduct an inclining experiment to establish stability characteristics. This test will indicate any problems with vessel stability and whether there are any restrictions with the vessel's use. If the designer had done his job well, this should not be a problem.

11. Soon after launch and the stability test, sea trials should begin. This should be done prior to accepting the vessel and a substantial payment should be tied to the successful completion of trials. Trials should entail vessel crew outfitting the boat with sampling gear and working the boat to the point that the crew is satisfied with its performance.

12. The final word – not enough emphasis can be placed on having the project team involved in all the decisions that affect the vessel project and a vital member of that team is an experienced captain. Regrettably, as the commercial fishing industry disappears in the Great Lakes it will become increasingly difficult to find captains with the necessary experience, knowledge and skills. An agency with an inexperienced captain would be well advised to contract with a naval architect who is particularly experienced in the design of fishing vessels.

This approach of using an in-house team to work with a professional designer or engineer would be just as applicable if an agency were doing a refit of an existing hull or the purchase and refit of a used vessel. In fact, the initial charge to the architect could be to examine the costs and tradeoffs associated with either a refit of a current or used boat versus construction of a new vessel. Make sure that you contact a marine engineer or architect before purchasing a vessel for refit and not after the purchase. Again, the key to success is finding a capable architect who can work well with a good team of agency staff.

8. Coordinated Management

One of the areas the GLFC wanted us to explore is the potential for better coordination and use of Great Lakes fisheries vessels. More specifically, can the University-National Oceanographic Laboratory System (UNOLS), which has operated effectively for 25 years within the marine science community, become a model for fisheries research vessel management on the Great Lakes? Briefly, UNOLS is a consortium of 57 agencies that operate the U.S. academic research fleet, which is a platform for most of the American oceanographic research. The cost of operating this fleet is shared by the vessel owners, the National Science Foundation (NSF), the Office of Naval Research (ONR), and by the vessel contracting institutions. The UNOLS council is an elective group that is responsible for the scheduling and coordination of cooperating vessels and equipment. They also ensure that the vessels are safe and well maintained. They do this by setting stringent safety standards and also providing for routine inspections to assure compliance with these standards. Most of the work undertaken by the UNOLS fleet is short-term research. Likewise, funding sources can be erratic, varying considerably (2 fold) from year-to-year. They also view long-term contracting as counter productive and inefficient. The UNOLS approach embraces competition among vessel operators in order to provide for the lowest cost and best service for the user – they consider this a key to their success. Although each of the vessels competes with one another for research monies, there is a strong cooperative spirit among institutions that operate the UNOLS ships.

Within the last 4-5 years, representatives of Canadian and U.S. vessel programs have convened a series of annual workshops. The Great Lakes Science Vessel Workshops have been organized by a group of Great Lakes governmental agencies with the intent of developing a coordinated approach to management and operation of Great Lakes science vessels. Although there is no formal connection or tie with UNOLS, there is a close association of purpose between the two groups. However, in spite of these efforts to improve vessel utilization, coordinated management of the Great Lakes science vessel fleet remains an elusive goal.

Our interviews revealed several possible explanations why SGLFMP agencies are reluctant to embrace the UNOLS model for vessel management in the Great Lakes. First, twenty-five percent of the fleet is scheduled to capacity, i.e., operating for 100 days or more, so there is little room for scheduling additional work. For the remainder of the fleet, however, there is considerable capacity for increased usage (58 day average use). For those agencies operating underutilized vessels, however, there is little motivation to solicit outside work because internal sources of funding for vessel operation and maintenance are fairly constant and secure, and because for many agencies moving outside contract dollars into their vessel program is not an easy procedure. Most vessel days (87%) are programmed to maintain long-term monitoring and indexing activities, which by definition involve the same effort, and funding, from year-to-year, whereas moving the contract dollars earned by the vessel back into their program would require special permission and procedures (i.e. Many state agencies would require approval of the state legislature in the form of a special appropriation.). Also, staff reductions at many facilities have created situations where some station staff feel they are “operating on the edge” and cannot undertake additional vessel operations at this time. They are trying to maintain their long-term programs in the face of staff cuts, and staff at some stations are feeling overworked and overburdened. These personnel are reluctant to look for work that will not only require the use of their vessel and crew, but will also require administrative efforts to coordinate and manage the contract work. At some stations, crews are used extensively for work on non-vessel projects and are not available for additional vessel projects.

Surprisingly, when station staff talked about meeting future program needs they frequently mentioned expanding cooperative and collaborative efforts. The key to their concept of expanded collaborative work in the future, however, was the close alignment of their program goals with any potential cooperators. Nearly all vessel station staff indicated they would welcome collaborative work with outside researchers, if their research proposals were compatible with the agency’s vessel program goals and schedule. This could be done with other agencies or entities on a “payment in kind” (personnel or vessel time) basis or gratis if the work could be “piggybacked” with the vessel station program. An indication of whether an agency is willing to accept contract, payment in kind, or piggyback sampling may be found in the Great Lakes Science Vessel Inventory produced by the Great Lakes

Commission in Ann Arbor, Michigan. For those researchers and program managers that are looking for future access to Great Lakes fisheries research vessels, the message here is that money alone will not gain you access to fisheries vessels. But, if your project is compatible with one of the vessel programs described in the following station summaries, then possibilities for future collaborative work is very good.

9. Issues and Recommendations

The following are a list of issues that surfaced during the course of our interviews and some recommendations we have made relating to these issues. We believe the issues are relevant to the safe and efficient operation of the Great Lakes large-vessel fleet and warrant consideration by agency staff.

A. Inspection issues: We believe there is a single overarching need for the Great Lakes fisheries research vessel fleet – *regularly scheduled, comprehensive vessel inspections* . Currently, there is no requirement for any kind of regular inspection for U.S. fisheries research vessels less that 300 gross tons by the U.S. Coast Guard (USCG), therefore all U.S. fisheries research vessels on the Great Lakes, except the USGS vessel KIYI, are considered "Un-inspected Vessels", and are not required to be inspected by the USCG. Consequently, some U.S. vessels have operated for decades without any kind of comprehensive inspection. Some field stations have tried to get their vessels inspected, but found that the USCG had barely enough staff and funds to meet their mandated inspections. Agencies could contract inspections with marine surveyors but this not often done. If the USCG does not require an inspection, there is little incentive to do it privately. The USGS is undertaking to maintain a high level of fitness for their new vessel KIYI by complying with the rigorous American Bureau of Shipping (ABS) inspection standards and services, but other vessels in their fleet or operated by other SGLFMP agencies are not required to meet these standards.

In contrast to the un-inspected status of U.S. fisheries vessels, Canada requires OMNR fisheries vessels to be inspected every four years. Canadian Coast Guard (CCG) inspections focus on hull integrity, life saving equipment and navigational aids and require that the boat be dry-docked to facilitate hull and shaft inspections. However, even these inspections are not fully comprehensive as they give little attention to mechanical, hydraulic, plumbing, and electrical systems. It appears that the purpose of these inspections is to insure that each vessel does not sink and that a disabled vessel can always be towed to shore (worthy purposes indeed). However, that some OMNR captains had their own separate list of maintenance and repair needs above and beyond what was described in the CCG inspection report underscores the need for more comprehensive inspections.

We found that many U.S. and Canadian fisheries vessels have been operating years without any kind of stability assessment. In some instances, vessels have been modified to accommodate large, heavy stocking tanks on their decks (a potentially dangerous situation) without any kind of stability test. Furthermore, we have heard captains describe poor handling characteristics of their vessel in some sea states.

Inspection recommendations: We recommend that the GLFC should facilitate an effort by the agencies to require U.S. fisheries vessels to at least meet the same safety standards that currently apply to Canadian fisheries vessels operating within the Great Lakes. The need for adopting Canadian standards, or some equivalent protocol, should be apparent when U.S. lawmakers and agency personnel consider that U.S. fisheries research vessels have no safety requirements, while similar vessels in Canada must comply with a fairly rigorous Coast Guard safety standard. An ideal inspection protocol would be more comprehensive than the Canadian standards, perhaps akin to the ABS standards, which would include all vessel systems.

We also recommend that each agency ensure that their vessels have had a comprehensive stability test, e.g. an inclining experiment. If a test was done years ago and there have not been any substantive changes in ballast, superstructure, gear placement etc., then a new stability test is probably not required. However, if any of these modifications have occurred, then another stability test should be considered. A qualified marine engineer, architect or marine surveyor should be contracted to conduct these stability tests. At the very least, a rolling test

should be completed in order to alert staff to any potential problems with stability (contact a marine architect or marine engineer for procedures related to conducting an in-house rolling test).

B. Staffing issues: Staffing issues include levels, recruitment, use of dedicated crews, and compensation and overtime for captains. In the next 20-25 years, the capacity for agencies to do anything new and creative, or the capacity to expand any existing program may be limited by staffing levels. There is common belief among all the vessel stations that they will not see any new staff for their stations. With the majority of current staff time and fiscal resources directed toward maintaining long-term databases, it may be difficult for agencies to adapt to new situations that may arise in the future. Rather than having the capacity to move quickly on new issues, Great Lakes fishery agencies may be restricted and inflexible.

In the future, resource agencies may have a more difficult time finding personnel to fill new or existing positions who are sufficiently skilled and interested in working on fishery research boats on the Great Lakes. If the commercial fishing industry continues to diminish, as many Great Lakes managers predict, the future pool of individuals with Great Lakes fishing and fishing gear experience may be much smaller and more competitive. Agencies may have to recruit from areas outside the Great Lakes to find people with the right combination of skills. These trends will likely affect recruitment of captains first, but may also influence engineers and vessel technicians as well.

In the past, it was usual practice that the fisheries vessels had a captain and another staff who had the primary responsibility to operate and maintain the vessel and its gear. Today, some agencies no longer have dedicated vessel crews, believing non-dedicated crews are a more efficient use of staff resources. In extreme cases, the captain may be the only permanent, experienced member of the crew, with the other crewmembers being only inexperienced land-based or seasonal people. On paper this arrangement suggest full vessel staffing levels, but captains can readily envision difficult situations where they may have to run the boat, deal with emergencies, while untrained crewmembers provide limited help or assistance. Common sense and reasonable practice suggest that no fisheries vessel should leave a dock without a crewmember on board who is capable of running the vessel if the captain were to become incapacitated. Field stations that practice this staffing approach should know that their vessels operate at greater risk than vessels with trained, permanent and experienced crews. In the mean time, program administrators should consider a comprehensive training and indoctrination program for these seasonal crews, more so than they might otherwise require of permanent staff.

We are fully appreciative of the skills and responsibilities required of Great Lakes fisheries research vessel operators. From our view, the USGS is the only agency that adequately compensates their vessel crews. Whereas other agencies complained about recruiting and retaining good people to operate their research vessels, the USGS has had no problems either finding capable, reliable personnel nor have they had difficulty retaining these people for long, productive careers. Many other agencies do not seem to recognize the responsibility that goes along with the USCG or CCG boat operator's certifications. These operators are responsible for the safety of crew and vessel, and in the event of an accident, they alone will sit before a review panel to explain their actions. They alone could potentially lose their license and they alone could possibly lose their jobs and benefits. Scientists and other crew do not have any similar responsibility or risks to their job status. Regrettably, some agencies have tried to improve the compensation for their captains, but find that with only one or two such positions in their state, that it is difficult to get any attention from their agency's personnel offices. Some agencies should review their compensation programs for their Great Lakes vessel captains. For example, OMNR captains have low pay relative to other Great Lakes vessel captains and they do not qualify for overtime, yet their crewmembers are eligible for time-and-half overtime compensation. There is only an $800 (US) difference between OMNR's top crewmember and the lowest paid OMNR captain. Theoretically, with only 41 hours of overtime per season, a crewmember would make more than the OMNR captain, but at the same time the captain is their supervisor and is also responsible for their health and safety. Agencies should reconsider their compensation packages for their captains and ensure compensation is properly aligned with responsibilities.

Staffing recommendations: Agencies should evaluate current scientific and vessel-dedicated staffing levels at their Great Lakes stations and prepare staffing plans to ensure that current and future levels are adequate to maintain important long-term databases and explore new programs as needs arise.

Agencies, with support from the GLFC, should initiate training programs that would involve using existing vessel personnel and/or commercial fishers with Great Lakes navigation and fishing-related skills to teach these skills to non-experienced vessel personnel to insure that this pool of knowledge does not run dry.

Large-vessel crew personnel in tiers 1-3 should be vessel dedicated with official vessel-dedicated job title classifications and position descriptions (Boat Captain, Assistant Boat Captain, Mate, Engineer, Seaman, Boat Technician, etc.). Appropriate job titles and position descriptions may convince administrators of the responsibilities of these positions and provide justification for higher pay levels. Employing part-time tier 1-2 personnel (captain, assistant captain, mate or engineer) for only the vessel-operating season should be avoided.

Large vessels should be staffed with at least one person besides the captain who is licensed or otherwise qualified to serve as the vessel operator in the absence of the captain. Tier 4 (seasonal inexperienced non-dedicated employees, students, volunteers, etc.) should not be used to take the place of tier 2 and 3 personnel.

Pay levels for vessel-dedicated tiers 1-3 personnel, especially boat captains, should be commensurate with their responsibility and the hazardous environment of the Great Lakes. Boat captains are usually first-line supervisors and are responsible for the lives of the crew and others onboard their vessel as well as the vessel itself. Other dedicated crewmembers are often in charge of deck operations and share responsibility with the captain. Although some agencies cannot compete salary-wise with other agencies, within-agency salaries for vessel positions should be higher than comparable land-based positions.

C. Safety training issues: Aside from regularly scheduled CPR and First-Aid training, there is little else that agencies require. Several captains indicated that their agencies could do more. They would like to see "situation based" training on a whole host of vessel operation issues. They also suggest that training should be extended to everyone who works on the boats, not just captains and engineers. Many captains expressed concern with "walk-ons", who come aboard with little or no experience or training. They see greatly increased risks of accident or injury with them, particularly in poor weather conditions. They also see this risk increasing with the future trend toward doing more collaborative work with universities and other outside groups resulting in greater numbers of inexperienced personnel onboard. Standardized firefighting training is another need for fisheries vessels in the Great Lakes. Some vessel crews received some firefighting training from local fire departments such as how to use fire extinguishers, but many crews received no professional training at all and rarely was the training situation based.

Safety training recommendations: Safety training protocols, including firefighting, should be developed for all SGLFMP-agency large and small Great Lakes vessels. This would involve extensive training of dedicated members of the crew and an introductory program for temporary employees, students, and other non-dedicated personnel onboard. Developing the protocols and providing some training would seem to be an excellent agenda item for coordination workshops, e.g., GLFC or Science Vessel Workshops.

D. Program support issues: Two factors seem to work together to foster complacency in Great Lakes fisheries programming. First, much of the large-vessel resources are now targeted for maintenance of long-term data series, and tight fiscal management provides few funds for new work. In addition to staff cuts, program managers see more of their time being directed away from traditional biology, which they value, and more toward administration and grant writing, which they value less. Some field station staff also look longingly to the past as a period of "better times." It should not be unexpected that tight budgets, staff reductions, and lost operating funds not only limit field station productive capacity, but also affect morale and staff attitudes. There were more than a few comments that indicated, "We are operating on the edge." This environment may be stifling creative thinking, enthusiasm and program growth.

Most state agencies are not enthusiastic about doing contract work, e.g., renting their boat and crew in exchange for dollars. There are three reasons for the lack of interest: 1) the states generally provide adequate funds to operate their boats, 2) they are limited in staff to support contract operations and 3) any money that may be earned does not get back to their program. Hence, there is little incentive to solicit and schedule work for outside agencies. OMNR provides good support for core program, but requires any other work beyond core assessment activities to be funded with outside dollars. The USGS is more dependent on contract work, using some of the dollars to support their long-term assessment programs. Although there is some discretion in selecting compatible contract activities, soliciting outside funding in a difficult fiscal environment may potentially alter the large-vessel programs. This could result in a substantial proportion of a station's vessel program being dictated by what funds are currently available in the marketplace, rather than what is programmatically appropriate (soft-money effect). This could be exacerbated even more if field stations are required to seek outside funding to support their long-term, core programs. There is a growing frustration with scientists that oversee long-term data sets with the "new environment" where they are expected to find customers to support their work. The "new environment" is one in which hard money (budgetary appropriation) supports staff and hard assets, but where operating funds are generated from soft money (grants and contracts). Unfortunately, it is very difficult for Great Lakes fishery biologists in some agencies to find support for research that comes from long-term data sets; consequently, their funding is erratic and in some instances they may not have sufficient funds to conduct surveys. There is also concern among some station administrators, in particular, that they are spending an inordinate amount of time chasing money and less time on biology. Some agencies need a better understanding that long-term monitoring programs require adequate, long-term funding sources, too.

Program support recommendations: Agency personnel responsible for vessel operations from the boat captain on up should work together to ensure stable funding (hard money) for core programs on the Great Lakes. This might be accomplished by taking steps to educate budgetary administrators and appropriate state or federal legislators as to the importance and expense of maintaining a Great Lakes large-vessel program. This education process would likely involve highlighting the links between large vessel operations and lake wide assessment plans, fish community objectives, and state-of-the-lake reports, and long-term pro-active budget.

E. Maintenance issues: Older boats require more attention and preventive maintenance in order to be operated effectively. Old engines and other equipment are more time-consuming and expensive to repair because the repair parts are difficult to find or must be fabricated. Yet, most program people admit that it is next to impossible to convince central office budget staffs that it makes sense to fix things before they break. Fiscal administrators are much more responsive to a phone call indicating that a research vessel has broken down and was towed into some port far from home. In these situations, nearly all field station staff said their agency finds the money for the needed repairs. But, unforeseen breakdowns during the field season result in lost survey time and they cost more. Shipyard repair costs are higher because yards have usually scheduled their work for the summer season, and agencies generally want their boat fixed ASAP – this costs more money. Fixing problems during the winter season before they occur will usually be cheaper and there will be more time to do the repair correctly. Further, there is not a loss of program time, which is especially important with our limited field seasons. Finally, there is the issue of safety. The maintenance approach that waits until a vessel breaks down is increasing the chance that vessels could be incapacitated offshore, and this situation could have serious consequences for the health and safety of vessel crews. "Fix-it-when-its-broke" is bad vessel management policy and more efforts should be directed toward better preventive maintenance programs.

One captain made a revealing admission, that perhaps "we (captains) aren't the best people to gauge how the vessels should be maintained." He indicated he had to rely too much on people from shipyards and other supposed experts, and found such variation in their opinions that he questions this whole approach. His admission probably describes other circumstances, too, where captains and crewmembers may not be the best suited for determining vessel maintenance needs. This supports the view that fisheries research vessels should have periodic, comprehensive inspections of the hull and all the ship systems by qualified inspectors. Such inspections could provide an excellent foundation with which to gauge the maintenance needs for each vessel.

Everyone should be alerted to situations where a vessel due for replacing may not be properly maintained. Some field and administrative personnel may not want to maintain their boat in tip-top condition because they believe it might jeopardize their prospects of having it replaced (new-boat trap). Or, they may be reluctant to spend money on a boat that is soon to be replaced because it will only benefit the next owner. Not doing the best to maintain these vessels could result in circumstances that affect the health and safety of the crews that use them that otherwise could have been averted with a properly maintained vessel.

One of the problems facing the captains is the vague pressure to "go along" and not disrupt program activities by taking a firm stand on issues that may affect safe vessel operation. Many of the field stations have had to deal with the loss of staff and funding associated with their agency's cost cutting activities. Most field stations have relatively small staffs with a strong esprit de corps that are trying to maintain program in the face of these cuts. In this environment, some captains are very hesitant to make any demands for safe vessel operation that may be impossible to fund. For big repair or maintenance issues this is not problematical, but for little things they see incremental compromises making the boats less safe than they would like.

Maintenance recommendations: In order to gain support for preventive maintenance programs, vessel program administrators and captains should focus on safety aspects of preventive maintenance. Fiscal office personnel should understand that waiting for something to break before authorizing a repair could result in unsafe and dangerous situations for vessels and crews. The advantages of preventive maintenance programs related to less costly, off-season repairs and less disruptions to survey schedules should be secondary considerations behind crew and vessel safety. Educating those administrative personnel that control the maintenance purse strings will be facilitated by a coordinated, consistent refrain that preventive maintenance is a safety issue first.

Boat captains and agency administrators should develop long-term prioritized maintenance plans for their vessels. These plans should be based on the results of regular vessel inspections by a qualified marine surveyor, as well as problems identified by the captain and the crew. Maintenance should be prioritized on the basis of safety first and program second. Putting safety first should avoid the "new-boat trap" and facilitate securing financial support from agency administrators. In addition, captains have a responsibility to notify their station leaders when they feel they are getting near the edge of operating safely, and conversely, program administrators should actively engage their captains to discuss their "gut feelings" about boat maintenance, staffing, schedules and other issues that may have a bearing on safety. Open communication is an important component of a well-run, large vessel program operating on the Great Lakes.

F. Retrofit and replacement issues: There were many complaints about the lack of suitable shipyard services to take care of fishery vessels on the Great Lakes. This is undoubtedly linked to the decline in the number of commercial fishing vessels in the Great Lakes and conversion of many shipyards to servicing fiberglass and aluminum recreational boats. Not only are many of the yards lacking in skilled workers, but also many agencies feel they are being overcharged because of a lack of competition. This has been somewhat less of a problem for the USGS, because they maintain a fleet of five vessels, and therefore, can have more leverage in the marketplace. Other agencies may be able to improve their purchasing power too, by collectively directing their shipyard needs to a small number of yards that meet certain service criteria they established collectively. This might be an approach that could be examined by the captains through the Science Vessel Workshops.

In a previous section we outlined a suggested protocol for vessel replacement. One issue in the vessel replacement process was important enough that it should be highlighted here as well –input from vessel crews. This may seem like a point that is so obvious it should not have to be stated, but there have been recent experiences where vessel and field station staff opinions were either not solicited or they were lost among the many opinions of administrators, budget staff and other "vessel experts." What is even more disturbing is the thought held by some program administrators that "those people are too provincial and can't see the big picture."

Many of the vessels we observed had no watertight compartments within their hulls. If there were a breech of hull integrity, the crew would have to rely on bilge pumps to remove water. The idea behind having at least three watertight compartments is that if one section were flooded, the other two would provide enough

buoyancy to keep the vessel afloat. In addition, a separate, watertight compartment for the engine room facilitates any fire fighting that may be required. By localizing the fire to an engine room, the engine room hatch and air vents can be closed, thereby starving the fire of oxygen. Compare this approach to that of the captain going down into a smoke filled bilge with a fire extinguisher in hand. Again, this issue could be addressed within the context of establishing inspection and retrofit or replacement standards for fisheries vessels operating in the Great Lakes.

Retrofit and replacement recommendations: Establish an interagency committee through the Great Lakes Fishery Commission or via the Vessel Coordination Workshop to evaluate shipyards on the Great Lakes, East Coast, and Gulf Coast. This committee would prepare a shipyard database that would include location, capabilities, and recent reputation. The committee could explore interagency group contracting to secure reduced costs for group members.

Agencies considering a vessel replacement or major retrofit should include establishing at least three watertight compartments in their vessel with one of them being the engine compartment.

G. Coordination and Planning issues: As we suggested in the Coordinated Management Section, most of the vessel program staff operating within the Great Lakes today believe that new, future program needs will be best satisfied by working more cooperatively and collaboratively with other agencies. Agencies with minimal cooperative, interagency vessel programs should recognize the value of cooperative assessment, particularly in a limited fiscal environment. Programs that are tilted toward maintaining long-term data series (nearly all the vessel programs) require stable, reliable support, i.e. crews, vessels and maintenance and operating funding. The principal value of cooperative vessel programs is long-term stability. Agencies with big cooperative programs, such as NYSDEC and USGS operating in Lake Ontario, report firmer support by their agencies to these cooperative surveys, and improved reliability by virtue of two vessels-- if one has a mechanical failure the other can finish the survey. Furthermore, there are other improvements in efficiencies that can come from sharing gear, sharing staff talents, and partitioning the analytical workload.

Planning is an essential component of any Great Lakes program operation. Interagency planning through the GLFC's various lake and technical committees has done much to resolve differences, reach agreement on data needs for fish community assessment, and coordinate assessment efforts by individual agencies in the collection of fish community data, especially those data needed to maintain the long-term databases that have been proven necessary in management of important fish stocks. Although results of lake-wide assessments in all lakes has been presented in agency reports, annual reports to the GLFC, and state-of-the-lake reports; the documentation of the agreed-upon methodology for these assessments remains largely scattered in these reports and minutes of lake and technical committee meetings for all lakes except Lake Michigan. Members of the Lake Michigan Committee and Lake Michigan Technical Committee have documented lake-wide interagency assessment methodology in an unpublished report entitled "Lake wide Assessment Plan for Lake Michigan Fish Communities". Documents such as the Lake Michigan assessment plan are an important planning tool in developing and maintaining a vessel program on the Great Lakes.

Coordinated fish community assessment in the Great Lakes, in most cases, requires the use of large fisheries research vessels. The importance of these vessels should be stressed and documented in all lake or technical committee assessment planning and plans. This would provide interagency peer pressure, which could be used by the agencies to help justify their large-vessel programs. Although methodology and results of lake-wide assessments and special projects on all lakes are presented in the reports mentioned above, rarely is there mention of the large-vessel program required to do the job.

Planning recommendations: Agencies should examine their current vessel program in the context of their lake committee and see what surveys could be accomplished cooperatively. If there are doubts about the value that can be added to their programs by instituting cooperative surveys, they should contact agencies that have had a long, effective cooperative tradition. If there is sufficient interest to work cooperatively, lake committees should then consider preparation of a lake-wide assessment plan similar to the one developed for Lake Michigan to document interagency assessment methodology and provide a source of interagency support for maintaining a large-vessel

program by individual agencies. These assessment plans, including a revision of the Lake Michigan plan, should contain a section detailing large-vessel needs for the lake-wide assessment.

Lake committees should use the assessment plan for their lake and our vessel report to explore and develop interagency vessel management recommendations, including vessel sharing and cooperative assessment. In addition to tailoring vessel management for individual lakes, this effort would provide another source of peer pressure and support for maintenance of individual agency large-vessel programs.

10. APPENDIX A -Vessel Program Summaries

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VESSEL PROGRAM SUMMARY

NAME: **SETH GREEN**
OPERATOR: New York State Department of Environmental Conservation (NYSDEC)
LOCATION: Lake Ontario
HOME PORT: Cape Vincent, New York
CAPTAIN: Eric Muise
LAB DIRECTOR: Steve LaPan

VESSEL DESCRIPTION: The SETH GREEN is a 46x18x9 ft., 50 ton steel fisheries research vessel designed by the Napier Co., Arbroath, Scotland. It was built in Newport, RI in 1984 and delivered in 1985. The SETH GREEN is propelled by a single Caterpillar 3306 and is fitted with a 30kW Northern Lights generator, 2 main winches (1,800 ft., 3/8" cable), a limnological winch (300 ft., 3/16" cable), an anchor winch (400 ft., 5/8" cable), a Crossley 24 in. gill net hauler, and a net drum (6 ft. x 4 ft.). Available spaces (sq. ft.) include: deck 360, wet lab/enclosed deck 216, hold 360, galley/crew quarters 150, and wheelhouse 80.

VESSEL OPERATION & MAINTENANCE COSTS: From 1998 to 2000, the SETH GREEN averaged 59 operating days per year. All of the operating days were used for fisheries surveys. The distribution of gear used during these surveys was roughly 50 percent trawling and 25 percent each for gillnetting and acoustics. During the last three field seasons, the SETH GREEN averaged 383 service hours[3] per year on the main engine, or 6.5 hrs. per day. Total fuel use for the SETH GREEN was 2,482, 2,650 and 4,383 gallons for 1998-2000 field seasons. Fuel use in 2000 was 71% greater than the 1998-99 average, principally because the main engine was run at higher speeds (2,000 rpm) during transit than in previous years (1,800 rpm). Fuel costs averaged $1,779 in 1998-99, but increased substantially in 2000 to $5,742, due to increases in fuel cost as well as usage. Using 1998-99 fuel use and 2000 fuel prices results in an average use of 2,537 gallons and a cost of $3,323, assuming a 59-day average vessel season.

Maintenance and repair costs were $3,009, $3,506 and $9,078 for 1998-00, respectively. In 2000, a special electrical system repair was included at a cost of $4,960. A haul-out was also completed in 2000 that included hull cleaning, painting, and some hull and mechanical work for $8,884. The previous haul-out was in 1997, although haul-outs for the SETH GREEN have usually been on a two-year cycle. New equipment purchased and installed during the last three years included: radar ($6,821), isolation transformer ($1,032), global positioning system ($446), and a freezer ($204). Total annual cost for fuel, maintenance, haul-out (prorated), and new equipment was $14,316. These operational costs averaged $243 per operating day, assuming a 59 operating day average for 1998-00.

Normal operation of the SETH GREEN includes a 2-person vessel crew, a captain and maintenance assistant, and a survey biologist. On three cruises an additional technician assisted the biologist and crew. During each cruise, the maintenance assistant runs the deck machinery, and also does the entire data recording for the biologist.

The last captain of the SETH GREEN had 21 years total vessel experience and had a 200-ton Master's license, but completed less than 2 seasons with NYSDEC. The starting, 10-year and top salaries for a NYSDEC captain are $32,076, $39,111 and $39,860, respectively. From 1998-00, SETH GREEN's captain averaged 112.5 hrs. overtime and earned another $2,642 in overtime pay. For the maintenance assistant, the base, 10-year and top

[3] Service hours are related to how hard the engine works. It does not accurately reflect actual time spent on surveys, but is a minimal estimate of actual time.

salaries are $24,037, $29,714 and $30,464, respectively. The maintenance assistant averaged an additional 145 hrs overtime/year from 1998-00 earning another $3,350 per year. The discrepancy between captain and maintenance assistant earned overtime was due to a half year in 1998 when the SETH GREEN was without a permanent captain. Travel expenses for each of the vessel crew averaged $1,280 per year. A simulation of the total vessel crew operating expense, assuming 10 years of service for captain and maintenance assistant, is $68,825 or $264 per day for a 260-day work year. Assuming a 59-day vessel season, staff costs would total $15,618. Combining operating, maintenance and crew expenses yields a total expense of $29,934 or $507 per operating day.

SAFETY: A stability test (inclining experiment) of the SETH GREEN was completed at the time of commissioning in 1985. Since then, ballast was added to the fish hold and the deck was reconfigured with a gantry and outriggers. The Napier Co. completed another inclining experiment in 1993. The results indicated that vessel stability was within safe limits. For fire fighting, the SETH GREEN is outfitted with a Haylon system in the engine room, two-1 ½ in. fire pumps (one remotely operated), and various alarms. There was no portable pump for fire fighting or de-watering, no fireman's outfits (SCBA), no emergency escape breathing devices and no USCG fire-fighting training for the crew. The SETH GREEN had a complete complement of approved PFDs with lights, life raft, EPIRBS and survival suits.

SURVEYS, INSPECTIONS and FITNESS: The SETH GREEN has had a few courtesy inspections at irregular intervals by the USCG auxiliary for compliance with the 1971 Boating Safety Act. An un-inspected vessel examination was done in the late 1980s by USCG Marine Inspection Office. A marine surveyor completed a detailed hull examination in 2000 and found several areas pitted by electrolysis. Steel plates were repaired during haul-out and the boat fitted with an isolation transformer to prevent further deterioration. In addition, the electrical system was repaired and upgraded. The hull is now considered to be in excellent shape. The main and auxiliary engines have 9,503 and 17,800 hrs, respectively, and have not yet had their first overhauls. NYSDEC has provided good support to maintain the SETH GREEN. The crew has utilized a preventive maintenance approach, i.e., keeping spares on board and replacing components if there is any indication of possible failure. Consequently, few survey days have been lost to mechanical failures.

Lake Ontario Unit staff felt their vessel program is affected as much by vessel crew staffing issues as vessel fitness itself. Within the last three years the SETH GREEN has had three captains and the position has recently been filled. The pool of talent NYSDEC has sought for the captain position has been the coastal commercial fishing industry. These fishermen have the fishing gear construction, maintenance and vessel operation skills that are compatible with requirements for operating the SETH GREEN. In the last two position canvasses few individuals indicated an interest in taking the job. Unit staff believes the transition from being self-employed to a government position is difficult, but more importantly, salary and benefits should be improved to attract and retain quality candidates.

PROGRAM DESCRIPTION: The current biological program undertaken by NYSDEC on Lake Ontario is scheduled for 78 operating days. Nearly all (95 percent) of this effort is directed toward maintaining long-term fisheries databases. Continuing to update these databases has resulted in a relatively stable program – 2/3 of surveys undertaken in 2000 were part of the 1980 program. Individual cruises usually take 7-10 days. Bottom trawling cruises are directed toward assessing alewives (10 days), smelt (10 days), yellow perch (4 days), salmonid survival (4 days) and juvenile lake trout (10days). Gill net surveys for larger predators are used to assess the adult lake trout population (10 days) and the warm-water fish community of the Eastern Basin (10 days). Two lake wide hydroacoustic/midwater trawl cruises were also scheduled for summer and fall (10 days each). These surveys, as well as other lake wide cruises, incorporated some limnological sampling into their designs. Most of these surveys (60 days, 77 percent) are done in cooperation with either the Ontario Ministry of Natural Resources (hydroacoustic surveys) or with the United States Geological Survey, Oswego Biological Station (alewife, smelt, juvenile lake trout, and adult lake trout).

Generally, a 100-110 day program schedule represents an ambitious and busy vessel season within the Great Lakes. In the mid-1980s, the SETH GREEN had a number of 100+ vessel day seasons. More recently, 60-day seasons are more the norm. The lack of fuller utilization of the SETH GREEN is more related to limits

imposed by scientific staffing than by vessel capabilities and capacity. NYSDEC has two biologists – one has fulltime responsibilities aboard the SETH GREEN and the other biologist allocates approximately ¼ of his time (the other ¾ is spent directing a creel census). NYSDEC biologists feel there is not sufficient time to institute short-term studies or experiments. Furthermore, two long-term programs that staff would like to see added to current activities would be a population index of stocked piscivores and a more detailed assessment of lower trophic system dynamics. The Lake Ontario vessel program has room for future expansion, but any expansion will be tied to additional scientific staffing.

FUTURE PROGRAM: Although NYSDEC's Lake Ontario vessel program has room for expansion, both the scientific staff and vessel crew believe it will be relatively unchanged by the year 2020. Their forecast is affected by two factors. First, their program is almost entirely directed toward updating long-term data series of major components of the open water fish community. These databases represent more than 20 years of collection and they have provided fish managers with valuable insights and understanding. Staff felt very strongly that future programs should be directed toward maintaining these data sets. The second factor that suggests the Lake Ontario program will change little in 20 years is the prospect for future staffing additions. Cape Vincent staff concurred that prospects for new staff additions were poor, hence future vessel program expansion is not likely. Moreover, staff does not see future technological improvements that will make scientific staff more productive. In summary, the Lake Ontario program is unlikely to expand or change greatly in the future, and vessel utilization will probably remain unchanged as well. The biggest potential gains in efficiency, however, could come from expansion of cooperative arrangements within NYSDEC's other divisions, with other resource agencies and by developing better working relations with academic institutions.

Both the scientific staff and vessel crew were agreeable to future expansion of contract work with two provisos. One, that contract work should not alter or affect the completion of in-house surveys, and two, some provision should be made to facilitate the acceptance of outside funds. Currently NYSDEC does not have an easy system for accepting contract dollars from outside sources. Furthermore, any monies earned could not be ear marked for the Lake Ontario program. If funds could be paid directly to the Lake Ontario program, it would provide some incentive for unit staff to actively seek additional outside work, coalitions or other funding sources. Staff suggested that the GLFC, in their coordinating role, might be able to help improve the flow of funds between resource agencies and outside funding sources.

VESSEL SUITABILITY: Both vessel crew and scientific personnel agree the SETH GREEN meets current program needs. Positive characteristics of the SETH GREEN include: a strong, safe hull; excellent deck space for its size; a protected, comfortable deck enclosure (wet lab); and relatively inexpensive operating costs. Negatives include: slow speed and extremely tight crew quarters. On balance, the SETH GREEN has proved to be an excellent fisheries survey vessel and should provide adequate service for the next 20 years. Program managers should recognize, however, that engine overhauls will be needed and continued repairs for aging components will be required to maintain vessel fitness.

VESSEL PROGRAM SUMMARY

NAME: **NAMAYCUSH and STEELCRAFT**
OPERATOR: Ontario Ministry of Natural Resources (OMNR)
LOCATION: Lake Ontario
HOME PORT: Glenora, Ontario
CAPTAIN: Chuck Wood
OPERATIONS MANAGER: Dawn Walsh
LAB DIRECTORS: Tom Stewart (Assessment) and John Casselman (Research)

VESSEL DESCRIPTION: The Glenora Fisheries Station uses a small fleet of fisheries vessels to carry out a field program on the eastern end of Lake Ontario. Several small (20-25 ft.) outboard powered boats are used for near shore netting (<100 ft.) and three larger steel vessels are used for deeper sampling. Two steel vessels are diesel powered and have gillnetting and trawling capabilities, however, their operations are limited to the eastern basin and the Bay of Quinte. The third steel boat is used for stocking. These boats, however, are considered too small to be safely operated for any extended, open lake surveys of Lake Ontario.

The NAMAYCUSH (background of photo) is a 49 x 12 x 4.5 ft., 28 ton steel fisheries research vessel designed and built by Matheson Shipyard Ltd. It was purchased as a new boat in 1954 and was repowered with a single Detroit 6V-71 diesel engine (180 hp.) in 1989. Since then, 1,200 hours have been accumulated on the main engine. Other equipment includes an Onan 20 kW generator, a Crossley 24 in. gillnet lifter, two Carron main winches (~450 ft. of 5/16 in. cable), a half-ton capacity crane and a net drum. Navigational aids include: Comnav 2001 autopilot, Furuno FR240 radar, Furuno GP-36 GPS, Furuno LC-90 Loran-C, Furuno FE 606 and FCV 552 color sounders, and a Standard Horizon marine radio. There is 120 sq. ft. of open deck space on the aft deck and 48 sq. ft. of covered wet lab space just forward of the aft deck. The NAMAYCUSH is used principally for index trawling and gillnetting in the Bay of Quinte.

The STEELCRAFT was acquired by OMNR in 1984 in a buyout of a Lake Huron fisherman. It measures 45 x 12 x 5 ft. and displaces 23 tons, and was designed and built by Steelcraft Shipyard Ltd. in 1945. Like the NAMAYCUSH, it is also powered by a Detroit Diesel 6V-71. The main engine was rebuilt in 1984 as part of a refit completed just prior to delivery to the Glenora Fisheries Station. Other equipment is also identical to that aboard the NAMAYCUSH: Onan 20 kW generator, Crossley 24 in. lifter, two Carron main winches (~1,000 ft. of 5/16 in. cable), and a net drum. Wheelhouse electronics include a Comnav 2001 autopilot, Furuno 1931 radar, Furuno GP-36 GPS, Furuno LC-90 Loran C, Furuno FCV 662 and Furuno FE 400 sounders, and an Apelco marine radio. In addition to the nearly identical outfitting of both boats, there is roughly the same open deck and covered deck space on the STEELCRAFT. The STEELCRAFT is used primarily for index trawling and deep water gillnetting in the eastern basin of Lake Ontario.

In addition to these two fisheries research vessels, the Glenora Station also operates the DOROTHY J, which was acquired by OMNR in 1986 in a buyout of a Lake Ontario fisherman. It measures 40 x 13 x 3.5 ft. and displaces 15 tons, and was designed and built by Ralph Hurley at Port Burwell, Ontario in 1976. This fully enclosed gillnet tug is powered by a Perkins 6.354 diesel engine (120HP) and is equipped with a 30 inch Crossley gillnet lifter. The electronics include Wood-Freeman auto pilot, Furuno FR 240 radar, Furuno FMV-605 sounder, Furuno GP-500 GPS, Furuno LC-90 loran-C, Apelco VHF radio. In the past, the DOROTHY J was used as a gillnetter, but recently has been used solely for stocking lake trout during April and May (15 days). Due to the limited use of the DOROTHY J, the following discussion of operation and maintenance expenses will focus on the operation of the NAMAYCUSH and the STEELCRAFT.

VESSEL OPERATION and MAINTENANCE: Not only are both vessels similarly equipped, but their use is nearly identical as well. From 1998 through 2000 field seasons, the NAMAYCUSH and STEELCRAFT averaged 25 and 28 operational days per season and accumulated 99 and 111 hours on their main engines, respectively. The average fuel consumption was 349 and 375 gallons per season for the NAMAYCUSH and STEELCRAFT, respectively. Both boats used about 3.5 gallons of fuel per hour of operation. Seasonal fuel costs for each boat averaged approximately $335 (US)[4].

The captain and crew do all of the routine maintenance (e.g., oil changes, fuel filter and belt replacements etc.) on both vessels. The captain decides what needs to be done to maintain the vessels. More extensive repairs are done by the equipment manufacturer's technicians or in the shipyard. The engine manufacturer's factory mechanic does all the mechanical work on the main engine other than routine maintenance. In the event of a major mechanical problem with either the NAMAYCUSH or the STEELCRAFT, there is no lost program time because both vessels are virtually interchangeable. Recently, there have been no major breakdowns for any of the boats. If there were, there is good local access to shipyard facilities and skilled labor. In the past, OMNR has provided good support for maintenance and operational expenses for Glenora's vessel program.

Maintenance costs for the two vessels were approximated using budget allocations for the last three seasons. For routine maintenance $100 was allotted for each vessel each year. Each vessel is hauled every winter, and prior to the new season, the bottom is cleaned and painted. The cost for each winter haul-out is $1,155 per vessel. The cost of annual inspections of the inflatable life rafts was $782 for each vessel. New equipment installed on both boats in the last three years included new radar for $2,500, two new GPSs for $1,500 each, new trawl cable for $1,400 and a new radio for $350. These costs were annualized and added to the annual maintenance costs for a total annual maintenance expense of $3,245 per vessel. Adding these expenses to the cost of fuel yields an annual operating expense of $3,580 or $133 per day, assuming an average 27-day operating season. Operational costs for both vessels would be $7,160 per 54-day operational season.

SAFETY, SURVEYS and INSPECTIONS: Both vessels had inclining experiments completed in 1990 by Stephen Leake, marine architect for German and Milne Ltd., Ottawa, Ontario. The architects recommended adding ballast to the NAMAYCUSH to correct some stability problems, and ballast was also added to the STEELCRAFT by Glenora staff. Although the handling characteristics of both boats improved, concerns with stability are one of the reasons these two vessels are not used routinely in the open waters of Lake Ontario. Both vessels have a similar complement of safety gear: 6-person inflatable life rafts, six survival suits, 6 PFDs and six work vests. Each vessel has two, ten-pound portable extinguishers, but there are no engine room extinguishing systems, e.g., Halon or CO2. There are no alarms, smoke detectors, or fireman outfits. Each vessel has a belt driven fire pump. OMNR requires all its new employees to take Marine Emergency Duties (MED 1-A) training, which covers worker safety afloat, including fire fighter training. There is also an orientation day for new workers and a requirement that all small boat operators have a pleasure boat operator's certificate. In addition, CPR training is updated annually and First-Aid training is renewed every three years.

Annual haul-outs allow the captain to visually inspect each hull at the end of each season of operation. In addition, the Canadian Coast Guard (CCG) requires an inspection of the NAMAYCUSH every four years, but not the STEELCRAFT. The STEELCRAFT comes under the registered tonnage requirement for inspected vessels. The CCG inspection of the NAMAYCUSH considers hull integrity, lifesaving gear and navigational lighting. Inspections of the mechanical, electrical, plumbing and hydraulic systems are not required. Plating wastage was estimated by locating an area of greatest pitting, drilling a hole through the center of the pit, measuring the amount of steel and then putting a bolt through the hole and welding it. CCG inspections also call for removing both the drive shaft and rudders to assess bearing integrity and potential leakage.

VESSEL STAFFING: There is no crew specifically assigned to either the NAMAYCUSH or the STEELCRAFT.

[4] All subsequent cost figures are expressed as US dollars by assuming $1 US buys $1.43 Canadian. Cost of fuel was based on $0.44 per liter.

There is a single, permanent vessel captain, however, who is responsible for the maintenance and operation of both of these vessels. Currently the captain spends 75 percent of his time on vessel support and the remaining time on other activities related to the overall fisheries program. During the field season, Glenora Station also hires a seasonal captain to help with vessel operations. The normal crew complement is usually five persons for each vessel and includes the captain, a permanent technician (who has had MEDI training), and three seasonal technicians or students. This approach to vessel staffing by OMNR has changed from 20-25 years ago when there were smaller, permanent crews that operated and maintained the vessels.

Qualifications for the captain requires a master's license, MED 1-A training and some fishing experience. The current captain was recruited internally from the resource technician series[5], but any future captains will likely come from outside the agency and local area. The starting and final salary for an OMNR vessel captain is $28,428 and $32,782, respectively. This range includes two Resource Technician grades (Senior 1 & 2) with three steps in each grade level. There is no provision for overtime compensation to captains; neither time-and-half pay nor compensatory time off. In addition, there is no career ladder for Ontario's vessel captains; i.e., the difference between start and final salaries is small. The fish technicians that make up the remainder of the crew have starting and final salaries of $24,723 to $27,620. In contrast to the captain, fish technicians who work on the vessels can accrue time-and-half compensatory time off. Since the vessels are only operating on a day-trip status, overtime and travel costs are generally minimal.

A simulation of the NAMAYCUSH or STEELCRAFT vessel crew operating expense was calculated assuming a two-person crew, with an average annual salary for the captain of $30,605 and an annual average salary for a technician of $26,172. This combined crew salary is $56,777, or $218 per day for a 260-day work year. Assuming a 27-day operating season for the vessels, staff operating costs would be $5,886 for operating either the NAMAYCUSH or the STEELCRAFT. Combining operating, maintenance and staff costs yields a total operating expense of $9,466 or $350 per operating day (27-day season) for either boat.

PROGRAM DESCRIPTION: Glenora Station's current vessel program for the NAMAYCUSH and the STEELCRAFT is confined to an eleven-week period from the end of June to mid-September. Normally, this entails about 27 days for each vessel, or about a 50-60 day program for both. The vessel program represents approximately 25-30 percent of Glenora's overall field program. Other activities include commercial catch sampling, eel ladder monitoring, walleye tagging study, egg collections, creel surveys, Ganaraska rainbow trout studies, hydroacoustic prey fish assessment, as well as near shore sampling activities and stream electroshocking sampling. Outboard powered work skiffs are used for all the near shore sampling (<100 ft.) excepting trawling. The NAMAYCUSH and STEELCRAFT are used to collect fish from deeper water, and to do all the bottom trawling, regardless of depth.

The Community Indexing Program is the core monitoring and assessment activity undertaken by the Glenora Fisheries Station. Begun in the late-50s, this program was designed to sample a broad array of species using graded mesh gillnets and trawls at several index sites within the eastern basin of Lake Ontario and the Bay of Quinte. Sampling sites and sampling protocols have been modified over the years, but currently the approach is to fish three days per week from late-June to August, and then fish four days per week until mid-September. Compared to the original sample design, now there is greater diversification – wider area covered, more near shore sites visited and less attention to few, deeper stations. Other than few days spent on stocking, approximately 95 percent of the vessel operating time is allotted to fisheries work, and there is very little habitat work and limnological sampling.

One of the principal deficiencies with Glenora's current Lake Ontario program is lack of open lake sampling; described by one Glenora staffer as a "vast vacuum for the offshore." Nearly all of the current vessel effort is focused on the Bay of Quinte and the eastern basin of Lake Ontario. Little attention and effort is directed to the open lake because Glenora does not have a suitable vessel for safe operation in offshore waters. Size and stability are the major issues that limit the use of the NAMAYCUSH and the STEELCRAFT. However, with

[5] The current captain also completed necessary course work and testing for his boat operator's license.

additional people and dollar support more could have been done offshore, up to a point[6]. Currently OMNR is working with NYSDEC in a cooperative prey fish assessment program using hydroacoustic and midwater trawl gear. In the past, OMNR has also collaborated with USGS – Oswego in open lake sampling aboard the KAHO. This was done to help mitigate Glenora's inability to collect information from the open waters of Lake Ontario.

The approach that the Glenora Station has taken toward implementing their field program is to cover a relatively restricted geographic area, e.g., eastern Lake Ontario, and to use a number of workboats operating on a day-trip basis. There are no extended surveys that require living aboard the vessels and work is scheduled so that there is minimal overtime and travel costs. This operational scheme is very efficient, but staff caution that working harder to compensate for personnel and budget cuts may compromise effectiveness, e.g., people are pushed to the maximum, maintaining equipment is a lower priority etc. Again, there are no dedicated vessel crews, only a single, permanent captain who is responsible for the vessels. Most technical staff move from one activity to another, depending on what the needs are on any given day. Glenora's large vessel program now encompasses about 50-60 days per year, but could be greater in the future if they acquire a suitable offshore research vessel.

Most core activities are funded internally with OMNR funds; however, in some instances some core programming needed external funding. Beyond core program, external sources of funds are required. This affects the research to a greater degree than the assessment unit because the two units are funded and administered differently. In practice, nearly 50 percent of research is supported with outside funds, whereas grant dollars represent a small component of the assessment unit's budget. Increasingly however the assessment unit is relying more on grant dollars and partnerships to maintain and augment programs. There is no contract work done by either unit for the sole purpose of generating operating funds. But, there have been numerous collaborative studies when they serve the programmatic interests of the Glenora Station, as well as provide funding support for vessels and staff. Not unlike many of the other fisheries stations on the Great Lakes, the information collected by Glenora's vessels exceeds the analytical ability to process the information. Glenora has a strong archival program and they believe they should, as a normal function, collect far more information than they can analyze. In assessing OMNR's support of their current program, Glenora staff feel they receive adequate support to operate and maintain their vessels, but feel their capabilities are limited by staffing constraints.

FUTURE PROGRAM: The biggest concern for Glenora's fisheries program in 20-25 years is to expand their geographic horizon. Glenora staff believe they have done an excellent job with the eastern end of Lake Ontario, but that this gain in knowledge and understanding has come at the expense of ignoring the larger, offshore component of Lake Ontario. This imbalance is linked to an inadequate vessel(s) and staff know how important it is to have a new research vessel that will permit them to collect a wide array of biological information from anywhere within the lake system. Aside from offshore vessel needs, there are other issues that may demand additional effort with exotics, lake trout, Atlantic salmon, habitat, species at risk, salmon production in tributaries and better understanding of land-lake interfaces.

Not only is offshore vessel capability linked to the quality and content of Glenora's overall programming, but it will also affect the ability of research and assessment to attract additional funding. Without the ability to do offshore fisheries and limnological work, there may be limited interest by outside academics, partner agencies, and institutions in collaborating with Glenora's staff.. This also suggests there will have to a process for balancing short-term, grant supported research with core program activities that will be extended to the offshore area of Lake Ontario.

Future staff issues will likely affect what the Glenora Station can accomplish in the future. In the course of the last ten years Glenora's program has regressed, particularly in offshore activities. Cooperative lake trout and prey fish sampling programs with NYSDEC and UGSG were terminated in 1996 because of staff and funding cuts. These programs provided offshore coverage, but were more susceptible to budgetary cuts, when compared to long-

[6] With better funding a vessel could have been moved to an open lake port, staff could have been assigned to the base, travel and overtime support could have been provided, and work could have been completed during periods of good weather.

term sampling programs with 30-40 year databases. Broadening their geographic perspective of Lake Ontario will not only require a new research vessel, but it will also necessitate a dedicated technical crew for maintenance and operational support. The addition of a new boat without appropriate new staffing may force cuts in current program. Glenora staff want a future where they mend their geographic and programmatic deficiencies, but not at the expense of gutting existing programs they have supported for more than four decades. Glenora is guardedly optimistic that the next 20-25 years may bring improvements in staffing. There is the hope that staff cuts may have finally hit bottom, and the future has to be better.

VESSEL SUITABILITY and FITNESS: The NAMAYCUSH and STEELCRAFT are very similar vessels, they serve better as a backup than to complement one another's capabilities. Their strengths are they are well suited for near shore, protected water work, and they have easy access to shallow water harbors. On the negative side, both vessels are 50+ years old, they both are limited in their ability to operate safely in the open lake and their lack of crew accommodations limits their use as day-boats. However, OMNR seems to have a reasonable approach to operating the NAMAYCUSH and STEELCRAFT. OMNR refit both boats within the last 15 years, they provide ample operation and maintenance funds, they have established limits for operating the boats safely, and the CCG provides detailed inspections every four years. Regardless of how effective Glenora manages their vessels and their fisheries program, these boats do not meet their station's current or future needs – they do not provide a suitable tool(s) for operating in the offshore, open water environment of Lake Ontario.

Glenora staff have complained for years about poor vessel capability and their resultant restricted geographic perspective of Lake Ontario, but only recently have they begun the formal process of vessel replacement. There was a recent report submitted to OMNR's budget office outlining capital infrastructure needs within the Great Lakes. Included in the report were two observations: 1) that many of OMNR's fisheries vessels are ageing and are not meeting program needs, and 2) that replacing these boats will cost $500,000 or more. The report also emphasized that failure to address these infrastructure issues may haunt the ministry in years to come. If OMNR's budget office endorses these recommendations, then the next phase in the process will be to outline and prioritize specific vessels for replacement. The following stage in the process will include choosing an architect or marine consultant and beginning the design of a new vessel.

VESSEL PROGRAM SUMMARY

NAME: **KAHO**
OPERATOR: United States Geographic Service –Biological Resources Division
Great Lakes Science Center (GLSC)
LOCATION: Lake Ontario
HOME PORT: Oswego, New York
CAPTAIN: Ed Taber
STATION ADMINISTRATOR: Robert O'Gorman

VESSEL DESCRIPTION: The KAHO is a 65 x 18 x 9 ft., 83 ton steel fisheries research vessel designed by the University of Michigan, built by Hans Hansen of Toledo Ohio in 1961 and operated by the GLSC, Lake Ontario Biological Station (LOBS) in Oswego, NY. The KAHO was re-powered in 1987 with twin Cummins N-855 main diesels, and a Cummins 6B 30kW generator, a MYANMAR/KOHLER auxiliary generator, and Twin Disc reduction gears and the main engines have accumulated 9,200 operating hours since they were installed. Other equipment includes: split winches (2,000 ft., 3/8 in cable), twin-waterfall net drums, HIAB articulating hydraulic crane, limnological winch and a Bandolier gillnet lifter. Wheelhouse electronics include: Comnav 2001 autopilot (installed 2000), Raytheon R81X and R41X radars, Northstar 951X GPS, Raytheon 575 GPS, Simrad EY-M sounder, Raytheon 850 color sounder and three marine radios (ICOM, Horizon and Raytheon). Workspace areas (sq. ft.) are: aft work deck 400, galley 110, and bunk 150 (with separate provision for women and men).

VESSEL OPERATION and MAINTENANCE COSTS: The vessel program for the KAHO totaled 94, 83 and 80 operating days each year for the 1998-2000 season, averaging 86 days per year. Engine use during 1998-2000 averaged 566 hours per year, or 6.6 hours per operating day. All this sampling effort was expended on fishery surveys, with 73 and 27 percent of scheduled days directed at bottom trawling and gill netting, respectively. Total fuel use for the KAHO was 5,178, 4,492 and 3,950 gallons for the 1998-2000 field seasons. Average fuel use was 4,540 gallons per season and 8.0 gallons per hour. Seasonal fuel costs for the last three years averaged $4,512.

Maintenance and repair cost for the KAHO for the 1998-2000 seasons averaged $45,000 per year, which included the new equipment items noted below. Haul-outs are on a 5-year cycle; the last one was completed in 1999 at a cost of $6,500. New equipment and major maintenance purchase for the KAHO in the last three years included: 1998: automatic level wind installed on trawl winches; 2000: engine room fire suppression system refurbished and upgraded to current standards, hydraulic power system for deck equipment re-engineered and upgraded (all hydraulic lines, control valves, and hoses replaced, new hydraulic pump installed, emergency hydraulic pump installed), replaced hydraulic/electric steering system (new electric motor, hydraulic cylinders, hydraulic pump, hydraulic fluid reservoir and hydraulic lines), new autopilot, compass, and helm steering unit installed, emergency steering system replaced ($50,000 spent on hydraulic/steering upgrades), DC electrical distribution panel installed, fuel filtering system installed ($900), new weather instrument package ($2,500), and new marine radios ($800).

The engineer is responsible for maintaining all mechanical systems aboard the KAHO. He services the engines daily, replaces filters and belts when required and does some engine and mechanical system repair. Major engine and system refits, overhauls or replacements are done by factory mechanics or other trained professionals. Total annual cost for fuel, maintenance (haul-out cost annualized), and new equipment (annualized) was $50,812. This estimate was inflated by expensive repair and equipment replacement costs. Assuming an 86-day season average, the average daily operational cost was $591.

The GLSC runs the largest fleet of fisheries research vessels on the Great Lakes (I. e., five vessels). All maintenance and repair activities are coordinated and administered through the GLSC in Ann Arbor, Michigan. In

2000, the LOBS Chief was given responsibility for the KAHO's operational budget (i.e., fuel, crew overtime and per diem, dockage, and day to day operating costs).

In the recent past, mechanical breakdowns, and insufficient operating funds, and government shutdowns/travel restrictions at start of the fiscal year resulted in lost operating days and, in some instances, canceled surveys. Some of the lost time and program might have been averted with better funding for preventive maintenance and, in one instance, better contractor performance (e.g., the contractor performing preventative maintenance on the trawl winches did not reinstall the gears correctly, which resulted in their premature failure and lost operating days). It is usually more cost effective to repair equipment before it fails, and to do it in the winter when the vessel is normally not in operation. Although emergency repair funds usually have been quickly released when a major breakdown has occurred in the middle of a survey, the repair costs are usually greater during the field season, because shipyards or skilled personnel are busy during summer and can command premium pay for emergency repair work.

Station staff feel that they are still in a catch-up mode, trying to address all of the maintenance needs foregone during the budgetary squeeze in the final years with the USFWS and the initial years with NBS and USGS, and would like to see more resources allocated to preventive maintenance, although they note that vessel support of the KAHO is now improved to the point that it is "just enough" to meet minimum needs. The captain and engineer sense that the frequency of repairs has increased, suggesting that they will require additional funds to meet future maintenance and operational needs.

VESSEL STAFFING: Staffing for the KAHO during normal trawling operations is a captain, an engineer, a biologist and a bio-technician. During gill-net surveys, an additional biologist or technician is added to help with the more labor-intensive work. During vessel operations, the captain is responsible for the safety of crew and vessel and makes all the decisions regarding safe vessel operation. The LOBS Chief supervises the captain and engineer. The biologist-in-charge on the vessel ensures that the survey is completed properly and makes any needed adjustments to the cruise schedule.

The present captain has been on the KAHO since 1978, working first as its engineer and as captain for the last 5 years. Job requirements include a United States Coast Guard boat operator's certificate, the ability to handle and repair fishing gear, the ability to maintain various records and logs and the ability to communicate well. The salary range for a GLSC vessel captain is $49,473 to $57,815. Captains currently are compensated for overtime work with time-and-half pay. The engineer on the KAHO has been in the position for 2 years. Job requirements for the engineer include skill in the operation and maintenance of all the mechanical systems found on each vessel and in the operation and maintenance of fire fighting and safety equipment, and writing skills as needed to maintain various maintenance logs and equipment inventories. The salary range for the engineer is $38,771 to $45,271. Overtime compensation for both captain and engineer can add several thousand dollars to their salaries annually. Travel expense information was not available, but a per diem allowance is provided for meals during surveys. A simulation of the total vessel crew operating expense, assuming 10 years of service for captain and engineer, is $103,086 or $396 per day. Assuming an 86-day operating season, the staffing costs to run the KAHO would be $34,097, not including overtime compensation. Combining operating expenses and vessel crew salaries yields a total expense of $84,909 or $987 per operating day (86-day season), plus the per diem allowance for meals during field operations.

SAFETY, SURVEYS and INSPECTIONS: The KAHO's first comprehensive marine survey was completed in 1997 and included a detailed examination of the internal structure, watertight integrity, and hull plate condition. The surveyor recommended repairs or modifications to the steering, hydraulic, and engine room fire-fighting systems and all three systems have been replaced, although the entire list of recommended repairs and modifications has not been completed. The surveyors also recommended that the vessel have a dedicated engineer (at the time, engineers were being detailed from other vessels for each cruise) and an engineer was hired in spring 2000. A hull inspection was done in 1991 by the USCG, but a stability test has not been performed.

The safety gear aboard the KAHO includes a Switlick 10-person life raft, 7 Imperial survival suits, 8

Mustang PFDs, 10 Mustang exposure suits, and an EPIRB. There is a CO_2 flooding system for the engine room, two fire pumps (one electric, one belt driven), and 3 smoke detectors. There is no fireman's outfit or emergency breathing devices. The crew has had fire fighting; CPR and First-Aid training and biologists and technician have had CPR and First-Aid training. There are annual updates on CPR and First-Aid. The captain received fire-fighting training once, and the engineer had extensive fire fighting and damage control training in the Navy. In-pool training with PFDs and life rafts is conducted periodically in Ann Arbor, most recently in April 2001.

The KAHO'S crew believes that vessel crews operating on the Great Lakes could spend more time addressing safety issues and training and that safety training should be and required for all persons who work on the vessel. They see heightened accident risks with some personnel who come aboard with little, if any, vessel safety training or experience. This increased risk is particularly true in bad weather when unstable footing and seasickness are likely. The KAHO's crew also cautions that using 2-person crews on non-fishing, transit days is risky because they could not handle some emergency situations that might occur. The crew believes falling overboard may be one of the major risks facing vessel crews working on the Great Lakes and that more attention needs to be given to man-overboard drills.

PROGRAM DESCRIPTION: From 1998-2000, the KAHO averaged 86 operating days per year on fish stock assessment activities. The 2000 vessel program for the KAHO was composed of seven cruises (mostly 12 days duration) beginning on April 24 and continuing through November 3. All of these cruises were directed toward fish stock assessment activities using bottom trawls (73% of scheduled effort) and gill nets (27% of effort). In addition, plankton samples were collected throughout the season during most of these surveys.

The current biological program is aimed mainly at prey fish assessment and lake trout rehabilitation. The seasonal timing sequence for each of the prey fish surveys is designed to optimize catches. Alewives were surveyed in April-May, smelt in June, and sculpins in October. Two other surveys provide information to support the lake trout rehabilitation program in Lake Ontario. A bottom trawl survey of juvenile lake trout was completed each July-August, and adult lake trout were collected each September. These surveys were initiated soon after USFWS established the LOBS in 1978. All of these activities, excepting sculpin assessment, are done in conjunction with NYDEC's Cape Vincent Fisheries Station staff and their vessel the SETH GREEN. This cooperative approach has been ongoing since these surveys began and it includes planning, sampling, data sharing and co-authored annual reports. Furthermore, the cooperation has extended to assisting each other at times when staffing or vessel problems made it difficult for one of the agencies to meet their sampling responsibilities.

The cruise schedule for 2000 is remarkably similar to the KAHO's schedule 20 years ago. The only major change was the absence of a cruise focused on reproductive success of yellow perch in the northeastern basin; that cruise was dropped in 1998 due to staff shortages and lack of operating funds. Based on the 2000 schedule, 92 percent of survey effort focused on maintaining long-term data series. A deepwater prey fish assessment survey and lake trout thiamine study are shorter-term activities that constituted 8 percent of the 2000 program. In addition to these scheduled program activities, the LOBS supported numerous "piggy-back" research and collaborative activities.

The LOBS also performed contract work, which usually had a strong link to program interests (e.g., *Diporeia* study), but some was done solely to earn operating dollars (e.g., military debris retrieval). In the final years under the USFWS, and under NBS and now USGS, leaders of the lake programs were encouraged to seek outside funding to help support the base-funded studies that generate their long-term fisheries data sets. Most of the money (less overhead) earned through contract work by the KAHO has accrued to the LOBS to help support the field program.

The LOBS staff indicate that in the final years with USFWS, with NBS, and in the initial years with USGS, base funding of their core, long-term program elements have not been adequate. However, GLSC staff add that it is now improving. They believe that operating budgets and staffing are insufficient to fully implement their current program and characterize their budgets over the last ten years as "erratic." They report situations in the past where there was not enough money to operate the KAHO, and where (in 1994) station staff accepted funding

from a citizen group for fuel, per diem, and dockage to conduct a cruise and had to solicit funding from outside sources for fuel. Staff reductions also reduced the station's productive capacity 3 years ago, when they lost one of three biologists. The current feeling is that the KAHO's potential is not fully realized because there is insufficient analytical capacity (scientists) to process the information that is currently being collected.

FUTURE PROGRAM: LOBS staff hope they will soon return to staffing levels they had in the 1980s, but they are not optimistic. They believe the station's program in 20-25 years will probably change very little and that the databases will be 40 years in length and even more valuable. However, they caution that if future staffing and funding do not improve, most of the program resources will be committed to maintaining the long-term data sets, at the expense of program flexibility, thus preventing new program expansion. If funding and staffing improve, they hope to schedule more vessel time for the KAHO, spend less time soliciting funds and writing funding proposals, employ better technology, expend more lake-wide effort on lake trout, and resume yellow perch work that was discontinued after 1997.

Over the next 20-25 years, the cooperative GLSC-NYDEC prey fish assessment program in Lake Ontario should continue to yield improved understanding of the fish community. Station scientists also expect that "piggy-back" research and collaborative work will continue to grow, particularly by integrating lower trophic level studies into the fisheries surveys. However, station scientists also caution that doing more collaborative work may have limits, especially if the time needed to work on associated projects diminishes what they see as their main responsibility – preyfish and lake trout research.

VESSEL SUITABILITY and FITNESS: During 40 years of operating on the Great Lakes, the KAHO has proven to be an extremely capable fisheries research vessel. The vessel's strengths include flexibility and comfortable crew accommodations. Lack of wet or dry labs and too much exposed work deck space are deficiencies the crew would like to see changed. Currently the KAHO is meeting program needs in Lake Ontario. Whether it meets future needs will depend primarily on how much base funding is provided for vessel maintenance and operations. The captain and engineer believe the KAHO is in "good shape", although the hull and electrical system need some work and all of the recommendations provided by a marine surveyor in 1997 have yet to be completely addressed. Station staff do not think the KAHO can be safely operated for another 20-25 years without a major refit sometime in the next 15 years. LOBS staff are unaware of any formal discussion by GLSC management about whether the KAHO will be replaced or refitted and they doubt they will be involved in the decision. Vessel management actions have been aimed at keeping the KAHO operating safely and on schedule to maintain long-term data sets. In several respects the KAHO would be a good candidate for a major refit. It is seaworthy, comfortable, and has an extremely flexible design; engines, reduction gears and generators are relatively new with low operating hours; all deck equipment has been replaced within the last 5 years; and hydraulic, steering, and autopilot systems were recently replaced. Furthermore, needed wet and dry lab workspace could be created with minimal restructuring.

VESSEL PROGRAM SUMMARY

NAME: **ARGO**
OPERATOR: New York State Department of Environmental Conservation (NYSDEC)
LOCATION: Lake Erie
HOME PORT: Dunkirk, New York
CAPTAIN: Doug Zeller
LAB DIRECTOR: Bill Culligan

VESSEL DESCRIPTION: The ARGO is a 42x16x5 ft., 36 ton steel fisheries research vessel designed by the Napier Co., Arbroath, Scotland. It was built by Goudy and Stevens in East Booth Bay Harbor, Maine in 1986. The AGRO is a stern trawler design propelled by a single Lugger 6466A diesel, which also powers the hydraulic system. The ARGO is fitted with 2 main winches (800 ft., 5/16" cable) mounted overhead on the covered deck, a Crossley 12 in. gill net hauler, and a 4ft.x 4ft. net drum for the trawl. Wheelhouse electronics include: Wood-Freeman autopilot, Furuno radar, Northstar GPS and Loran, Sitex and Eagle sounders, and ICOM and Unidex marine radios. Available spaces (sq. ft.) include: deck 225, wet lab/enclosed deck 120, and galley/crew quarters 129.

VESSEL OPERATION and MAINTENANCE: From 1998-2000, The ARGO averaged 71 operational days per year, and averaged 544 hours per year on the main engine, or 7.7 hours. per day. Total annual fuel use averaged 2,251 gallons for 1998-2000 field seasons, which represents a 4.1-gallon per hr. average. The three-year average fuel cost was $1,537 per year.

Maintenance and repair costs were $9,329, $3,979 and $16,145 for 1998-00, respectively. These costs included haul-outs reflected in 1998 and 2000 expenses. Haul-outs are normally scheduled on a two-year cycle. The three-year average for combined maintenance and annualized haul-out costs was $9,818. New equipment purchased and installed during the last three years included: global positioning system ($1,000), computer ($2,500) and a sounder ($200). Total annual cost for fuel, maintenance plus haul-out and new equipment (annualized) was $12,588. These operational costs averaged $177 per operating day, assuming a 71 operating day average for the ARGO during the 1998-2000 field seasons.

SAFETY: A stability test (inclining experiment) of the ARGO was completed at the time of commissioning in 1986 by the vessels designer Maurice Napier. No modifications or added weight have occurred since then that would alter the findings from the initial stability test. For fire fighting, the ARGO is outfitted with a Halon system in the engine room, two-1 ½ in. fire pumps (one off the main engine and the other operated electrically), and various alarms. There was no portable pump for fire fighting or de-watering, no fireman's outfits (SCBA), no emergency escape breathing devices and no USCG fire fighting training for the crew. The ARGO had a complete complement of approved PFDs with lights, life raft, EPIRBS and survival suits. Safety training for the ARGO's crew includes in-water survival suit familiarization drills, CPR and first-aid training and aquatic safety training sponsored by NYSDEC, Cornell University and the New York Chapter of the American Fisheries Society. Safety-at-Sea tapes are also available for crew review.

SURVEYS and INSPECTIONS: There have been no formal USCG safety inspections nor have there been any hull or vessel surveys, aside from an annual inspection of the main engine by a factory trained mechanic. During haul-outs the captain and shipyard staff do a visual inspection of hull plating and welds; no problems have noted to date. The ARGO is in excellent condition, and to date, there has been no loss of survey time due to mechanical failure.

VESSEL STAFFING: Normal staffing of the ARGO consists of a 4-5 member crew: the captain, a biologist, two permanent technicians, and on gillnet surveys, a seasonal technician. The biologist and technicians are involved in all aspects of gear use and data processing. Technicians also assist the captain running the boat, maintenance and operating fishing gear. They also assist the biologist in data processing.

The current requirements for a research vessel captain for the New York State Department of Environmental Conservation (NYSDEC) are at least 1 year experience operating a fishing trawler or fisheries research vessel and an USCG tonnage license. The recruitment protocol for vessel captain involves advertising for the position (usually the National Fisherman), evaluating experience and references, conducting an interview, and then choosing the best candidate. The ARGO's captain has ten years experience in the position and currently holds a 50-ton license. The starting and final salaries for a NYSDEC captain are $32,076 and $39,860, per year respectively. There is no formal career ladder for NYSDEC vessel captains, other than a series of in-grade longevity increases. From 1998-2000, the ARGO's captain averaged 77 hours overtime per year and earned another $2,300 in overtime pay. Nearly all of the work done by the ARGO and its crew is on a day-trip basis, consequently, travel costs are minimal, and overtime costs are restricted primarily to long day trips.

Both permanent technicians have nearly ten years experience, and one is a licensed operator. Technicians need at least a two-year associate's degree in environmental science and they are hired off a list developed from a competitive test of knowledge and skills. Their annual starting and final salaries are $25,451 and $32,134. Each technician averaged an additional 60 hours overtime/year earning another $1,450 per year. Travel expenses for each of the vessel crew averaged $150 per year. A simulation of the total vessel crew annual operating expense, assuming median salaries for captain and technicians is $64,611 or $249 per day, assuming 260-day work year. For the 71-day vessel season, crew salaries would be $17,679. These figures do not include the expense for biologists or for a seasonal technician who joins the crew during gillnet surveys. Combining operating, maintenance and staff costs yields a total expense of $30,267 or $426 per operating day.

PROGRAM DESCRIPTION: In 2000, the scheduled field season (not actual operational days) consisted of six surveys: May-October limnological surveys (15 days), May lake trout stocking (5 days), July hydroacoustics survey (13 days), August lake trout assessment survey (22 days), September warmwater fish stock assessment survey (22 days) and October young-of-year trawling (6 days). Of these 83 scheduled days, 76% were fisheries assessments, 18% were limnological surveys and 6% of the program effort was used for fish stocking activities. For the scheduled fisheries activities, 70% of effort utilized gillnets and 30% used trawls (21% midwater and 9% bottom trawls). Most of the long-term surveys have changed little since their inception. Eastern Basin smelt assessment, however, evolved from an initial bottom trawling survey to the current cooperative acoutic/midwater trawl assessment.

Most of the ARGO's fisheries investigations are directed toward maintaining long-term data series, which for NYSDEC's Lake Erie program began near the time of delivery of the ARGO in 1986. Eighty-one percent of the scheduled effort in 2000 were programs that began in 1986. Although the intent of these monitoring programs is to maintain a consistent sampling approach, there have been some modifications and adjustments to account for changes in Lake Erie's biological and physical conditions. NYSDEC staff cooperate with Pennsylvania Fish Commission, USGS – Sandusky and OMNR – Port Dover on nearly all of their survey programs. They also contribute data and expertise to several of the Lake Erie task group activities coordinated through the GLFC.

If 100-120 operating days represents the maximum potential use of a fisheries research vessel on the Great Lakes, then the 71 day average operating use of the ARGO represents 30-40% unused capacity. The crew of the ARGO, however, contributes another 35% of their field effort using smaller boats to do walleye tagging, fry sampling, limnological sampling and other activities. Staff felt the ARGO's program was not constrained by vessel capability, vessel funding or scientific staffing. They noted, however, that given additional monies and staff the ARGO could provide more information. Dunkirk staff feel the ARGO has more potential to generate data than staff have the ability to process.

The Dunkirk station just completed a 2-year, limnological research contract project for Cornell University. Relative to the prospects of conducting on-going contract work, the Dunkirk staff are not actively soliciting researchers for additional work. It is not necessary to use the ARGO and crew to generate operating or program funds for the Lake Erie project because they receive excellent funding support from NYSDEC. Further, there is little incentive to sell ship time, since there is not an easy or effective protocol for outside funds to flow directly to the Dunkirk station. Station staff are, however, receptive to any cooperative arrangements with other agencies or institutions that have similar programmatic interests.

FUTURE PROGRAM: NYSDEC's Lake Erie program in 20-25 years will probably look very similar to the current program. Staff believe the long-term monitoring perspectives provide the best approach to understanding of the Lake Erie fish community, hence their core program will continue to maintain those data sets. They also suggest that habitat and lower trophic studies may become a bigger component of future work, and they also believe work in the next two decades will emphasize even more collaboration with scientific staff outside their agency. If future budgets increased, they could see better utilization of the ARGO's survey potential by increasing analytical staff. They also envision one potential caution regarding future operations -- animal rights groups could restrict or eliminate traditional gillnet and trawl collection techniques that kill large numbers of fish. Prospects for additional personnel in 20-25 years are unlikely and staffing will probably remain unchanged from current levels.

VESSEL SUITABILITY and FITNESS: The ARGO currently meets the programmatic needs of the Dunkirk scientific staff, and it is expected to meet any program needs in the next 20-25 years. The ARGO is in excellent mechanical condition, and with continued good care, will provide excellent service in the future. Vessel strengths include a sturdy, safe, reliable and flexible sampling platform, which is also very inexpensive to operate. Major complaints are that it could have been longer to accommodate visiting scientific crew (women's quarters too), and that the boat is too slow (the most common complaint of all Great Lakes fishery vessels). In summary, the ARGO is a very good design for NYSDEC's Lake Erie program needs, it is in excellent shape, vessel crew staffing is adequate to meet current and future needs, and NYSDEC funding and support are excellent.

VESSEL PROGRAM SUMMARY

NAME:	**ERIE EXPLORER**
OPERATOR:	Ontario Ministry of Natural Resources
LOCATION:	Lake Erie
HOME PORT:	Port Dover, Ontario
CAPTAIN:	Gord Ives
LAB DIRECTORS:	Phil Ryan (Assessment) and Brian Shuter (Research)

VESSEL DESCRIPTION: The ERIE EXPLORER is a 62 x 20 x 6 ft, 64 ton steel fish tug that is outfitted for gillnetting and trawling in the eastern basin of Lake Erie. The vessel was designed and built by G. Hopper in 1982 for commercial fishing on Lake Huron. OMNR purchased the boat for the Port Dover fisheries station in 1995. The ERIE EXPLORER is powered by a Detroit Diesel 8V-92 Turbo (~400 BHP) that was rebuilt in 1998. Other equipment includes a Westebeke 8kW generator, Hathaway split main winch, 30 in. Crossley gillnet puller, and HIAB articulating hydraulic crane. The navigational aid system consists of a Sperry Autopilot, Raytheon R-20X 24-mile radar, Furuno FCV 251 color sounder, Raytheon L750 sounder, Furuno GP-70 and GP-35 GPS's, NAVAD 7000A chart plotter, and Raytheon RAY82 marine radio.

VESSEL OPERATION and MAINTENANCE: During the 2000 season, the ERIE EXPLORER completed nearly 99 operational days conducting gillnet and trawl surveys in eastern Lake Erie. Over the last three seasons, the captain believes that annual engine use was approximately 750 hours per season. This represents a daily average of 7.6 hours, assuming 99-day operating seasons. Average fuel use over the last three years was approximately 6,400 gallons per year at an average cost of $7,100[7] per year. The represents an hourly fuel use of 8.5 gallons and daily fuel costs of $72 per day.

The captain completes all of the routine maintenance on the ERIE EXPLORER. This includes: changing oil and filters, replacing belts, adjusting and cleaning injectors, gear box maintenance, top-side painting or any mechanical repairs that are not too complicated. If required, factory-trained professionals or skilled shipyard personnel do any major engine or equipment work. The captain schedules any necessary repairs. Maintenance schedules are based on manufacturer's recommendations and specifications, and the captain's experience with the equipment.

Haul-outs are scheduled on a five-year cycle, the last one occurring in 1996. The next haul-out is planned for September 2001, which will include the dry-dock, inspections, new shaft bearings, hull sandblasting and bottom painting at a cost of $4,340. New equipment purchased and installed during the last three years included: backup sounder ($1,400), SoftStart generator upgrade ($2,800), and new bunks ($1,050). Annualized costs for haul-outs and new equipment were $2,618. Annual operational costs, not including regular maintenance, was $9,718 per year. These costs averaged $98 per operating day, assuming a 99 operating day average. Again, these estimates do not include any information on the past history of regular maintenance for the ERIE EXPLORER.

To date, the ERIE EXPLORER has provided relatively trouble-free operation. Little time has been lost to unforeseen mechanical breakdowns and there has not been a trend toward more frequent breakdowns in recent years. In the event of unexpected problems, there are excellent shipyard resources either in or close by Port Dover.

SAFETY: There has never been a stability test of the ERIE EXPLORER, nor is any test planned for the immediate future. There is a full complement of required safety gear including inflatable life raft, life rings, survival suits, personal floatation devices (PFD), flares, portable extinguishers and EPIRBS. There is no engine room extinguishing system, no fireman's outfit (SCBA), no emergency breathing devices, no portable pump, but there are electric and hydraulic fire pumps. Fire fighting training is included in a Marine Emergency Duty (MED)

[7] This cost, and subsequent cost estimates, are in U.S. dollars where $1.00 US buys $1.43 CAN. Fuel cost was based on $0.42 per liter.

training given to each new ministry employee and First-Aid and CPR training are provided on a regular basis.

SURVEYS and INSPECTIONS: The Canadian Coast Guard inspects all OMNR fisheries research vessels every four years – it is required by law. These surveys are detailed examinations of the hull and all the vessel systems. Also, they are conducted during dry-dock in order to facilitate hull and shaft inspections. If any defects are found during an inspection, a vessel is not permitted to leave dry-dock without making necessary repairs. The next inspection of the ERIE EXPLORER will occur in September 2001. In the past, OMNR has provided excellent support of their vessels for maintenance, repair and operation. The captain expects OMNR will provide whatever is needed if there are any repairs or adjustments needed to maintain compliance with CCG regulations.

VESSEL STAFFING: The usual crew for the ERIE EXPLORER is 3-5 persons, depending on the type of sampling required. At least three crewmembers are needed for trawling, but usually there are four. An additional crewmember is generally aboard for gillnetting surveys. The qualifications for captain are a CCG tonnage license, mechanical expertise and some commercial fishing experience. The primary responsibility of the captain is to maintain and operate the ERIE EXPLORER. The remainder of the crew is composed of fish technicians. These technicians are not dedicated specifically to the ERIE EXPLORER, but are used throughout the fisheries program wherever they may be needed. On the ERIE EXPLORER their responsibilities are to not only help with the operation of the boat, but to also ensure the proper collection of the data.

The starting and final salary for an OMNR vessel captain at Port Dover is $28,430 and $30,726[8], respectively. There is no provision for overtime compensation to captains, neither time-and-half pay nor compensatory time off. In addition, there is no career ladder for Ontario's vessel captains. The fish technicians that make up the remainder of the crew have starting and final salaries of $24,723 to $27,620. In contrast to the captain, deck hands and technician staff can accrue time-and-half compensatory time off. Since the vessels are only operating on a day-trip status (i.e., no overnight, long-term cruises) travel costs are nil. A simulation of the ERIE EXPLORER vessel crew operating expense was calculated assuming a two-person crew, an average salary of $29,578 for the captain and $26,172 for the technician's average salary. This combined crew salary is $55,749, or $214 per day, assuming a 260-day work-year. For a 99-day field season, crew cost would be $21,227. Combining operating, maintenance and staff costs yields the ERIE EXPLORER's total operating expense of $30,945 or $313 per operating day (99 day season), but this figure does not include normal maintenance costs.

PROGRAM DESCRIPTION: The ERIE EXPLORER's field program encompasses nearly the entire ice-free time period for eastern Lake Erie. Starting the year, a trawling/limnological index program is scheduled for one day per month in January, February, November and December, and two days per month from May through October (16 days). In March through May, walleyes will be captured with gillnet gear and tagged for an eastern basin rehabilitation program (35 days). A Long Point adult index-gillnetting program is scheduled from June through August (24 days). An interagency hydroacoustic-midwater trawl survey program is conducted in the eastern basin in July (5 days), and in the central basin in August (5 days). Adult lake trout are collected in August (10 days), as part of an interagency lake trout rehabilitation program. Finally, in October there is an outer bay juvenile index-trawling program (4 days). These activities result in a total program effort for the ERIE EXPLORER of 99 days.

The outer bay juvenile trawling and the Long Point adult indexing programs have been underway for more than two decades. These activities can be considered a core program and they represent nearly 30 percent of ERIE EXPLORER's scheduled effort. The hydroacoustic, lake trout netting and limnological indexing surveys were initiated in the 1990s as part of Port Dover's long-term assessment program. They represent 36 percent of the total survey effort. The walleye tagging survey, however, is a short-term, 5-year study -- the program began in 2000 and will terminate in 2005. Much of the information acquired during all these surveys is shared through the task group activities of the Lake Erie Committee of the GLFC. The hydroacoustic and lake trout netting work are cooperative surveys done with New York DEC, and to a lesser extent, the Pennsylvania FBC. Port Dover station has not done any contract work for other agencies, but they have collaborated with other scientists (e.g., U. of Waterloo, U. of Toronto and CCIW) and "piggy-back" studies are a common part of their program. The Port

[8] Salaries are in US dollars, assuming a $1.43 conversion.

Dover station is most likely to cooperate with other scientists and/or agencies that have common, compatible interests with OMNR.

The 99-day season that is currently scheduled for the ERIE EXPLORER is considered a near maximum use of vessel crew resources. With a mid-March through December possible field period, the maximum potential operational period is nearly 150 days, assuming 20 workdays per month and 4 days per month for gear and vessel maintenance. Port Dover staff indicate that with only one dedicated crewmember responsible for operation and maintenance of the ERIE EXPLORER their 99-day schedule is near optimum. Increasing survey time above 99 days can only be accomplished with more staff, particularly another vessel operator.

Port Dover station staff rate their agency's support of their vessel operation (e.g., fuel and maintenance) as outstanding – they are very satisfied and very pleased with this aspect of their operation. Staffing is another matter, however. If available, they would use any additional dollar support to improve staffing. Vessel capability and support dollars are very adequate.

FUTURE PROGRAM: The future foreseen by Port Dover staff is similar to that for many of the other biologists working on the Great Lakes. They hope their station will be active and productive in the next 20-25 years. They anticipate that those activities that were supported over the last 20 years will be an important component of future station activities. They also expect that their efforts will probably continue to broaden into habitat, near shore and lower trophic level studies. Cooperative work will likely expand ("piggy-back" research will grow), but it is unlikely that they could undertake any vessel-for-hire activities, particularly without staffing improvements. As mentioned previously, the main constraint on current program and any future activities is staffing. With current staffing, Port Dover is "just" meeting needs. Any future demands for new research and study, without additional technical and biological staff increases, will require cutting existing program to meet these new needs.

VESSEL SUITABILITY and FITNESS: The Port Dover station is very satisfied with the ERIE EXPLORER. It meets all the current needs of Port Dover's research and assessment biologists. Positive features of the boat are that it is safe, dependable, comfortable, and has lots of space and power. The only feature that could be improved would be better crew accommodations, but this is a lower priority considering that nearly all the work of the ERIE EXPLORER is done on a "day-trip" basis. Biologists and crew cannot see any future needs that could not be met with the vessel's current configuration. One of the advantages of a vessel made of steel and with extensive deck space is flexibility. Any future demands for new sampling gear or new deck equipment could be easily incorporated into the ERIE EXPLORER with a quick trip to a shipyard. The vessel has been well maintained, it has had comprehensive inspections by Canadian Coast Guard on a regular basis, and there are only 2,800 hours on the main engine since it was rebuilt. The agency has also had a proven record of providing excellent vessel support. This should ensure continued future success of Port Dover's vessel operations.

VESSEL PROGRAM SUMMARY

NAME: **PERCA**
OPERATOR: Pennsylvania Fish & Boat Commission (PFBC)
LOCATION: Lake Erie
HOME PORT: Erie, Pennsylvania
CAPTAIN: Paul Atkinson
LAB DIRECTOR: Roger Kenyon

VESSEL DESCRIPTION: The PERCA was designed and built as a law enforcement vessel by Paasch Boatyard, Erie, Pennsylvania in 1959. It was acquired by PFBC Division of Fisheries in 1969 and refitted by Paasch in 1969 and again in 1975. The PERCA's dimensions are 50 x 12 x 4 ft. and it displaces 20 tons. The hull is constructed of steel with aluminum topsides. It is fitted with a Detroit 6V-71 developing 235 hp (original engine) and there is no auxiliary. Deck machinery consists of a gasoline pony engine powered 12 inch Crossley gillnet lifter and a removable, two-drum Stroudsberg winch (600 ft of 3/8 in cable) powered by an 18 hp gas engine. There is neither a net drum nor a crane -- the 42 ft bottom trawl is pulled over the stern by hand, assisted, when required, by block and fall attached to a stern gallows. Wheelhouse electronics include: Furuno 16 mile radar, Furuno GPS, Furuno Loran C, Furuno color sounder and a Kenwood marine radio.

VESSEL OPERATION and MAINTENANCE COSTS: During the last three years, the PERCA typically completed 30 operational days per season and accumulated about 200 hours on the main engine each season. The PERCA burns 600 gallons of fuel per season at a cost of approximately $775. Estimated rate of fuel use is 7-9 gallons per hour when cruising.

Maintenance costs from 1998 through 2000 were $500, $1100 and $900, respectively, with $833 as a 3-year average maintenance expense. The main engine was rebuilt in 1993 after a major failure, but only has 5,000 hours since 1974. The PERCA is dry-docked each winter at a cost of $1,400. The bottom is painted each spring and every five years the hull is sandblasted to bright metal and repainted. Within the last three years new radar was installed at a cost of $2,900. Annual maintenance cost, including an annualized new equipment expense, was $3,200. The total annual cost for both maintenance and fuel is $3,975.

The captain is responsible for all the routine maintenance on the PERCA, which includes painting, engine service, filter and belt replacements, as well as somewhat more involved service, e.g., replacing injectors, setting injectors and valves. The captain also determines what maintenance and repairs are needed based on his experience and manufacturer's recommendations. More involved engine service or repairs are made by factory or other skilled mechanics. There is good access in Erie for parts, service and boat yard facilities. Station staff characterize their agency's support for maintenance and repairs as very good. They never have a problem getting the funding they need to adequately maintain the PERCA. The Erie Station lost survey time in the spring 1993 when the PERCA's main engine failed. In recent years, there has been a higher frequency of unforeseen repairs, and more care and attention are needed to maintain the boat.

VESSEL STAFFING: Normal staffing for the PERCA is three crewmembers during trawling and four during gillnetting. The captain is aided by two permanent biologists and one seasonal technician. One of the crew biologists is also the captain's supervisor, but this has not resulted in any conflicts because the captain's authority has not been questioned on issues related to vessel operation and on-board safety. The captain began working aboard the PERCA in 1978 and assumed the captain's position in 1983. Current requirements for the job are a United States Coast Guard (USCC) master's license, fishing and trawl gear experience, and good mechanical skills. Starting and final salaries are $27,900 and $42,093 based on a 20-step pay scale. The captain also qualifies

for time-and-half overtime, and accrued approximately 70 hours per year, mostly from acoustic surveys. This added another $2,000 per year to the captain's annual pay. The small amount of shoreline and good cruise speed (12 kts) of the PERCA mean the furthest sampling site is only a 1.5 hrs steam. Consequently, all of the work is done on a day-trip basis without much overtime or travel expenses. A simulation of a PFBC captain's expense, assuming a median salary, would be $34,997 per year or $135 per day and a seasonal boat technician salary is another $63 per day. The total crew cost to run the PERCA for a 30-day season is $5,950 or $198 per operating day. Adding fuel, maintenance and annualized new equipment costs results in a total operational cost of $9,925 or $331 per operational day.

The major change in the vessel program in recent years was the loss of a dedicated vessel technician who assisted the captain with vessel and gear maintenance. The loss of this permanent position was compensated by hiring a seasonal technician each year. The purpose of this change was the cost savings realized by paying a boat technician at a seasonal rate rather than a permanent, higher rate with added benefits. In addition, savings were incurred by not having a technician employed during the winter season. This staffing arrangement is only effective if the skills and experience of the seasonal and permanent crew are similar, but in nearly all cases they are not. A permanent vessel technician is preferred because their experience and vessel familiarity enable the captain to pay more attention to the safe operation of their boat and less attention to directing and overseeing an inexperienced crewmember. This is even more evident during bad weather or an emergency situation. Furthermore, at a time when the commercial fishing industry is declining, it is increasingly difficult to find temporary workers who have appropriate vessel and gear skills.

SAFETY, SURVEYS and INSPECTIONS: Other than annual, in-house inspections by the captain, who is an USCG veteran, there have been no formal inspections of the PERCA. There has never been a stability test nor is any test planned in the immediate future. At the same time, the captain describes the PERCA as being uncomfortable in a beam sea. There is a hesitancy by station staff to have the vessel surveyed because the PERCA is scheduled to be replaced in the near future. The PERCA is fitted with an inflatable life raft, three survival suits, 15 type I PFDs. There is no EPIRB, no engine room flooding system, no smoke detectors, and no fireman's outfit. The captain and crew receive CPR and first aid training annually, and the captain had some fire fighting training during his service time with the Coast Guard. Captain and crewmembers receive mandatory, agency boating safety instruction or training updates every three years.

PROGRAM DESCRIPTION: The field season for the Erie Station begins in May with a limnological sampling program done 2 days per month through November. Most of this work is done with a smaller skiff, but 4-5 days are scheduled for the PERCA. In mid-May there is a Spring Assessment of percids using gillnet and trawl at several index sites (15 days). In July, there is a Hydroacoustic Survey of the eastern basin of Lake Erie directed at smelt and pelagic prey fish (2 nights). In August, there is a Coldwater Sampling program for lake trout and burbot (10-12 days). From September through early-November there is a Fall Assessment using gillnets and trawls at the same index sites sampled during the spring (18 days). The main interest in the fall is collecting young-of-year percids, but there is also "piggy back" collections of benthos and other limnological sampling. This field season represents a scheduled 45-52 day program for the PERCA. Nearly all the information collected by the PERCA is contributed to Lake Erie task group technical sessions. Furthermore, the lake trout and acoustic work are both cooperative surveys done with NYSDEC and OMNR.

The Erie Station's program today is very similar to what they did 20 years ago. The spring and fall index surveys have been ongoing since 1971 and the lake trout sampling since 1980. The acoustic and limnological sampling are the only new additions since then. Twenty years ago the PERCA was operating about 75 days per season, compared to 45-52 days now. Much of the early work was exploring a new resource, because there was little previous work to provide a baseline. Also, earlier emphasis was on very intensive sampling, which subsequent analysis showed was overkill and inefficient. But staffing is probably the main reason why the PERCA is not scheduled more heavily. The PERCA lost a permanent boat technician and boat biologists have more demands on their time today than in previous years. A tight fiscal environment has also created problems with seasonal, temporary staffing. Two years ago the PERCA was tied to the dock because PFBC financial problems lead to layoffs of the Erie Station's temporary workers. Collectively the result is a vessel program that is directed

solely at maintaining long-term data sets, with few staff resources to do much more. When asked how they would rate their agency's support of their vessel program, station staff indicated a 3 1/2 of 5. They are satisfied with the operation and maintenance support, but their major need is better vessel crew staffing.

All of the activities associated with the PERCA are supported with federal aid dollars. Most of these funds are tied to completion of reports and information that will be used in Lake Erie task group activities. Station staff have assisted other agencies and groups, but there is less enthusiasm in partnering and doing contract work. Contract work is perceived to constrain scheduling flexibility for in-house work, put demands on limited staff resources, and increase personal liability risks because of inexperienced workers. There is also a concern that outside scientists may demand more from boat and crew because they have purchased the vessel time. Finally, none of the money earned from contract work would find its way back to the Erie program; hence, there is little incentive to fill-in the PERCA's schedule with outside work.

FUTURE PROGRAM: Station staff could see a future with more, new demands and a program that may be less likely to meet those demands. They see dramatic changes in fish populations, continuing effects from exotics, more new exotics and greater demands for water use by a growing human population. The recent trend in lower fish yields and declining production will probably continue, too. There will undoubtedly be a suite of new problems that can only be imagined at the present time. Practically, Erie Station's program will probably shift somewhat toward more "piggy back" work directed toward habitat and lower trophic level research. However, the field program in 20-25 years will continue to focus on those long-term monitoring activities that represent the current core program. Without additional staff, it is unlikely that future demands can be met. It will be even more difficult for future staff to discontinue those activities that current staff have worked so hard to maintain – the valued 20 to 30 year data sets of today will be the more valued 40 to 50 year data sets of tomorrow.

VESSEL SUITABILITY and FITNESS: Without a replacement or a major refit of the PERCA, Erie Station staff do not see a PFBC vessel program on Lake Erie in 20-25 years. The positive characteristics of the PERCA are its speed and its modest operating costs. However, features that need improvement include: vessel handling characteristics, limited deck space, no fish processing facilities, no dry lab space, inadequate sanitation facilities, no auxiliary, and the lack of a hydraulic system. All these deficiencies also represent features they hope to see in a new vessel. Major fitness concerns are with pitting on hull plating (50% of 5/16 in plate), stuffing box and rudderpost leaks, faulty plumbing and old deck machinery. Some of these repairs would have been accomplished earlier, however, there is a concern that doing too much to update the PERCA may jeopardize support for its replacement.

A major refit of the PERCA is not considered a viable alternative because it lacks some essential design characteristics that are required to meet future needs, e.g., deck space and handling characteristics. With respect to a replacement, there has been recent public interest and support for a new vessel, and there have been suggestions that funds obtained from the buyout of commercial gillnet fishermen in the early 1990s be used to help subsidize new vessel construction. This initiative is not unlike the experience of many other agencies that have successfully built or replaced a new fisheries research vessel on the Great Lakes. Because fisheries research vessels are likely to be the most expensive single pieces of equipment operated by resource agencies, strong public/political support is a crucial component in any procurement process. PFBC central office staff are now trying to move in a positive way toward beginning the replacement process for the PERCA.

VESSEL PROGRAM SUMMARY

NAME: **GRANDON**
OPERATOR: Ohio Division of Wildlife
LOCATION: Lake Erie
HOME PORT: Fairport Harbor, Ohio
CAPTAIN: Bob Bennett
LAB DIRECTOR: Kevin Kayle

VESSEL DESCRIPTION: The GRANDON is a 47 x 16 x 5.5 ft., 50 ton steel fisheries research vessel designed by the Napier Co., Arbroath, Scotland. It was built by Washburn and Doughty of Booth Bay, Maine in 1991. The GRANDON is stern trawler design propelled by a single Caterpillar 3208 and is fitted with a Wood-Freeman bow thruster, 20kW Northern Lights M854v-20N generator, 2 main winches (800 ft., ¼ in. cable) mounted overhead on the shelter deck, a limnological winch (100 ft., 1/8 in. cable), a Crossley 12 inch gillnet hauler, and a net drum (4 ft. x 4 ft.). Wheelhouse electronics include a Wood-Freeman autopilot, Furuno radar, Northstar GPS, Furuno 5CV561 sounder and an ICOM marine radio. Available spaces (sq. ft.) include: deck 300, wet lab/enclosed deck 300, galley/wheelhouse 120, and bunk area 120 sq. ft.

VESSEL OPERATION and MAINTENANCE: From 1998 to 2000, the GRANDON averaged 39 operating days per season, e.g., 44, 29 and 43 days, respectively. Operational hours on the main engine average approximately 400 hours per year and there are 4,579 hours on the main engine. The GRANDON operates as a day boat throughout the field season, i.e., the crew travels back to Fairport Harbor each night, and therefore, overnight travel is minimal. The GRANDON uses approximately 1,800 gallons of fuel each season or roughly 4.5 gallons per hour. Budgeted fuel cost for 2001 surveys is $2,100.

The captain does all of the routine maintenance (e.g. oil changes, fuel filter and belt replacements etc.) on the GRANDON and he also schedules more detailed maintenance and repairs. The engine manufacturer's factory mechanic does all the mechanical work on the main engine other than routine maintenance. Aside from some post-delivery mechanical problems, the GRANDON has been relatively trouble free and few days have been lost due to mechanical problems.

Maintenance and repair cost for 1998-2000 averaged approximately $1,300 per year. If needed, major repair costs would be credited to a central office account. Haul-outs are scheduled every 4-5 years with the last haul-out occurring in 1996 at a cost of $13,000. Haul-out work included a complete painting of bottom and topsides. The GRANDON is stored in the water without any bubbling system, although the crew would prefer dry dock storage each winter. No new equipment was added to the GRANDON from 1998-2000. Total annual cost for maintenance and haul-out (annualized cost) was $3,900 per year, and including fuel was $6,000. These operational costs averaged $154 per operating day, assuming a 39 operating day average.

SAFETY: A stability test (inclining experiment) of the GRANDON was completed at the time of commissioning in 1991. After delivery of the vessel, cement ballast was added to the hull and the net drum was lowered to the deck, after review with the architect. Training for vessel personnel includes annual updates of CPR and first aid certifications. For fire fighting, the GRANDON is outfitted with a Haylon system in the engine room, two-1 ½ in. fire pumps (one remotely operated), and various smoke and CO_2 alarms. There is also a portable pump for fire fighting or de-watering, but no fireman's outfits (SCBA), no emergency escape breathing devices and no USCG fire fighting training for the crew. The GRANDON has a complete complement of approved PFDs, life raft, EPIRBS and survival suits. An important safety issue highlighted by the GRANDON'S crew is the concern regarding other untrained personnel on-board, especially during fishing operations and foul weather. Crewmembers have to be especially alert to the safety of visiting personnel.

SURVEYS and INSPECTIONS: There have been no safety inspections of the GRANDON by USCG. Requests have been made for inspections, but because of un-inspected vessel status for Great Lakes research vessels the Coast Guard is not obligated to comply with inspection requests. Fire extinguishers and the system in the engine room are inspected each year by a fire inspector. The captain tries to maintain the GRANDON at a level of readiness that would conform to applicable USCG standards.

VESSEL STAFFING: The minimum crew of the GRANDON includes the captain and two biologists. The dual role of biologists as scientists and crewmembers has resulted in very good relations between the captain and scientific staff. During summer, an additional seasonal technician or two may be added to surveys, depending on the workload. Four crewmembers are probably the average complement of crew. The captain is beginning his fifth season and the two biologists have 6-11 years experience. Nearly all the GRANDON'S crew time is spent doing activities related to vessel projects. Job qualifications for the captain's position require a 100-ton USCG marine license with mechanical aptitude and some commercial fishing experience. The captain was recruited by advertising the position, reviewing candidate's qualifications and references, and completing a job interview. In 1996 Ohio DNR reclassified their captain's position so that salary was comparable to a biologist and prior to this time it was difficult to hire and retain a qualified captain.

The starting and final salary for an Ohio DNR vessel captain is $33,488, and $47,632, respectively. The captain may also receives time-and-a-half overtime compensation for up to 160 hours per year, which can be taken as pay or accumulated and used as time off. Because the crew returns to Fairport Harbor each night, travel costs associated with implementing their vessel program are minimal. A simulation of the total vessel crew operating expense was calculated assuming an average salary for the captain ($40,560) and also including one of the biologist's average salary ($40,560) to reflect their companion role as vessel crew. This combined crew salary is $81,112, or $312 per day, assuming a 260-day work year. For a 39-day vessel season, crew salaries would total $12,168. Combining operating, maintenance and staff costs yields a total operating expense of $18,168 or $466 per operating day.

PROGRAM DESCRIPTION: The GRANDON's survey program has scheduled about 55 days per year, but has averaged 39 operating days per year from 1998 to 2000. Nearly all this effort is directed toward a juvenile fish stock assessment program using bottom trawls, although some fall gillnetting and summer hydracoustic sampling is also scheduled. Trawl index sites are visited each month (5-6 days sampling) from May to October, with more widespread sampling done in May August and October (10-12 days sampling). The database for these sites began in 1969, prior to the operation of the Fairport Harbor station; consequently, the majority of this assessment program is geared toward maintaining long-term data sets-- less attention is focused on short-term projects. Before 1988, these sites were sampled by vessels and staff from the Ohio DNR station at Sandusky, but were assigned to Fairport Harbor with the delivery of the GRANDON. In addition to the fishery surveys, there are some "piggy back" activities, lower trophic studies with phytoplankton, zooplankton, and water chemistry done in conjunction with trawling and gill netting activities. All of the assessment activities are part of a multi-agency cooperative effort under the cooperative umbrella of the GLFC. Results from these surveys are used in various Lake Erie Task Force assessments of fish stock health.

Currently, there is more than sufficient vessel time to implement Ohio's fishery survey programs in Lake Erie. The maximum length of the field season is 100-120 days. Therefore, the current program is scheduling approximately 50% of the GRANDON's potential survey effort. In addition to the vessel program there are a number of other activities that station support, e.g., tagging studies, creel surveys, commercial catch assessments etc. This level of current vessel work is considered to be the most efficient use of the biologist's time, providing a good balance between data collection and analysis/reporting. The GRANDON has done limited contract work in the past. There is not a procedure whereby monies collected from contract work can go to the GRANDON's program.

The current funding for the GRANDON's program on Lake Erie is all federal aid dollars. The lab director and captain indicate their program has not been constrained by operating funds. Although they don't always receive what they request, their funding is sufficient to continue their program. They rate the level of

support their agency provides as outstanding and the GRANDON more than meets their current program needs.

FUTURE PROGRAM: In the next 20-25 years Ohio DNR will likely provide less concentration on single species management and implement a broader, ecosystem approach to their assessment activities on Lake Erie. The next two decades will also see an increase in cooperative efforts among resource agencies with common interests and probably more integrated research. Although the future is likely to bring some system changes, Ohio DNR staff still see a core program centered on maintaining valuable, long-term data sets. Any future changes or modifications of program will more likely impact assessment techniques and technology and less likely affect vessel operations. The GLFC's purchase of hydro acoustic gear for Lake Erie fisheries research is an example of how partnerships promote more efficient and productive fisheries assessments. This kind of assistance in the future will help cash strapped agencies meet future technological needs. If future budgets were expanded, additional fiscal resources would be used to buy people and technology (not vessel capacity), and if their budgets declined their highest priority would be to maintain August and October bottom trawl surveys.

VESSEL SUITABILITY and FITNESS: Both vessel crew and scientific personnel agree the GRANDON meets current program needs and they are confident it will meet any future needs as well. Positive characteristics of the GRANDON include: a strong, safe, dependable, hull that is inexpensive to operate. The major draw back is its slow speed. Nevertheless, speed is probably less of an issue for vessel programs, such as Ohio DNR's, that have little steam time, operate on a "day trip" basis, and have minimal overtime and travel expense. The GRANDON is relatively new and has been well maintained. There are approximately 4,600 hours on the main and auxiliary engines; hence it should be years before overhauls are required. On balance, the GRANDON has proved to be an excellent fisheries survey vessel and should provide more than adequate service for the next 20-25 years.

VESSEL PROGRAM SUMMARY

NAME: **KEENOSAY and K.H. LOFTUS**
OPERATOR: Ontario Ministry of Natural Resources
LOCATION: Lake Erie
HOME PORT: Wheatley, Ontario
CAPTAIN: Al Matthews
LAB DIRECTORS: Andy Cook (Assessment) and Tim Johnson (Research)

VESSEL DESCRIPTION: The KEENOSAY is a 58 x 20.5 x 4.5 ft., 68 ton steel fisheries research vessel originally built by D.B. Powell Shipyard Ltd. of Dunnville, Ontario, but rebuilt in 1989 at Hike Metal Products Ltd. of Wheatley, Ontario. The mission of the KEENOSAY is to support trawl and gillnet operations in the open waters of western Lake Erie. The KEENOSAY is powered by a single Cummins N855M (215 BHP) main engine and is fitted with 15kW generator, two split Hathaway winches, HIAB deck crane with winch, and Crossley 30 in gillnet puller. The complement of electronics in the wheelhouse include: Furuno FR7100D Radar (72 mile); Furuno GP-50 GPS; DGPS GP35, COMNAV 2001 autopilot; Furuno color video and paper sounders; SiTex Chart Plotter Nav 7000, cell phone and INTERMARINE, UNIDEN and MOCOM marine radios. The KEENOSAY is the principal vessel used for gillnetting and trawling.

The LOFTUS is a 42 x 14 x 4 ft. aluminum survey vessel used mainly for limnological and lower trophic level research. It was built in 1990 by Kanter Yachts Ltd. of St. Thomas, Ontario. The LOFTUS is powered by a single Cummins 6 CTA 8.3 (350 BHP) diesel which enables 15 kt. cruising speeds. It has an 8 kW Westerbeke diesel generator and is fitted with two hydraulic booms with winches. Wheelhouse electronics include: Furuno 1839 (24 mile) radar, Furuno GP 50 GPS, DGPS GP 35, HORIZON/MOCOM marine radios, cell phone, Furuno VC551 video sounder, Lowrance X-15 paper sounder, NAVAD 7000 chart plotter, and a Sitex autopilot

VESSEL OPERATION and MAINTENANCE: During the 2000 field season, the KEENOSAY completed 56 operational days, which is fairly typical of its activities within the last three years. In 2000, fuel use was about 2,100 gallons (US), or 38 gallons per day of operation. On average, the KEENOSAY burns approximately 10 gallons per hour. Total fuel costs for the 2000 season were $2,450[9], or $44 per operational day. The LOFTUS was used for 21 days during 2000 and burned 1,800 gallons of fuel costing $2,100. Average fuel consumption is 86 gallons per day or approximately 12 gallons per hour.

The captain and crew do all of the routine maintenance (e.g. oil changes, fuel filter and belt replacements etc.) on both the KEENOSAY and the LOFTUS. They have a station maintenance protocol that covers when and what to do for routine maintenance, otherwise, the captain decides what needs to be done to maintain both vessels. More extensive repairs are done by the equipment manufacturer's technicians or in the shipyard. The engine manufacturer's factory mechanic does all the mechanical work on the main engine other than routine maintenance.

[9] All subsequent cost figures are expressed as US dollars by assuming $1 US buys $1.43 Canadian. Cost of fuel was based on $0.44 per liter.

Maintenance costs for the two vessels were approximated by budget allocations for the 2000 field season. The following list of maintenance costs were budgeted for the KEENOSAY: winter dry-dock $2,000, inspections $840, filters and oil $420, hull repairs $3,500, fuel gauges $3,500, and $1,400 for paint supplies. New equipment installed in the last three years included new radar for $3,500 and a new GPS for $840 (US). After annualizing the inspection, painting and new equipment expenses, the total annual maintenance costs were $11,717 for 2000, or $209 per operating day. Adding fuel costs to these estimates yields a total operational cost for the KEENOSAY of $14,167, or $253 per day.

A similar breakdown of maintenance costs for the LOFTUS totaled $1,960 per year. New equipment purchased within the last three years was a GPS at a cost of $840 and an anchor winch for $3,500. Therefore, total maintenance and annualized equipment expenses were $3,407 or $162 per operating day, assuming a 21-day season. Combined costs for fuel and maintenance costs were $5,507 or $262 per day. Operational costs for both vessels were $19,674, averaging $256 per day assuming a combined total of 77 operating days.

SAFETY: A stability test (inclining experiment) of the LOFTUS was completed shortly after construction in 1990. Because the KEENOSAY was a refit of an older vessel, there was no requirement for a stability test, and to-date no test has been completed. Canadian Coast Guard inspections ensure that each of the boats has a full complement of required safety gear, e.g., inflatable life raft (inspected annually), flares, alarms, PFDs (personal floatation devices), survival suits etc. They also require a ladder for access to the deck from the water.

The Ministry of Natural Resources requires all its new employees to take Marine Emergency Duty (MED 1-A) training, which covers worker safety afloat, including fire fighter training. There is also an orientation day for new workers and a requirement that all small boat operators have a pleasure boat operator's certificate. In addition, CPR training is updated annually and First-Aid training is renewed every three years.

The KEENOSAY has a Halon system for the engine room with a remote operational switch in the wheelhouse. There are 4 hand held extinguishers -- CO_2 and dry chemical. There are two fire pumps, one a 110 volt electrical and the other a main engine pump; both have two-inch hoses. The LOFTUS has three CO_2 and dry chemical hand held extinguishers. There are two bilge/fire pumps, one operating off the main engine and the other is an electrical pump (110 volt, 1.5inch). The extinguishers on both vessels are inspected annually. There are breathing apparatus or fire suits for either boat.

SURVEYS and INSPECTIONS: Contrary to the un-inspected status of American fisheries research vessels, all Canadian research vessels have to be inspected by the Canadian Coast Guard every four years, at a substantial cost to OMNR. These inspections are very comprehensive and require the boat to be dry-docked to facilitate hull (ultrasound) and shaft inspections. If any problems are detected during the inspection, the vessel is not permitted to be put back in service until defects have been corrected. Having these vessels dry-docked each winter also allows the crews to do visual inspection of the hull prior to each new field season; bottom cleaning and painting are done when needed rather than adhering to any specific schedule.

VESSEL STAFFING: During trawling and gillnetting operations aboard the KEENOSAY there are usually three crewmembers, but for most cases it is more common to have a crew of four. Although, with some labor-intensive surveys, there may be as many as six individuals in the crew. The crew consists of the captain plus another operator who can operate the KEENOSAY if the captain becomes incapacitated. For any new hires, qualifications for the vessel captain include a license (fishing master four), commercial fishing experience, and some level of natural resource training (e.g., community college training). The remainder of the crew generally consists of fish technicians, or depending on a busy schedule of activities, any able-bodied staff who is available. All of the fish technicians require some level of environmental science training. For the operation of the LOFTUS, there are from two to four crewmembers. The operator of the LOFTUS is currently a contract captain (temporary).

The captain of the KEENOSAY has various responsibilities other than boat operation. Perhaps it would be more accurate to describe his role as an operations administrator who also happens to operate the KEENOSAY, or at other times operate the LOFTUS, or do any number of other tasks to assist the scientific staff. At the present

time, there are no staff that are specifically assigned to the KEENOSAY or LOFTUS. This contrasts with the historical operational status of the KEENOSAY prior to 1990, which had a two-person dedicated crew. The lack of dedicated vessel crew is a major concern for Wheatley station staff. They see a potential for problems with excessive movement between vessels and other programs, i.e. things can get overlooked when shared responsibilities result in loss of focus.

The starting and final salary for an OMNR vessel captain is $28,428 and $32,782, respectively. This range includes two Resource Technician grades (Senior 1 & 2) with three steps in each grade level. There is no provision for overtime compensation to captains, neither time-and-half pay nor compensatory time off. In addition, there is no career ladder for Ontario's vessel captains; there is not much differential between start and final salaries. The fish technicians that make up the remainder of the crew have starting and final salaries of $24,723 to $27,620. In contrast to the captain, fish technicians who work on the vessels can accrue time-and-half compensatory time off. Since the vessels are only operating on a day-trip status, travel costs are nil.

A simulation of the KEENOSAY's vessel crew operating expense was calculated assuming a two-person crew, with an average salary for the captain of $30,605 and an average salary for a technician of $26,172. This combined crew salary is $56,777, or $218 per day for a 260-day work-year. Staff costs for the KEENOSAY's 56-day season is $12,229 and $4,585 for the LOFTUS' 21-day schedule. Combining operating, maintenance and staff costs yields a total operating expense of $26,396 or $471 per operating day (56 day season). A similar estimate for the LOFTUS would be $10,092 or $481 per day (21 day season). Total cost to operate both boats is $36,488 or $474 per day for a combined 77-day season.

PROGRAM DESCRIPTION: The Wheatley station has a 44-day schedule of surveys for both the KEENOSAY and the LOFTUS that represents their core program for the western basin of Lake Erie. It includes walleye tagging for 20 days in March (KEENOSAY), limnological index sampling two days per month (16 days) from April through November (LOFTUS), and an interagency trawl survey for 8 days in late August (KEENOSAY). The walleye-tagging program was initiated in 1990, but will terminate in 2001. The limnological monitoring has been ongoing for 14 years. The summer trawl program was begun in 1982, and in 1987 was incorporated into a cooperative effort with Ohio and Michigan DNRs. Other short-term, non-core program activities include a round goby study (20 days)` a walleye stock structure study (4 days), and a juvenile walleye growth study (25 days). All these short-term studies use fish collected with gillnets fished from the KEENOSAY. Other activities that put demands on the boats and their crews involve special collaborative research efforts, assisting enforcement officers (pulling illegal gillnets) and stand-by duty for a gillnet partnership program with commercial fishers.

Collectively the scheduled work for both vessels is nearly 100 vessel days. With a maximum potential season of approximately 120 days, the KEENOSAY has potential for some additional work and the LOFTUS for considerably more. The less than maximum use of these vessels is limited by staff, and not by the vessels themselves. Both boats are in excellent shape, well maintained and could easily be worked harder, if trained staff were available. Staffing issues are a key constraint in making better use of Wheatley's vessels.

Although there is under-utilized vessel capacity at the Wheatley station, only about five days per year are used for outside-the-agency work. OMNR staff are not enthusiastic about promoting outside use of their vessels because they cannot afford the staff time needed to run these vessels for other activities. Again, staff limitations are not only constraining their own program growth, but it limits any possible use by outside scientists or groups. This does not suggest, however, that the Wheatley station does not collaborate with other scientists on special short-term projects. They are willing to coordinate and cooperate, but these studies must be compatible with their agency's mission and their scientists' interests. Nevertheless, even these collaborative studies are ultimately limited by operational staff.

Aside from staff limitations, the vessels themselves are very well supported by OMNR. The boats accommodate their crews' comfort and safety, and the agency provides all the operational funds needed for vessel operation and maintenance. Regarding staff funding, OMNR provides sufficient dollars to fund Wheatley's core

program, albeit scientists have to look for other sources of funding to do any activities beyond their program. This is especially true of the research component of the station.

FUTURE PROGRAM: Wheatley staff were confident that their station will be operative in 20-25 years and will be providing an important function within OMNR. The Great Lakes natural resources are vital to Canada's future. Prominent future issues affecting Lake Erie will probably include sustainable productivity, climatic influences and the affects of other ecological perturbations. Staff are concerned about the continued expansion of people within the Lake Erie watershed, and the effect continued population growth will have on the resources the Wheatley staff are entrusted to help manage. From the station's perspective, staff see continuation of their core program in 20-25 years, but they also perceive more effective use of hydracoustic techniques in fish stock assessment, multi-trophic approaches to fish community assessments, and spatial GIS views of resources with overlays including habitat, yield and exploitation. These are approaches that will require special skills, which will mean new training for existing staff and/or adding new people with specialized skills.

Wheatley station staff believe there will be no further personnel reductions in the future -- they sense they have hit bottom. Moreover, they believe that future staffing can only improve. They also expect that future scientific staff will have a wider scope of skills than current staff. At the same time, there will be a continuing need for highly technical people with the same traditional skills possessed by vessel crews who currently operate the KEENOSAY and LOFTUS.

VESSEL SUITABILITY and FITNESS: The Wheatley station is well positioned for future work on western Lake Erie. They have two large survey vessels that are fairly new, well maintained and with flexible designs. With the current level of use for both the KEENOSAY and LOFTUS, it should be years before any major overhauls are required on any of the engines. The two boats complement one another in performance and capability, and the LOFTUS also has some ability to work as a fisheries vessel, if needed. These vessels have not constrained any of Wheatley's current program activities, and staff believe that their vessels capabilities will more than meet future needs as well. The regular inspections required by the Canadian Coast Guard also plays an important function as a driving force in keeping these vessels safe and in tip-top shape. This is especially true when combined with OMNR's commitment to provide safe fisheries research vessels for their staff working on Lake Erie.

VESSEL PROGRAM SUMMARY

NAME: **EXPLORER**
OPERATOR: Ohio Department of Natural Resources, Division of Wildlife
LOCATION: Lake Erie
HOME PORT: Sandusky, Ohio
CAPTAIN: Joe Baughman
LAB DIRECTOR: Roger Knight

VESSEL DESCRIPTION: The EXPLORER is a 53 x 16 x 4.5 ft., 53 ton aluminum fisheries research vessel designed for trawling and gillnetting in the western basin of Lake Erie. It was built by T.D. Vinette of Escanaba, Wisconsin and delivered in 2000. The initial specification and basis concept for the EXPLORER was developed by the Napier Co, Arbroath, Scotland (architects for the ARGO, GRANDON and SETH GREEN). The T.D. Vinette shipyard was awarded the contract on a design-and-build basis. They used a lengthened version of one of their pre-existing hull designs. The final design and construction details are the product of Vinette and did not meet the contract specifications. Delivery was three years late and the boat is still not operational. Ohio DNR has since contracted with Deck and Wilson, Co., marine surveyors from Chardin, Ohio, to recommend an approach to correct construction flaws. Extensive and expensive repairs were completed in 2000, but more work is needed to correct all the known problems. Ohio DNR staff hope the EXPLORER can be made operational in 2001.

The EXPLORER is fitted with a Caterpillar 3412 main engine developing approximately 740 bhp, because one of the important performance criteria was to have 15 kt cruising speeds. Other equipment includes: an American bow thruster, Northern Lights 12kW auxiliary, split main winches, 5 x 3 ft. net drum, side boom with winch, and a 12 in. Crossley gillnet hauler. Wheelhouse electronics include: Robertson AP45 autopilot, Raytheon 41XX radar, Garmin 220 and Raytheon 610 chart plotters, Koden sounder and a marine radio.

VESSEL OPERATION and MAINTENANCE: Since the EXPLORER is not yet operational, there is no information regarding operational use and expenditures for a field season. Nevertheless, the proposed 2001 program and past experience suggest the EXPLORER, once it is fully operational, will have a 60-70 day field season. The captain expects to do all of the routine maintenance (e.g. oil changes, fuel filter and belt replacements etc.) on the EXPLORER.

SAFETY: A stability test (inclining experiment) of the EXPLORER was completed by Deck and Wilson after delivery in 2000. Based on this test, some restrictions were noted for safe operation, notably that deck loads should be minimized and there should be no winter operation. The EXPLORER is fitted with a life raft, Bailey survival suits, PFDs, life rings and an EPIRB. Fire fighting equipment is not yet fully functional, but will be this year.

SURVEYS and INSPECTIONS: Typical of all U.S. Great Lakes fisheries research vessels, no inspection is required for the EXPLORER by the U.S. Coast Guard. Deck and Wilson Co. are currently working with Ohio DNR and local shipyards to correct construction and design flaws.

VESSEL STAFFING: The crew complement for the EXPLORER has not yet been finalized. On previous boats operated in the Western Basin of Lake Erie by the Ohio DNR, the typical crew complement consisted of the captain and three other crewmembers, which in most instances were biologists. The starting and final salary for an Ohio DNR vessel operator/captain is $33,488, and $47,632, respectively. The captain also receives time-and-a-half overtime compensation amounting to about 100 hours per year at the Sandusky station, which can be taken either as pay or time off. In the past, vessel operations out of Sandusky were largely day trips; consequently, travel costs were negligible. A simulation of the total vessel crew operating expense was calculated assuming an average

salary for the captain ($40,560) and also including one of the biologists' average salary ($40,560) to reflect their companion role as vessel crew. This combined crew salary is $81,112 for a 260-day work-year, or $312 per day. For a typical 65-day vessel season, the staff costs would be $20,280.

PROGRAM DESCRIPTION: The Ohio DNR program for western Lake Erie was initially established in the late-1950s, but the modern database begins in 1969. During the last 20 years, the main features of their stock assessment program are still in place, but there have been modifications to compensate for changes in the lake system, and also, to strengthen the sampling program, e.g., more effort and initiation of a stratified random design in lieu of fixed sites. The major component of their current program is an interagency (with OMNR) bottom-trawling program to monitor young-of-year fish in the spring and yearling and older fish in the fall. The trawling program is scheduled for 2 weeks per month from May to the end of September or the beginning of October (50 days). In practice, only one week is usually needed to complete each monthly survey (25 days). A total of 41 sites are visited during each monthly round of sampling. Another core, interagency (MDNR, OMNR, ODNR- Fairport) survey is scheduled during October (20 days) using graded gillnets. It is directed toward sampling adult walleye, yellow perch and other fishes. Two short-term surveys are scheduled for 10 days in September 2001. These surveys include a gillnetting program specifically targeting smallmouth bass and a hydroacoustic survey. Scheduled activities for the EXPLORER total 80 days, but past experience has shown that approximately 60 operational days is a more likely projected use.

All of the effort scheduled for the EXPLORER in 2001 is directed toward fish stock assessment. Trawling and gillnetting represent 60 and 40 percent of scheduled effort, respectively. In recent years, there has been a marked increase in "piggy back" effort directed toward lower trophic level studies, e.g., water chemistry and plankton sampling. With the problems associated with the late delivery of the new EXPLORER, the Sandusky station has had to contract with Ohio State University for vessel time to complete these surveys. Regardless of when the EXPLORER becomes operational, the 2001 surveys will be completed, as they have been in the past. There is a strong commitment by station staff to maintain their historic, long-term databases.

In the past, there has been little contract use of Ohio DNR vessels in western Lake Erie. There has been some discussion, however, in promoting outside-agency use of the EXPLORER to help defer program costs and provide new sources of income. Logistically, external use of the EXPLORER for periods of more than a few days in any week would be impractical under current staffing, since DNR biologists would serve as the vessel's crew.

FUTURE PROGRAM: In 20-25 years the fisheries program on western Lake Erie could by relatively unchanged, or it could be altered substantially. Because so much of current activities are directed toward maintaining long-term databases, in two decades the Ohio DNR program will probably continue with a major trawling effort for juvenile fishes and a gillnet monitoring program for adult warm water fish. Sandusky staff also believe the program could be altered too, in response to changing societal values. In two decades there could be a loss of the commercial fishery, increased emphasis on recreational fisheries, and greater concern for water quality and public health issues. A more likely future program will probably consist of continued support of long-term monitoring efforts, increase use and adoption of technology (e.g., hydroacoustics, satellite imagery etc.), and a greater diversity of staff expertise (e.g., marketing, public relations, geology etc.). Programmatic issues in two decades will probably see continued concern for new exotics and more effort applied to better understanding critical habitat needs for the fish community of the western basin.

Although the future may bring important, substantive changes to Sandusky station operations, staffing will probably remain unchanged. As staff transfer or retire, there will likely be some changes in the roles of replacement staff. One staff reassignment that may be needed is a permanent technician who is dedicated to the EXPLORER. Undoubtedly, future recruitment will be oriented toward meeting future resource needs.

VESSEL SUITABILITY and FITNESS: Ohio DNR at the Sandusky station has a unique and regrettable fisheries research vessel situation – a new vessel with many problems. Station staff are working hard to make the EXPLORER a safe, dependable work platform. Since delivery of the EXPLORER, their approach to solving problems seems reasonable and prudent: 1) employ a capable marine expert to outline problems and suggest

corrective measures, and 2) provide adequate funds to correct identified problems. Ohio DNR's Columbus office has been very supportive of Sandusky's efforts to correct construction mistakes. Sandusky staff gave high marks for their agency's support of their vessel program in Lake Erie. The coming field year will be crucial in establishing if the EXPLORER is safe to operate and how well suited it is for typical survey needs in western Lake Erie.

VESSEL PROGRAM SUMMARY

NAME: **MUSKY II**
OPERATOR: United States Geological Survey – Biological Resources Division
Great Lakes Science Center (GLSC)
LOCATION: Lake Erie
HOME PORT: Sandusky, Ohio
CAPTAIN: Mike McCann
STATION ADMINISTRATOR: Mike Bur

VESSEL DESCRIPTION: The MUSKY II is a 45' x 14.5' x 6', 27 ton steel-hulled fisheries research vessel operated on Lake Erie by the GLSC Lake Erie Biological Station (LOBS) in Sandusky, OH. The MUSKY II was built in 1960 by Hans Hansen shipyard in Toledo, Ohio. The MUSKY II is fitted with a single Detroit Diesel 6V-71, and an 8 kW 120v AC auxiliary generator. Deck equipment includes: a Crossley 12- inch gillnet lifter, KEM 4420 MS net reel, Belkin D-40 split main winches with 600 ft of 3/8-inch cable, a HIAB-200 articulating deck crane, and a limnological boom and winch. Wheelhouse electronics and navigational aids include: Roberton autopilot (inoperable), Raytheon 41X radar, Raytheon V-860 color sounder, Garmin and Northstar GPSs, and two marine radios.

VESSEL OPERATION and MAINTENANCE: Since the last complete overhaul of the main engine in 1986, the MUSKY II has accumulated 7,500 hrs. There was not sufficient information to determine seasonal use patterns, but in 2000 the MUSKY II operated a total of 31 days, which probably represents 200-250 hours. Other similarly sized and powered vessels (e.g., KEENOSAY) typically burn about 4.5 g/h. Therefore, total fuel usage by the MUSKY II was probably near 1,000 gallons per season at a cost of approximately $1,000.

The crew of the MUSKY II does most of the routine maintenance required to keep it operational. Each winter the MUSKY II is hauled out of the water and the bottom and some of the topside are painted the following spring. In 1999, the reduction gear was overhauled at a cost of $8,000, and in 2000, hull plates along the entire length of the keel were replaced at a cost $15,000. The main engine is 43 years old and has had two complete and one partial overhauls; the last was in 1993. The GLSC Vessel Manager believes the engine in the MUSKY II is operable but further repair is not cost-effective and a new engine is planned to be installed in 2001. New equipment installed in the last three years includes a differential GPS for $1,500. The annualized cost for repairs and new equipment was about $9,000, but this figure does not include expenses for regular maintenance and haul-out costs. Hence, a minimum estimate of operation and maintenance costs are roughly $10,000 per year.

VESSEL STAFFING: The normal crew complement aboard the MUSKY II is four people – a captain, engineer, biotechnician, and biologist. Currently there is no permanent captain assigned to the MUSKY II, the position responsibilities are shared by two captains assigned to other USGS vessels. This strategy was initiated because the USGS can draw from a number of qualified captains operating their other vessels and because the field program for the MUSKY II is relatively modest (i.e., only 31 days). A temporary (seasonal) engineer who has maintenance responsibilities entered on duty on 05/27/01. The GLSC hopes to reinstate a permanent engineer for the MUSKY II at some point in the future when the budget permits. Captain and engineer salaries can be approximated using the simulation from the LOBS (i.e., $396 per operating day). Assuming a 31-day program for Lake Erie (last field season), the captain and engineer costs would be $12,276 per season. Combining the estimate for fuel use, the partial estimate for maintenance, and staffing costs results in a minimal estimate of operating the MUSKY II of $22,276, or $718 per operating day.

SAFETY, SURVEYS and INSPECTIONS: The MUSKY II is fitted with a single, six-man life raft, four exposure suits, two life rings, and six PFDs. There are no survival suits, fire fighting suits, portable pumps, or

emergency breathing apparatus. There is a CO2 flooding system for the engine room and three ABC portable extinguishers. No stability assessment has been done on the MUSKY II. There are no watertight bulkheads, and the crew must rely on pumps to keep the MUSKY II afloat if there is flooding. There is a 12-volt 600- g/h bilge pump and an old-32 volt electric bilge pump. USGS vessel staff are required to have annual updates for CPR and a 3-year renewal of First Aid training. There is no record of a marine survey or comprehensive inspection of the MUSKY II. However, after the GLSC Vessel Manager identified plate wastage in April 2000, the hull was audio gauged (with ultrasound) by a licensed commercial shipyard in May 2000 and repairs were made.

PROGRAM DESCRIPTION: The 2001 field program for the MUSKY II consists of a near shore fish assessment survey in June (5 days), July (5 days) and September (5 days); a young-of-year survey in July (5 days) and October (5 days); an EPA-funded water quality survey in late-August (5 days); and a lake trout assessment survey in August (13 days). There are a total of 43 scheduled days in the 2001 program, although experience suggests that actual operational days will be less (31 days in 2000). The young-of-year and lake trout assessments are the station's two long-term monitoring programs, extending 40 and 9 years, respectively. These two activities represent 53 percent of scheduled effort. The lake trout survey is done in cooperation with NYDEC, PFBC and OMNR in the eastern basin of Lake Erie. The near-shore fish assessment is a short-term study (3 years) of a 5-year data series that was discontinued in 1990 and reestablished at the request of Ohio Department of Natural Resources to fill an important data need. The water quality assessment represents 12 percent of total effort. Bottom trawls are used for the near-shore and young-of-year surveys (58 percent of effort) and gill nets are used for the lake trout survey (30 percent).

In the 1970s, the MUSKY II operated about 90 to100 days per year. At that time, there was a rainbow smelt assessment program, walleye tagging work, and a more intensive young-of-year assessment program. In the late 1980s, the Sandusky station increased its efforts in the central basin of Lake Erie to include near shore fish assessment and EPA-funded water quality work. Recent work emphasizes collecting fish, plankton, and benthos and requires more laboratory processing of the catch and samples than the older approach, which maximized the sampling potential of the MUSKY II with a "catch, count, and toss approach". In addition, there has been increased vessel capability by the states and OMNR – currently seven other fisheries vessels are operating on Lake Erie.

The LEBS program has two principal sources of funds–base funding from USGS and soft money from grants and contracts. The GLSC expects all staff to supplement base funding with soft money from grants and contracts. Using grant monies to supplement base funding is potentially problematic because these sources of funding are usually not available on a regular basis. LEBS staff must exercise discretion in selecting compatible contract activities and be careful to ensure that the LEBS program is addressing the principal interests and priorities of GLSC and its partners and is not unduly influenced by what soft-money funds are currently available in the marketplace.

Considering that the LEBS needs one additional biologist, that the MUSKY II is 43 years old and in need of constant care and attention, and that base funding is sometimes inadequate, it is perhaps not surprising that station staff feel that their vessel and long-term monitoring programs are not fully appreciated. There have been instances where cruises were cut and where no new work was initiated due to funding constraints. There is a conflicting view among GLSC staff regarding the role of grant and contract money. Administration staff indicate that staff salaries and long-term, core assessment activities are not funded with grant and contract dollars, but lake program chiefs are aware of situations where grant and contract money sometimes is needed to augment their core program operations.

FUTURE PROGRAM: LEBS staff are uncertain about their future. Most of this uncertainty stems from not knowing how their administration views their role – they believe their program is the lowest priority among GLSC field stations. This view is supported by the following observations, which in some instances extend back to the 1980s:

1. scientific staff was reduced from 4 to 2 biologists;

2. the permanent vessel crew was eliminated and a captain and engineer were borrowed from other field stations when needed;
3. the MUSKY II is the least fit of the five GLSC vessels;
4. the maintenance strategy seems to be to provide "just enough" support to get by until the MUSKY II is replaced;
5. little hard money is provided for the LEBS small, core program;
6. and under the USFWS, a plan was considered that would have eliminated the LEBS in what was then a very tough fiscal environment.

Resolving these issues will require a renewed dedication to a more viable LEBS program and a commitment to provide the necessary resources to improve staffing and vessel capability. If that were to occur, there are some specific activities that staff believe should be part of their future program. The young-of-year trawling and lake trout gillnet monitoring programs will undoubtedly continue, because they represent important core activities. Hydro-acoustic assessments of the fish community may also be a component of future work, especially considering the pace of new technological developments and the continued demands by managers for better quantification of the fish community. There will probably be more interest in keying fisheries and invertebrate sampling to habitat-types using geographic information system technology. In addition, station staff will probably need to continue assessing the impacts of the next new exotic species that makes their way into the Great Lakes. If positive changes occur for the LEBS, their future program may be more flexible, diverse, and responsive to change than other GLSC lake programs, a greater portion of whose base funding is committed to maintaining long-term data sets.

VESSEL SUITABILITY and FITNESS: The MUSKY II had two major repairs completed within the last two years – one to repair a damaged marine gear and the other to replace deteriorated hull plates. The main engine has been rebuilt several times and a new replacement is planned in 2001. There are some other minor items that need attention as well (e.g., inoperative autopilot). Aside from issues related to mechanical fitness, the design itself does not meet the current mission, nor does it provide much flexibility for the future. The gill net lifter is situated too far aft, deck space is seriously limited, there are no wet or dry labs, and the crew accommodation is insufficient for extended surveys. The Great Lakes Science Center recognizes the need to replace the MUSKY II, but no formal plan to do so yet exists. In the short-term, the GLSC will maintain and use the MUSKY II until a replacement can be obtained. When the STURGEON refit is completed, and that vessel goes into use on Lake Michigan, the SISCOWET , which has better capabilities than the MUSKY II, may be dedicated for use in Lake Erie.

VESSEL PROGRAM SUMMARY

VESSEL NAME: **CHANNEL CAT**
OPERATOR: Mt. Clemens Fisheries Research Station, Michigan Department of Natural Resources, Mt. Clemens, Michigan
LAKE: Erie, St. Clair, Lake Huron
HOME PORT: Mt. Clemens
CAPTAIN: Jack Hodge
STATION ADMINISTRATOR: Robert Haas

STATION PROGRAM DESCRIPTION: The Channel Cat is used for walleye and fish community studies in Lake Erie, habitat assessment, fish community, and lake sturgeon studies in Lake St. Clair, and yellow perch and fish community studies in Saginaw Bay of Lake Huron. Work in Lake Erie starts the first week of April and includes walleye tagging as part of an interagency tagging effort. The GLFC Lake Erie Committee uses the results of walleye tagging for a lake-wide management program. Following work in Lake Erie and until mid-June, the Channel Cat is back in Lake St. Clair for habitat mapping using side-scan sonar and capturing lake sturgeon using setlines. These two projects go to mid-June. The Channel Cat then goes to Saginaw Bay and trawls for yellow perch and other associated species in the fish community. By mid-summer the Channel Cat is back in Lake St. Clair trawling for lake sturgeon, habitat mapping, and doing fish community assessment with large- and small-mesh trawls. In September, the Channel Cat returns to Saginaw Bay and trawls for yellow perch and associated species then goes back to Lake Erie for fall index gill netting for yearling walleye until mid-October. Most of the program is similar to the one done 10-20 years ago but vessel operation days have been increased about 40 days largely due to addition of the habitat and lake sturgeon work. The walleye/yellow perch/fish community assessments, mostly by trawling, make up 85% of the Channel Cat program. Habitat and lake sturgeon make up the remainder except that about 1-2% of the vessel time is used for assisting Michigan Department of Natural Resources (MIDNR) Law Division. The Channel Cat operates about 70-80% of the available time during April-October and could operate as early as the last week of March and as late as the first week of December. The Mt. Clemens Fisheries Research Station does cooperative work with other agencies, but does not do contract work for money or contract out any of its work to government or private entities. There are few commercial fishers available in the area that would be able to do the work. The station has thought about contracting some of the remote sensing habitat work but believe they would have to go out of the area, such as the East Coast, to find someone to do the work.

VESSEL DESCRIPTION: The Channel Cat is 46-foot long steel Lake Erie trap-net design boat that was designed and built for the Mt. Clemens Fisheries Research Station by Harlan Maybee of Toledo, Ohio in 1968. The Channel Cat beam is 16.5 feet, displacement is 26 tons, and draft is 4 feet. Workspace is restricted to the aft deck, which is about 260 feet^2. The Channel Cat is powered by two 215 hp Detroit Diesel engines (6V53) and has a cruising speed of 10 knots and a top speed of 13 knots. Total engine hours are 8,575 with 2,200 since the last overhaul. Deck machinery includes a 12-ton Tulsa (TP1-15UB) winch with a capacity of 600 feet of 3/8-inch cable, and a Crossley gill-net lifter. Pilothouse electronics consist of a Cetrek ProPilot 725 autopilot installed in 1999, Furuno 1830 radar installed in 1999, Raytheon Raychart 630 WAAS-DGPS installed in 2001, Raytheon RayNav 570 loran installed in 1986, Datamarine Sandpiper II depth sounder installed in 1975, Furuno FCV292 depth sounder installed in 2000, a Standard Titan marine radio installed in 1988, and a Raytheon Ray53 DSC VHF radio installed in 2001.

VESSEL STAFFING: The crew of the Channel Cat consists of full-time boat captain, full-time assistant boat captain, and a 9-month fisheries assistant. Previous crews have been two full-time positions including a boat

captain and either an assistant boat captain or full-time boat aide. The boat captain has worked on the boat for 23 years and has been the captain for the past 4 years. The assistant boat captain has been on the boat for 4 years and has been assistant captain for 2 years. The fisheries assistant has a season and a half experience on the Channel Cat. The captain and assistant captain must have a Coast Guard license rated equal to or greater than the tonnage of the vessel. The fisheries assistant must have a high school diploma. A biologist and fisheries technician is on board nearly 100% of the time during vessel operation. This scientific staff and vessel crew share jobs during the various fish and habitat assessments. The boat captain is the first-line supervisor of the assistant boat captain and fisheries assistant. The assistant boat captain supervises the deck operations (setting and retrieval of fishing gear). The station administrator supervises the boat captain and is responsible for filling vacant vessel positions. The vessel crew receives annual safety training, has access to training afforded to all state employees (i.e. computer training), and on-the-job training pertaining to the Mt. Clemens Fisheries Research Station vessel program. Channel Cat crew members spend about 25% of their time during year doing non-vessel related work such as station maintenance, lab work, fish aging, and data summarization and entry.

VESSEL OPERATION AND MAINTENANCE COSTS: The Channel Cat operated an average of 121 days in recent years. Main engine hours averaged 360 during 1998-2000 and ranged from 349 in 2000 to 369 in 1999. Fuel use during this period averaged 2,933 gallons and 8.1 gallons per hour. Fuel expense averaged $3,954 and ranged from $3,598 in 1999 to $4,192 in 2000. Fuel costs per engine hour and operation day were about $11 and $33, respectively. Maintenance costs during 1998-00 averaged $3,928 and ranged from $3,260 in 2000 to $4,964 in 1998. Total fuel and maintenance costs per engine hour and operation day were $22 and $65, respectively. The Channel Cat is hauled out annually and dry-docked for the non-operational season at a cost of $1,500 per year. New equipment installed in 1998-2000 includes a radar and an autopilot in 1999 and a depth sounder in 2000. Hull sandblasting is scheduled for 2001 and was last done in 1990. Engines were overhauled in 1995. Maintenance is done as needed except that engine overhauls are based on engine hours recommended by the manufacturer. The crew does day-to-day maintenance such as patch painting and oil changes. Other maintenance is contracted out. The boat captain is responsible for scheduling and seeing that maintenance projects are completed. The frequency of unforeseen repairs has increased in recent years but have not caused significant down time nor compromised the vessel program. However, regular repairs in the shipyard have sometimes delayed start of the operational season. A couple of repair facilities that can work on steel boats are available at Mt. Clemens. There used to be more but many facilities have switched to fiberglass boat construction and repair. The station administrator is responsible for the Channel Cat operation and maintenance budget, but much of the work in budget preparation is done by the boat captain and station administrative assistant. The Channel Cat's operation and maintenance budget has been flat the past 10 years but has not impacted the vessel program yet.

VESSEL INSPECTIONS and SAFETY: The Channel Cat receives a Condition and Value inspection every five years with the last one done in 2000. This is done in part as a requirement of the vessel insurance policy. No stability test has been done on the vessel but the length of the hull has been increased 10 feet since its original construction. Annual safety training for the Channel Cat crew includes CPR training and a day of in-the-water survival suit and man overboard training. First Aid training is also provided every three years. The Channel Cat carries a Plastimo 6-man Coastal life raft which is serviced and/or inspected every five years. Other safety equipment onboard includes an ACR406 (RLB27) EPIRB, six Sterns survival suits, and assorted life jackets. Fire suppression equipment is six hand-held fire extinguishers. The Channel Cat has one Lovett bilge pump.

FUTURE VESSEL PROGRAM: The Mt. Clemens Fisheries Research Station staff is fairly certain that the station will have a vessel program 20 years from now and that the Channel Cat will be a part of it. They believe that support for their program is strong within the Research Section and fairly strong within Fisheries Division. They believe the recent switch by Fisheries Division to lake basin management teams with strengthen that support. Certain surveys that make up the Mt. Clemens Fisheries Station program will be continued over the next 20 years in order to maintain long-term data sets. Station staff believes that they will be doing more remote sensing projects with technology that may ultimately replace some of their current netting programs.

VESSEL FITNESS and FUTURE: According to Mt. Clemens Fisheries Research Station staff, the Channel Cat is economical to operate and a flexible work platform with the necessary draft for working in the very shallow Lake

Erie, Lake St. Clair, and Saginaw Bay environments. However, she is slow, has some weak spots in the hull, needs to be rewired, and could be larger to accommodate more gear. The Channel Cat is one of three vessels being considered for replacement by an ad hoc committee of MIDNR boat captains. However, station staff believes that a retrofit of the Channel Cat may be an acceptable alternative to replacement. They are leery about going through the process of vessel replacement because of recent bad experiences by other agencies, who in the opinion Mt. Clemens station staff, found that their replacement vessels were inadequate to perform all their program tasks. Other factors contributing to the concern of Mt. Clemens station staff are that the MIDNR does not yet have a workable process in place for vessel replacement, and while they know of a shipyard at Mt. Clemens that could do a retrofit, they do not know of a shipyard that could build a replacement vessel.

VESSEL PROGRAM SUMMARY

VESSEL NAME: **CHINOOK**
OPERATOR: Michigan Department of Natural Resources, Alpena Fisheries Research Station
Alpena, Michigan
LAKE: Huron, including St. Marys River and Saginaw Bay
HOME PORT: Alpena
CAPTAIN: Clarence Cross
STATION ADMINISTRATOR: James Johnson

STATION PROGRAM DESCRIPTION: The Alpena Fisheries Research Station vessel program using the Chinook begins with a lake trout assessment using graded-mesh gill nets during May and most of June. This assessment starts in southern Lake Huron at Harbor Beach and samples 12 stations north to the Straits of Mackinaw. Some exploratory netting is done on offshore reefs during mid-July into August and two weeks of trawling is done in August for young-of-the-year lake trout and lake whitefish. September into October is spent in Saginaw Bay assessing walleye and yellow perch with small-mesh graded-mesh gill nets. The Chinook is used for assessment of spawning lake trout populations from mid-October into early November. Gill netting makes up 90% of the work done with the Chinook, trawling makes up 9%, and cooperative work with Michigan Department of Natural Resources (MIDNR) Law Division inventorying shipwrecks makes up the remaining 1%. A 20-foot aluminum boat is also used by the station to do shallow near-shore assessment of brown trout and lake trout with gill nets, and for assessing plankton and shallow-water fish communities in the St. Marys River, les Cheneaux Islands, and Saginaw Bay. Station personnel also collect data from commercial fish catches. The Alpena Fisheries Research Station does not do contract work with the Chinook and does not contract out for any of its vessel work. The station administrator believes that contract money earned by the Chinook likely would not go back to the station vessel program, and contracting out work would be expensive and can be done cheaper with the Chinook.

VESSEL DESCRIPTION: The Chinook was designed and built in 1947 by Marinette Marine in Marinette, Wisconsin. The Chinook was initially used for law enforcement by the MIDNR Law Division. The Chinook was acquired by Fisheries Division in 1968, used briefly for trolling to catch salmon then went to the MIDNR Gaylord Repair Shop in winter of 1970 where eight feet was added to bring it to 50 feet long. She was used for trolling and gill netting during the next three years and has been used for gill netting and trawling since then. The Chinook is a $3/16^{th}$-inch steel hulled boat, 50 feet long, 11.5 feet wide, draws 4 feet 8 inches, and displaces 26 tons. Workspace is the 250 ft^2 aft deck, the forward part of which is covered by a canopy to protect the crew from sun and rain. Below deck there is a 30-ft^2 galley area and a 25-ft^2 bunk area with a commode. The Chinook is powered by one General Motors 671 diesel engine that generates 250 hp with a cruising speed of 9.7 and a maximum speed of 11 knots. Onboard electrical power is provided by an Onan diesel-powered 7,500-watt generator. Deck machinery includes a hydraulic single-warp side trawling winch with 3,000 lb lifting capacity and a cable capacity of 950 feet of 0.5-inch steel cable, a hydraulic capstan mounted mid-deck, a Tulsa electric winch and boom with 1,000 lb lifting capacity, a hydraulic gurney for deploying bathythermographs and other sampling gear, and a 24-inch Crossley gill-net lifter. Pilothouse electronics includes a Wood Freeman Model 11 autopilot installed in 1969, a Raytheon GPS Chartplotter 630 installed in 2001, a Raytheon R21XX radar installed in 1996, a Datamarine Chartlink II GPS installed in 1994, a Furuno LC-90 Mark II loran installed in 1992, a Calvin Hughes depth sounder installed in 1966, a Sitex HE-705 depth sounder installed in 1987, a MIDNR radio installed in 1980, and a President-Uniden LTD-715 marine radio installed in 1996.

VESSEL STAFFING: The Chinook crew is a full-time boat captain, assistant boat captain, fisheries technician, and a 9-month fisheries assistant. A biologist is usually onboard during lake trout assessment and the survey work

in Saginaw Bay. The captain has been on the boat for 29 years with 6 years as captain, the assistant boat captain has been onboard for 11 years with 3 years as assistant captain, the technician has worked on the boat for 7 years, and the fisheries assistant has 3 years experience. This crew composition is similar to what it was 20 years ago except the part-time unclassified contract worker position has been replaced with a longer-term part-time fisheries assistant position that has Civil Service status. The vessel crew and scientific staff share jobs and work well together. The crew receives annual safety training with work-related training being mostly on-the-job. The Chinook crew spends 15-20% of its time on non-vessel related work such as sampling commercial fishers, station maintenance, walleye tagging, and inland stream fish community sampling.

VESSEL OPERATION AND MAINTENANCE COSTS: The Chinook operated an average of 61 days with a range of 58 to 64 during 1998-2000. Main engine hours averaged 204. Fuel use averaged 1,098 gallons and increased from 1,044 gallons in 1998 to 1,159 in 2000, and fuel cost averaged $1,574 and increased from $1,315 in 1998 to $1,901 in 2000. Average fuel use and cost per operation day and engine hour were 18 gallons and $26 and 5.4 gallons and $8, respectively. Maintenance costs averaged $3,174 and ranged from $2,807 in 2000 to $3,500 in 1998. The Chinook is hauled out, power washed, shrink-wrapped, stored, and put back in the water annually at an average cost of $1,675. Prior to being put back in the water, the Chinook is painted at a cost of $1,500 annually. Vessel overtime pay for the crew came to about $3,400 a year and travel expenses averaged $10,210 for 1998-2000. The boat captain schedules major and minor maintenance projects based on his evaluation, marine surveys, and manufacturer's recommendations. The station administrator secures budget support and provides project oversight. The crew chips paint, changes oil, and does minor engine repairs. Special maintenance projects are done as judged necessary by the boat captain and station administrator. The hull was sandblasted and painted in 2000 with the previous sandblasting done 20 years ago. The engine is tuned and overhauled as needed. Unforeseen repairs are handled with a minimum of down time and have not resulted in cancellation of any part of a survey. The Chinook has ready access to parts suppliers and a hoist at Alpena, and diesel repair facilities at Alpena and at the MIDNR Gaylord Repair Shop about 75 miles away. Although the Chinook's operation budget has been flat the past 10 years, maintenance money to keep the Chinook operational has been adequate. However, overtime money, which is necessary for the vessel program, has usually been less than requested. Vessel maintenance has not constrained the Alpena Station's ability to implement its Lake Huron program.

VESSEL INSPECTIONS, and SAFETY: The Chinook receives a Condition and Value survey every five years with the last one done in 1996. The hull was sandblasted and was tested with ultrasound in 2000. It is not known if a stability test was ever done but an old file indicated a "listability" of 45 degrees. The crew receives CPR and on-the-job training for safety and fire fighting annually and first aid training every three years. The captain and assistant captain have had life raft training from the Coast Guard, and the captain has been to radar school. Safety gear onboard the Chinook includes a Revere 6-person coastal life raft, an ACR-Satellite 406 EPIRB, five adult exposure suits, and 10 life jackets. Fire suppression equipment includes a Halon system in the engine compartment and three hand-held extinguishers. The Chinook has two Lovett automatic bilge pumps and one SABSCO bilge pump.

FUTURE VESSEL PROGRAM: The Alpena Fisheries Research Station staff believes that support for their vessel program within MIDNR is good and that the station will have a vessel program 20 years from now. The future vessel program at the Alpena Fisheries Research Station depends upon progress in the recovery of lake trout and walleye in Lake Huron. Until populations of these species show signs of recovery, the current assessments will continue. Some additional lake trout sampling stations were added to comply with the August 2000 Consent Decree agreed upon by the state, federal, and tribal agencies. Other modifications to these assessments might be more non-lethal sampling and more tagging. This could mean a shift from gill nets to trap nets requiring some modifications to the Chinook. A shift from lake trout and walleye assessment to other work such as habitat assessment will depend upon the focus established by the Lake Huron Committee. The station would like to do more lake trout tagging with thermal and depth tags, and do some studies on lake trout hooking mortality since size limits are being increased. Although the vessel and vessel staff could take on additional work, especially in July and August, the station lacks sufficient scientific staff to oversee this work and process the additional data.

VESSEL FITNESS and FUTURE: The Chinook is a seaworthy vessel that is economical to run and its size and shallow draft permits access to many harbors. Alpena station staff believes that she has a serviceable life of at least 20-25 years providing that major and minor maintenance problems are taken care of. The Chinook is old and is experiencing some electronics and steering system problems. Some hull plates will have to be replaced in the next 10 years and the hydraulic system will have to be rebuilt or replaced. The station staff would like the Chinook to be about 5 feet wider to accommodate more deck gear and minimize rolling, and would like it to have a thicker hull to do some operating in ice. A major retrofit would be required to accomplish the above. Consequently, the Alpena Fisheries Research Station is considering replacement of the Chinook. Specifications being considered for a replacement vessel include a beam at least five feet wider than the current Chinook, twin engines to increase speed to 12-13 knots and enhance safety and maneuverability, a dry lab, freeboard low enough for efficient gill netting, and a deck plan that allows all fish handling to be on one deck. The Alpena staff is working with the ad hoc committee of mainly MIDNR boat captains to develop design, cost estimates, and a process for obtaining approval and funding for replacement of the Chinook and one or two other agency vessels. The Alpena Fisheries Research Station staff believes that the current and foreseeable fiscal environment within MIDNR is not suitable for obtaining either desirable staffing levels or a replacement for the Chinook.

VESSEL PROGRAM SUMMARY

NAME:	**ATIGAMAYG and WONDA GOLDIE**
OPERATOR:	Ontario Ministry of Natural Resources (OMNR)
LOCATION:	Lake Huron
HOME PORT:	Owen Sound, Ontario
CAPTAINS:	John Brookham and Jim Hastie
LAB DIRECTORS:	David McLeish (Assessment) and Brian Henderson (Research)

VESSEL DESCRIPTION: OMNR's Owen Sound Fisheries Station is organized somewhat differently from the other OMNR facilities on the Great Lakes. From the operational standpoint, most of the other stations have research and assessment unit functions that are implemented by a common, integrated vessel operation group. In contrast, the Owen Sound research and assessment units each have a separate vessel and captain, and in addition, each of the units has a separate funding source to maintain and operate their vessels.

The ATIGAMAYG is a 57 x 21 x 6 ft., steel 75-ton Lake Erie style gillnet tug that is operated by OMNR's fisheries research unit at Owen Sound. The boat was built in 1954 by Matheson Boatworks and had an extensive refit by Hike Metal, Wheatley, Ontario in 1990 and other work in 1997. The main engine is a turbocharged Detroit Diesel 6V-71 (~300 hp) that was rebuilt in 2000 -- currently there are 3,308 hours on the main engine. The ATIGAMAYG is fitted with a 12.5 kW Westerbeke auxiliary and a gillnet lifter – there are no trawl winches, net drum or crane. Navigational aids include: Furuno 24-mile radar, Lowrance LMS 350 GPS and depth sounder combination, Furuno FE-4300 color sounder, and two marine radios. There are live-aboard accommodations, extensive deck space (350 sq. ft.), but no wet or dry labs.

The WONDA GOLDIE is a 50 x 12 x 4.5 ft., 35-ton steel fisheries vessel operated by the assessment unit at OMNR's Owen Sound fisheries facility. The Russell Brother's Shipyard built the vessel in Owen Sound in 1950. The WONDA GOLDIE was re-powered in 1994 with a Caterpillar 3116 main engine, and since has accumulated 2,418 hours. Deck machinery is outfitted for gillnetting, with the addition of a new Crossley 24 in. lifter in 2000. There is no equipment for trawling. Wheelhouse electronics include: Comnav 1001 autopilot, Furuno 1831 radar, Furuno GP 50 GPS, Furuno color sounder and a Raytheon 90 marine radio.

VESSEL OPERATION and MAINTENANCE: In 2000, the ATIGAMAYG operated 384 hours and burned 3,086 gallons of diesel fuel at a cost of $5,960[10]. Over the last three years, the vessel program has ranged from 40-60 operational days and consists almost entirely of fisheries collections using gillnets. The WONDA GOLDIE also operated exclusively as a gillnetter and operated an average of 321 hours in 1999-2000, consumed an average of

[10] All subsequent cost figures are expressed as US dollars by assuming $1 US buys $1.43 Canadian. Because of fuel quality issues, fuel for the ATIGAMAYG was purchased at a local marina at a substantially higher cost than contract fuel used in the WONDA GOLDIE.

2,228 gallons, which cost $2,777. The rate of fuel consumption was 8.0 and 6.9 gph for the ATIGAMAYG and the WONDA GOLDIE, respectively.

The captains doe all of the routine maintenance (e.g. oil changes, fuel filter and belt replacements etc.) on their vessels. They decide what needs to be done to maintain their vessels. There are good local factory mechanics to handle any engine problems or extended maintenance, but for any hull or systems repairs they travel to Wheatley, Ontario – there are no local yards that can service either boat.

Maintenance costs for the two vessels were approximated using recent budget allocations along with some actual expense data. For the ATIGAMAYG, $6,300 is budgeted each year to cover the cost of minor repairs, oil, filters and life raft servicing etc., and a winter haul-out. Problems with the main engine in 2000 required an overhaul at an additional cost of $11,200. Maintenance, repairs and winter haul-out expenses for the WONDA GOLDIE averaged $8,855 per annum from 1999-2000. Within the last three years, new $3,500 radar was installed on the ATIGAMAYG, and the WONDA GOLDIE was outfitted with a new life raft, hydraulic system and new gillnet lifter at a total cost of $17,920. Combining fuel cost, maintenance expenses and an annualized estimate of new equipment resulted in a total operational expense of $17,160 for the ATIGAMAYG and $17,605 for the WONDA GOLDIE. Both of these figures, however, were exaggerated by the unusual expenses for big ticket, repair items, e.g., an engine overhaul, new hydraulic system and gillnet lifter.

Both vessels have provided good service, without appreciable loss of survey time. The WONDA GOLDIE is characterized as being dependable and reliable. A week of sampling time was lost in 2000 for a hull repair, but this was considered unusual. The ATIGAMAYG had problems with the main engine and fuel systems and required four weeks for a repair during the 2000 field season. However, the repair was scheduled ahead of time and staff were able to work around ATIGAMAYG's downtime without a loss of program. Station staff indicated that for years they under spent on vessel maintenance, and recently began providing better support. They also suggest that it has taken time for staff to fully appreciate the costs required to keep these boats in good operational condition. Unfortunately, funding for preventive maintenance is not as readily available as it is for emergency repairs during the field season. Owen Station staff are trying to change administrative attitudes toward preventive maintenance.

SAFETY, SURVEYS and INSPECTIONS: The ATIGAMAYG undergoes a Canadian Coast Guard (CCG) vessel inspection every four years, but the WONDA GOLDIE is not inspected because it is under the CCG weight requirement. The CCG inspections conducted on the ATIGAMAYG and other OMNR fisheries research vessels are not as complete and comprehensive as may be needed. These inspections focus principally on hull integrity, as well as life saving equipment and navigational lights. The hull inspections are done with the vessel out of the water where they can check plate wastage and the shaft and rudderpost bearings. Other systems (e.g., mechanical, plumbing, electrical and hydraulic) are not usually examined. The primary purpose of the inspections seems to be to ensure that the vessel will not sink. Although these CCG inspections may not be as comprehensive as needed, they are still valuable and important. For example, the captain of the WONDA GOLDIE during routine maintenance discovered holes in some of the steel plates near the transom. This kind of a problem could have undoubtedly been detected much sooner with a CCG hull inspection.

The WONDA GOLDIE had an inclining experiment done in 1985 to establish if it could be operated safely with fish stocking tanks on the deck. Past maintenance records for the ATIGAMAYG are not complete, nevertheless the captain believes there has never been a stability test. In 1990 the ATIGAMAYG was widened from 15 to 21 ft. and it is frequently used to stock fish (without any problems to date), yet no stability test of any type was completed.

As a result of the CCG inspections every four years, there is a full complement of safety gear aboard the ATIGAMAYG: including a Halon fire extinguishing system for the engine room, six-man inflatable life raft, six immersion suits, PFDs, EPIRB, life rings and flares. In addition to the Halon system, the fire fighting equipment includes: two portable extinguishers, two fire/bilge pumps (one electrical and one mechanical), and a smoke detector (non-operable). There were no fireman's outfits or emergency breathing apparatus. The WONDA

GOLDIE has no engine room fire suppression system, only portable extinguishers. There is a life raft, immersion suits, PFDs and an EPIRB.

Firefighting training is made available through OMNR's MED 1-A training program, which is generally available for new captains, and on occasion, other employees. Also, MED 1-A firefighting training deals primarily with how to handle portable extinguishers[11]. All station staff have annual updates of CPR training and every three years for First-Aid training. Both captains believe more could be done with a safety program, especially one that focuses on situation-based, "what-if" training. Moreover, the captains feel that better training should be made available to all potential crewmembers, and not just the captains. This is particularly important today when most crewmembers are temporary, seasonal employees. With the current arrangement of vessel staffing, the captains want to see some provision for a backup captain, e.g., technician with a boat operator's license, that could run the boat if a captain were incapacitated.

VESSEL STAFFING: Four people are the typical crew complement for the ATIGAMAYG, and a captain and two technicians make up the crew of the WONDA GOLDIE. Twenty years ago the fisheries vessels operated on Lake Huron by OMNR had dedicated crews, e.g., generally a captain and technician whose sole responsibility was vessel operation and maintenance and care and construction of fishing gear. Today this is no longer the staffing strategy for OMNR's fisheries vessels. The captain spends as much, or more, of his time on non-boat related activities. Moreover, technical crew on the vessels today are more likely to be seasonal, temporary employees who also spend most of their time on non-boat activities. These temporary crew are also less likely to come with commercial fishing backgrounds and skills, but are more likely to have some level of formal natural resource training.

The captain of the WONDA GOLDIE has been in that position for 10 years, and the captain of the ATIGAMAYG was a crewmember for 10 years and captain for the last ten years. Current job requirements for these positions are an appropriate tonnage license, two years of education in resource management, and some fisheries and gear experience. The education requirements underscore the dual role of Owen Sound captains. During the winter, they are often involved in other activities that support the overall mission of the fisheries units, such as scale reading, data summaries etc. The captain of the ATIGAMAYG spends approximately one-third of his work on vessel operation and maintenance and two-thirds on other program activities. A similar distribution of work effort for the captain of the WONDA GOLDIE is roughly one-half for vessel operation and one-half for other station activities. One of the concerns station staff have is that finding future captains that have this combination of skills will probably be very difficult. Someone who has good vessel and gear skills may not have a "clue" as to what is required in the lab, while another individual who has a good biology background may not have good vessel operation skills. Owen Sound staff see this as a dilemma, because this current hiring practice may lead to hiring a new captain who does not have the best combination of vessel and gear skills.

The salary and compensation package for the Owen Sound captains is similar to those captains at the other OMNR fisheries stations on Lakes Ontario and Erie. The starting and final salary for an OMNR vessel captain is $28,428 and $32,782, respectively. This range includes two Resource Technician grades (Senior 1 & 2) with three steps in each grade level. There is no provision for overtime compensation to captains, neither time-and-half pay nor compensatory time off. In addition, there is no career ladder for Ontario's vessel captains; i.e., the difference between start and final salaries is small. The fish technicians that make up the remainder of the crew have starting and final salaries of $24,723 to $27,620. In contrast to the captain, fish technicians who work on the vessels can accrue time-and-half compensatory time off.

A simulation of the ATIGAMAYG or WONDA GOLDIE vessel crew operating expense was calculated assuming a two-person crew, with an average annual salary for the captain of $30,605 and an annual average salary for a technician of $26,172. This combined crew salary is $56,777, or $218 per day for a 260-day work year. Assuming a 50-day operating season for the ATIGAMAYG, staff operating cost would be $10,900. For the WONDA GOLDIE, with a 110-day schedule, the staffing cost is $23,980. Combining operating, maintenance and

[11] Other levels of MEDI training get more involved in firefighting.

staff costs yields a total operating expense of $28,060 for the ATIGAMAYG and $41,585 for the WONDA GOLDIE or $561 and $378 per operating day, respectively.

PROGRAM DESCRIPTION: Owen Sound station staff characterized the difference between research and assessment vessel programs as research spends 20 percent of their effort catching fish and 80 percent processing the catch, whereas the assessment unit spends 80 percent of their time catching fish and 20 percent processing. This thumbnail description provides a context to view the field programs for both units. Nearly all the effort for the research unit's ATIGAMAYG is associated with fisheries work: 75, 15 and 10 percent of effort is spent on research, assessment and fish stocking, respectively. The field program begins in May with lake trout stocking in Lake Huron (5 days). From late-May through June, the ATIGAMAYG works in Lake Superior collecting lake trout for research and to assist contract commercial netters working for the Lake Superior management unit (35 days). During August-September, 10 to 14 days will be spent at South Bay, Manitoulin Island, to net sites that have not been visited since 1992. Finally, approximately 18 days will be spent supporting the assessment unit's Offshore Index program. The total field program encompasses approximately 70 days.

The assessment unit's program also begins in May stocking lake trout (20 days). The remaining time between June and October is directed at their core assessment activity, the Offshore Indexing Program. This is a gillnet index program that began in the late-1970s that was initially targeted at chubs, whitefish, lake trout and perch, but is also used to monitor other components of Lake Huron's offshore fish community. Four sites are visited annually for approximately 10 days of effort at each site (40 days), and two sites are netted biannually, 10 days per visit (40 days). Another 10 days of effort is planned for various other activities. More integrated, "piggy back" work is being done today than previously. Water quality, phytoplankton and benthic samples are collected along with gillnet samples, and much of this work is done collaborating with other scientists or agencies. Collectively these surveys total 110 operational days for the WONDA GOLDIE.

In spite of the ambitious core Offshore Indexing program (98 days total), assessment unit staff feel the schedule represents a bare-bones program. The principal concerns are that there is not adequate geographic coverage and that the bottom set gillnets do not adequately reflect the species assemblage in the fish community. To address the problem of insufficient sampling of the offshore-pelagia, assessment and research staff are considering the use of pelagic gillnets, albeit this approach is less efficient and more labor intensive than bottom set gear. With limited staff resources and survey coverage, this approach is unlikely to resolve all their concerns. For vessel program expansion, there is no available time for increasing the use of the WONDA GOLDIE. On the other hand, the ATIGAMAYG has some unused capacity (e.g., 70 days vs. 110 days) that could conceivably be used to expand the Offshore Index program. However, the captain's time is limited by other non-vessel activities and it constrains making better use of the ATIGAMAYG. Both units indicate that current funding is inadequate and it has inhibited formulating a good, base program that considers the spatial and bathymetric distribution of the fish community.

There is a difference in funding for both of these vessels, and the difference has to do with two different administrative units. The assessment unit indicates they get good support for operation and maintenance of the WONDA GOLDIE. Base funding provides money for day-to-day maintenance, repairs and winter haul-out, and capital funding is used to replace equipment, take care of major unforeseen emergency repairs etc. The ATIGAMAYG has the same two sources of funding, but does not have the same access to capital funding as the assessment unit. Consequently, money for new equipment and repairs is less available than that for the WONDA GOLDIE. This point is underscored by the fact the ATIGAMAYG has some maintenance issues, noted during previous inspections that are still unresolved and are considered a "work in progress."

FUTURE PROGRAM: Owen Sound's hope for future programming is tied directly to unmet current needs. Both units would like to see an increase in the spatial scope of their Offshore Indexing program to include northern Lake Huron. They also need a vessel with bottom and midwater trawling capability to help monitor and quantify prey fish distribution and abundance. Connected with the trawling and prey fish assessment, they also want to augment their sampling capability with the addition of hydroacoustic gear.

All of the additional activities that Owen Sound Station staff would like to see in the future are bound to a requirement for additional staff. Yet, the units are not optimistic about future increases in personnel. They hope that they will not have to experience any more cuts in staff than they have already faced, but they do not rule out the possibility that further cuts may lie ahead. This gloomy assessment of future staffing levels is not compatible with their hope for future programming. It suggests that it may be more realistic to think that in 20-25 years the Owen Sound program will look much like the one today. In the meantime, however, better integration of research and assessment unit staff and fiscal resources may improve efficiency, and better use of technology (e.g., hydroacoustic gear) could improve productivity and effectiveness. Regardless, without additional funding or the ability to adapt, it will be difficult to address what is currently considered "unmet needs."

VESSEL SUITABILITY and FITNESS: The WONDA GOLDIE is considered to be in good shape. The main engine was replaced in 1994 and has 2400 hours of use since then – it will be many years before a normal overhaul is required. The gillnet lifter and hydraulic system were replaced in 2000 along with the autopilot and GPS. Although the boat has been well maintained, it is 50 years old and showing signs of structural deterioration. The perforated hull plating discovered and repaired in 2000 is an example of this kind of deterioration. In the future, the WONDA GOLDIE will require constant attention to the structural integrity of the hull, and it is unlikely that it can provide safe service for another 20-25 years without a major refit. The design and sampling capabilities of the WONDA GOLDIE are limited now and they would provide a serious constraint on assessment programming in the future – "the WONDA is not the boat we want to have for the future." The vessel is narrow, deck space is limited, and handling characteristics are poor compared to the ATIGAMAYG. A new vessel is the only way that the assessment unit can consider bottom trawling, midwater trawling and hydroacoustic sampling. Moreover, expanding their geographic range to include index sampling in northern Lake Huron will require a survey vessel with good handling qualities and adequate live-aboard accommodations for the crew.

The ATIGAMAYG went through a major refit in 1990 and had a new wheelhouse and galley installed in 1997. With care it should provide very adequate service for another 20-25 years. The vessel's strengths are its deck space and sea kindliness, while improvements are needed with better electronic navigational aids, better crew accommodations for long surveys, adding some safety equipment (e.g., life sling and boarding ladder), and adding a HIAB crane. The current state of fitness is considered adequate, but it will better when a number of maintenance issues are finally resolved, i.e., replacing electronics and several inspection issues. Getting the ATIGAMAYG into better shape, more quickly could be accelerated with better funding or a change in funding sources. The lack of trawling and hydroacoustic capabilities was noted as an important research need now and in the future. Aside from another refit of the ATIGAMAYG, another approach to providing this capability for the research unit is to develop a more integrated vessel management plan for the Owen Sound station. If and when the WONDA GOLDIE is replaced with a more functional and capable fisheries vessel, research unit staff could schedule any trawling and hydroacoustic work with the new vessel, while the ATIGAMAYG could be used to a far greater extent supporting the Offshore Index program. Considering that research and assessment staff all consider funding and staffing inadequate, it would seem reasonable to make the most efficient use of current resources, i.e., both boats could be shared and funded under a common operational group, similar to the approach used at Glenora, Port Dover and Wheatley stations.

VESSEL PROGRAM SUMMARY

VESSEL NAME: **TOGUE**
OPERATOR: U.S. Fish and Wildlife Service, Jordan River National Fish Hatchery, Elmira, Michigan
LAKE: Superior, Huron, Michigan
HOME PORT: Cheboygan, Michigan
CAPTAIN: Mike Perry
MARINE ENGINEER: Bob Bergstrom
STATION ADMINISTRATOR: Rick Westerhof

PROGRAM DESCRIPTION: The primary mission of the Jordan River National Fish Hatchery is restoration of lake trout populations in the Great Lakes. The primary use of the TOGUE is to transport and stock lake trout on historical offshore spawning reefs. Lake trout stocking by the TOGUE is done during April, May, and June. The boat cannot be used for anything else during that period because it must be on call 24 hours a day for stocking. In October, the TOGUE is used for assessment of spawning lake trout populations with graded-mesh gill nets on offshore reefs (Six-Fathom Bank/Yankee Reef complex). Lake trout stocking is cooperative work with other state, federal, and tribal agencies in their respective lakes, and the spawning lake trout assessment is done in cooperation with member agencies of the GLFC Lake Huron Technical Committee. The TOGUE operated an average of 91 days in 1998-2000 with lake trout stocking and lake trout assessment netting making up 85% and 15% of those days, respectively. The TOGUE has not been used for contract work, but Jordan River staff estimates the cost of contracting the TOGUE would run $1,500-$2,000.

VESSEL DESCRIPTION: The TOGUE was acquired by the U.S. Fish and Wildlife Service (USFWS) in 1985 for stocking lake trout offshore in the Great Lakes. It was designed and built in Louisiana by Rodregez Brothers shipyard. The TOGUE is a steel boat, 85 feet long, 22-foot beam, 10-foot draft, and a displacement of 175 tons. Work deck area is 384 ft^2 on the aft deck. It has four bunks, a galley, and a head with a shower. The TOGUE is powered by two Detroit Diesel engines that generate 500 hp and cruise the boat at 8.5 knots. There are two generators rated at 75 and 50 kWs. Deck machinery consists of a removable Crossley 12-inch gill-net lifter (Kennebec Marine Co.). Pilothouse electronics include a Robertson autopilot (AP-40) installed in 1985, two Raytheon radars installed in 1988 (R-41) and 2000 (R1210/6XX), two North Star GPSs installed in 1997 (9300) and 1999 (961XD 1705-A), a North Star loran (9000) and North Star control head (9400) installed in 1997, two Raytheon depth sounders installed in 2001 (JFV90) and 1996 (V8010), a Raytheon marine radio (Sea 157) installed in 1988, and a Sea/Datamarine marine radio (SEA 156) installed in 2000.

VESSEL STAFFING: The crew of the TOGUE is supervised by the Hatchery Manager of the Jordan River National Fish Hatchery. The crew consists of a part-time boat captain hired for the months the vessel is operating and a full-time marine engineer. This has been the crew composition since acquired by the USFWS for fish stocking. One or more biologists and technicians from other U.S. Fish and Wild Service offices (Iron River and Pendills Creek NFH and Alpena Fishery Resource Office) are on board when the vessel is stocking lake trout or doing lake trout assessment netting. The boat captain must have a 200-ton Coast Guard Masters License to operate the TOGUE. The marine engineer has a boat engineer's license. The current boat captain has 1 year of experience on the TOGUE, and the current marine engineer has 12 years of experience on the TOGUE. Together they have 70 years of experience on Great Lakes vessels. The captain is contracted so to fill that position would involve advertising or soliciting marine academies for candidates. The boat captain earns $26.71 per hour and approximately $13,889 annually. The marine engineer is a wage-grade position and currently earns$30.42 per hour and annually $63,485. The captain and engineer have rather specific jobs so there is little job sharing

between these positions. The vessel crew and scientific staff share jobs such as fish stocking, setting and lifting gill nets, and deckhand duties. The captain generally does not do non-vessel related work, but the marine engineer spends about 10% of his time on non-vessel related work such as facilities maintenance at the vessel base in Cheboygan, Michigan. The contracted captain and the marine engineer both get annual CPR and first aid training.

VESSEL OPERATION AND MAINTENANCE COSTS: The TOGUE operated an average of 91 days annually during 1998-2000, ranging from 87 days in 2000 to 98 days in 1998. Main engine hours averaged 4,377. Fuel use averaged 7,321 gallons per year during 1998-2000 and fuel cost averaged $6,719. Average fuel use and cost per operation day and engine hour were 80 gallons and $74 and 2 gallons and $2, respectively. Annual maintenance cost for the TOGUE has averaged $ 10,133 during the past three years or about $334 per operating day. Average annual operating and maintenance cost for the TOGUE from 1998-2000 was $128,491 and new equipment purchased during that period came to $27,350. The Jordan River National Fish hatchery manager is responsible for the TOGUE's operation and maintenance budget. The marine engineer determines what is needed in the way of equipment and schedules maintenance projects and the hatchery manager approves and provides oversight for the projects. The marine engineer does most of the maintenance except sandblasting and major engine overhauls. Haul-out is done every five years. The last haul-out was in 1999 and cost $9,000, which included haul out and return to the water, sandblasting, and painting. Otherwise hull and deck painting is done as needed, and engine tune-ups and overhauls are scheduled according to manufacturer's specifications or as needed. The TOGUE is wet-docked and heated during the non-operational season. Dockage is leased from RYBA Marine in Cheboygan, Michigan and the crew has free use of the USGS vessel base located adjacent to the RYBA Marine dockage. Maintenance needs in general and the frequency of unforeseen repairs has increased in recent years but this has not yet affected the TOGUE's operation. Although the amount of money appropriated for operation and maintenance has not increased in recent years, budget shortfalls have been covered by money from the hatchery budget. The hatchery superintendent and engineer work quickly to secure funds and undertake unforeseen repairs and the TOGUE has ready access to parts suppliers and repair facilities.

VESSEL INSPECTIONS, AND SAFETY: The last inspection of the TOGUE by a marine architect was in 1991 and the next one is scheduled for 2001. The hull is inspected during haul-out every five years. A stability test was done in 1989. Some concrete ballast, a generator, and an air compressor have been added since this stability test. The boat captain and marine engineer receive annual USFWS-supported CPR and first-aid training, and has had marine fire-fighting training as part of the requirements for the marine engineer's license. Safety equipment onboard the TOGUE includes a life raft (Model CRG-10-STD MK-2), an EPIRB (Northern Airbore Tech S1510), 6 immersion suits (Parkway Imperial Model 1409 and Mustang suits Model 2175), 19 PFDs (5 Sterns work vests, 10 adult Safeguard Corp., 4 child Safeguard Corp.). Fire suppression equipment onboard includes a Halon system in the engine room, six hand-held fire extinguishers, and a water pump with 2.5-inch hose. The TOGUE has two bilge pumps.

FUTURE VESSEL PROGRAM: The Jordan River National Fish Hatchery has good support from the USFWS for its major vessel program, which is stocking lake trout on historical offshore spawning reefs to enhance lake trout rehabilitation in the Great Lakes. This agency support is evidenced by the 4.3 million dollars budgeted in 2004 for construction of a vessel to replace the TOGUE. The vessel program is also supported by partner state, federal, and tribal agencies. Recent negotiations with Native-American tribes in the upper Great Lakes has reclassified additional areas of northern Lake Michigan and Lake Huron as lake trout rehabilitation areas. Consequently lake trout stocking may increase by two million fish and require more vessel use for offshore fish stocking. Additional vessel time will likely also be needed by partner agencies to do assessment netting to evaluate the results of offshore fish stocking. The Jordan River Hatchery Manager would like to increase the vessel staff by making the contracted boat captain a full-time position and adding a seasonal deck hand. A full-time captain would assist the Hatchery Manager in managing vessel operations, assist the marine engineer in vessel maintenance, and provide stability and experience for the position.

VESSEL FITNESS AND FUTURE: The TOGUE is the only vessel on the Great Lakes specifically modified for lake trout stocking. The vessel has been well maintained, and thus far has not missed a day of operation due to breakdowns. However, the TOGUE has structural integrity problems and is near the end of its serviceable life.

The keel is twisted and deck plates have buckled. The marine engineer estimates a serviceable life of three years to four years. A formal survey is scheduled for 2001 to determine the life of the TOGUE. The process for replacement of the TOGUE is underway with money budgeted to begin construction of a new vessel in 2004 with an estimated completion in 2006. A team will be assembled including the Jordan River Hatchery Manager, boat captain, marine engineer, USFWS Fishery Resource Office personnel, USGS personnel, and perhaps other partner agency personnel. The team will work with the U.S. Corps of Engineers Marine Design Center to design a new vessel. Major specifications would focus on the onboard fish transport and distribution system to optimize survival of stocked fish. Secondary specifications would enhance the fisheries assessment capabilities of the vessel such as improved gill netting and a laboratory to process fish and house sensitive sampling equipment, and provide better crew quarters. A major concern of the Jordan River Hatchery Manager and the marine engineer is that the TOGUE might not last, even with a retrofit, until completion of a new vessel in 2006. The results of the marine survey in 2001 should answer the above question.

VESSEL PROGRAM SUMMARY

VESSEL NAME: **GRAYLING**
OPERATOR: U.S. Geological Survey, Great Lakes Science Center
Ann Arbor, Michigan
LAKE: Huron, Michigan
HOME PORT: Cheboygan, MI
CAPTAIN: Edward Perry
CHIEF OF VESSEL MANAGEMENT: Robert Nester
SCIENCE CENTER ADMINISTRATOR: Dr. Nancy Milton, Director

PROGRAM DESCRIPTION: The GRAYLING is used primarily in lakes Huron and Michigan for prey fish population assessment with bottom and mid-water trawls and hydro-acoustic gear, and for lake trout assessment with trawls and gill nets. The GRAYLING operates during April-November and about 85% of its operation is for fish population assessment and the remaining 15% is for fish habitat assessment. All of the work is cooperative with partner agencies through the Great Lakes Fishery Commission's Lake Huron and Lake Michigan committees and Lake Huron and Lake Michigan technical committees. Although personnel from these agencies may or may not be present on the GRAYLING when sampling is done, the data are shared with all partner agencies and used for management of the fish populations. The GRAYLING is currently not being contracted to do work for other agencies, nor is work typically done by the GRAYLING being contracted out. The Great Lakes Science Center occasionally uses the GRAYLING for special projects funded from outside sources, providing these projects do not interfere with prey-fish and lake trout assessment core projects.

VESSEL DESCRIPTION: The GRAYLING was designed and built by Bender Shipyard in Mobile, AL in 1977 and acquired by the Great Lakes Science Center in 1978. It is steel-hulled, 75 feet long, 22 feet wide, has a 10-foot navigational draft, weighs 183 gross tons, and has a full-load displacement of 133.4 tons. It carries 6.5 tons of fixed ballast as steel welded to the keel, cement in the lazarette, and pig iron in the bilge. The GRAYLING has twin screws and rudders and is powered by two 275 hp Cummins diesel engines with a cruising and maximum speed of 9.7 knots. It has a fuel capacity of 4,400 gallons, a cruising range of 1,500 miles, and endurance of 12 days. The GRAYLING has 490 ft^2 of exterior workspace of which 152 ft^2 is taken up by deck equipment. Interior workspace includes 70-ft2 forward and 84 ft^2 aft. There is 43 ft^2 of science storage and a 23-ft^3 freezer. The GRAYLING has accommodations for seven people in five staterooms. There are two heads with showers. The GRAYLING has a 2,500-gallon potable water capacity and a 2,987-gallon sewage capacity. Is has a galley with stove, microwave, refrigerator, sink, water cooler, and hot water dispenser. Recreational facilities include a TV and VCR.

The GRAYLING has two Cummins 855 NH-230-22 diesel 75 Kw generators. Other auxiliary machinery includes a Campbell-Hausfield air compressor, a Wei-Mcaim Ship heater boiler, a Gould J-plus Jet 0.5 hp seawater pump, a Gould Century 10 hp fire and bilge pump, a Crane 5 hp sewage pump, and a Myers 0.5 hp portable ejector pump. Deck machinery includes a Rowe 9-BHH anchor windlass, a HIAB-Dunbar 345 deck crane, a BT winch and boom with 2,000 feet of 3/16th-inch cable, two Rowe 17-H trawl winch with 2,200 feet of 0.5-inch steel cable, a Kem Krd 4420 MS net reel, and a Crossley 30-inch gill net lifter. Pilothouse electronics includes a Simrad autopilot, two radars (Raytheon R4 installed in 1989, Raytheon 1210XX installed in 1997), two depth sounders (Furuno 502L, Wesmar DS 200), a North Star 9000 loran installed in 1995, a North Star 951X differential GPS installed in 1997, a Datamarine Chart Link II plotter installed in 1995, two marine radios (two Sea 156 in 2000), two hand-

held radios acquired in 1996, a Raytheon Ray 400 intercom installed in 1985, a Man Overboard Alert installed in 1997, a Hewlett Packard 700 fax installed in 1997, an Ameritech AC-250 cell phone acquired in 1996, a Simrad net monitor installed in 1994, a Tack II shaft tachometer installed in 1997, a Richie compass installed in 1977, Yokogawa Gyro compass CMZ 250X, and a F420-CWSHROWA anemometer installed in 1977.

VESSEL STAFFING: The current crew of the GRAYLING consists of a boat captain whose official Wage-Board Series classification is a Ship Operator, and an engineer whose official classification is a Marine Machinery Repairer. To meet current Coast Guard manning requirements the vessel also needs a licensed Mate. A 500-ton Coast Guard Masters License is required to operate the GRAYLING and the current captain has a 1,600-ton Coast Guard Masters License. The boat captain is responsible for operational readiness of the vessel, navigation, routine maintenance, and safety. The captain assists the biologist-in-charge on board in planning daily work schedules. An engineer's license is not required by USGS for the Marine Machinery Repair position, but the incumbent must possess knowledge, skills, and abilities consistent with specified acceptable performance for the position including the operation, maintenance, and repair of the vessel's engines, machinery, fishing equipment, and electrical, heating, plumbing, and hydraulic systems. As of 2000, pay ranges were $23.90-$27.93 per hour for Ship Operator and $18.73-$21.87 per hour for Marine Machinery Repairer. In the 1980s, the crew of the GRAYLING also included a cook/seaman. One or more biologists and technicians provide scientific staffing for the core assessments and special projects done by the GRAYLING. The scientific staff assists the crew with various deck duties and the crew assists the scientific staff with processing fish samples. The captain and engineer spend less than 5% of their work time on maintenance of the USGS vessel base facility at Cheboygan, MI.

VESSEL OPERATION AND MAINTENANCE COSTS: The GRAYLING operated 98 days in 2000 and is scheduled to operate 106 days in 2001. Fuel costs for the GRAYLING in 2000 were about $23,000 or $235 per operating day. The captain and engineer work with the vessel manager in scheduling maintenance and they generally do all but major repairs. The frequency of unforeseen repairs has increased in recent years and a recent breakdown of engines on the GRAYLING resulted in some down time and loss of survey days in 2000. Access to parts suppliers and repair facilities for the GRAYLING is good at the vessel's homeport, Cheboygan, MI. Agency support for maintenance of the GRAYLING has been adequate to address repairs and safety concerns necessary to keep the boat operational. However, past budgets have not been sufficient to fund some preventive maintenance, which has resulted in necessary emergency repairs and some loss of survey time.

VESSEL INSPECTIONS, AND SAFETY: The GRAYLING received a condition assessment inspection in 2000 by the Great Lakes Science Center's chief of vessel management. The GRAYLING is hauled out and inspected every 3-5 years for routine maintenance, but the vessel has never had a full-scale formal inspection by a marine surveyor. A stability test done on the GRAYLING in 1976 while it was in the shipyard at Mobile, AL. The crew receives annual CPR training and first aid training every three years. Safety equipment onboard the GRAYLING includes, a man overboard alert system, a 12-foot aluminum boat with a 9.9 hp Johnson outboard, two 10-man life rafts, 10 exposure (survival) suits, 24 life jackets, 4 life rings, and 2 water lights. The Great Lakes Science Center provides the captain and engineer with annual safety training, including CPR and first aid; abandon ship training was conducted in 2001; the crew has also received fire fighting training and that training will be repeated in 2002. Fire fighting equipment includes a fixed CO2 system in the engine room, eight portable fire extinguishers (7 ABC, 1 Haylon) stationed about the vessel, and a Gould Century fire and bilge pump. The Great Lakes Science Center provides support to the crew to update licenses needed to meet Coast Guard requirements.

FUTURE VESSEL PROGRAM: USGS support for operation and maintenance of the GRAYLING has been minimal, but is improving. Great Lakes Science Center administrators and vessel personnel are developing new systematic safety and budget strategies that will more clearly convey to USGS administrators the support needed for the GRAYLING and the Great Lakes vessel program as a whole. These strategies include classifying vessels as facilities, each with its own maintenance budget, and preparing comprehensive vessel management plans that incorporate five-year preventive maintenance schedules based on regular condition assessments performed by the vessel manager and licensed marine surveyors. Great Lakes Science Center personnel believe that their current prey fish, lake trout, and fish habitat assessment core programs will be continued during the next 20 years but that the sampling technology will likely change. They expect to see more assessment done by remote sensing, as this

technology is further developed and they believe that the Great Lakes Science Center vessels will be the ideal platforms from which to deploy this new technology. Challenges and opportunities for the Great Lakes Science Center vessel program for the GRAYLING in the next 20 years includes increasing vessel staffing with the addition of a mate and filling two biologist positions to bring the scientific staffing up to three biologists.

VESSEL FITNESS AND FUTURE: The GRAYLING is a safe cost-effective work platform, which has had few maintenance problems until recent years. It was considered to be the best of the five USGS vessels prior to acquisition of the KIYI. The GRAYLING is expected to last at least another 20-25 years. There are currently no plans to replace the GRAYLING. Adding 10 ft. to the hull at the stern of the vessel would increase stability and add working space on deck.

VESSEL PROGRAM SUMMARY

VESSEL NAME: **SISCOWET**
OPERATOR: U.S. Geological Survey, Great Lakes Science Center
Ann Arbor, Michigan
LAKE: Michigan
HOME PORT: Cheboygan, MI
CAPTAIN: Thomas Girard
CHIEF OF VESSEL MANAGEMENT: Robert Nester
SCIENCE CENTER ADMINISTRATOR: Dr. Nancy Milton, Director

PROGRAM DESCRIPTION: Prior to the recent delivery of the KIYI in 2000, the SISCOWET served as the principal research platform for the U.S. Geological Survey (USGS), Great Lakes Science Center studies on Lake Superior. In late 1999, the SISCOWET was re-assigned to Lake Michigan to temporarily replace some of the research activities conducted by the Cisco that was decommissioned in the same year. The SISCOWET was used in fall 1999, all 2000, and will be used in 2001 principally for lake trout population assessment in Lake Michigan. This vessel will support science and survey needs on Lake Michigan until the complete refurbishment and delivery of a replacement research vessel, the Sturgeon (anticipated in mid- to late 2002). Months of operation span from late April to mid November; in 2001 a total of 75 operation days are planned on Lake Michigan. Nearly 100% of the work done by the SISCOWET in Lake Michigan is fish population assessment. All work done by the SISCOWET is in cooperation with partner state, tribal, and federal resource agencies on Lake Michigan, coordinated through the Great Lakes Fishery Commission and the Lake Michigan Technical committees. Although other agencies are not directly involved in the sampling, data collected by the SISCOWET and resultant analyses are shared with these partner agencies for joint management of the fish populations. The SISCOWET does not do contract work for other agencies and no Great Lakes Science Center core program work on Lake Michigan is contracted out to other agencies or entities. The SISCOWET has been used for joint surveys partly underwritten by tribal fishery management authorities (2000) and US Fish and Wildlife Service (2001) on Lake Michigan. In addition, the SISCOWET was also used for an extended period on Lake Erie in 2000 due to a breakdown of the MUSKY II.

VESSEL DESCRIPTION: The SISCOWET is a Great Lakes gill net tug design that was built by Burger Boat of Manitowoc, WI in 1946. It was acquired by the Great Lakes Science Center, Lake Superior Biological Station at Ashland, WI in 1949. The SISCOWET was modified for trawling in 1957. It is a steel-hulled boat, 57 feet long, a beam of 14.5 feet, a navigational draft of 6 feet 4 inches, and a displacement of 42.7 tons. It has an unknown amount of iron ballast in the lazarette. The SISCOWET has a fuel capacity of 1,250 gallons, a potable water capacity of 500 gallons, and two sewage-holding tanks with a total capacity of 106 gallons. It has 450-ft^2 exterior workspace on the aft deck, a 140-ft^2 interior wet lab in the bow, and a 12-ft^2 storeroom in the bow forepeak. The SISCOWET has berthing to accommodate five people: one bunk for the captain in the pilothouse and four bunks in a stateroom. It has a galley with stove, microwave, refrigerator/freezer, and a table with seating for 5. Recreational facilities include a TV and VCR. The SISCOWET is powered by a Detroit 671 diesel engine with 8.4 knots as the cruising and top speeds. It has two diesel generators, a 73 hp 30 kw Detroit 3-53 and a 27 hp 20 kw Yanmar 27, a Quincy 120 psi 30-gallon air compressor, and a Weil McLain 68 V oil boiler. Deck machinery includes a custom-made anchor windlass, a Bruco Apr H2m winch with 1,500 feet of 3/8^{th}-inch cable, a Hoist/BOS/NS N/E6 winch with 1,000 feet of 1/8^{th}-inch cable, and a KEM gill net reel. Pilothouse electronics include a Raytheon 1210 XX radar salvaged from the Cisco and installed in 2000 and a Pathfinder SL70 backup radar installed in 1999, two depth sounders (Raytheon V850 and Furuno FCU-582), a Raytheon RayStan 920 GPS installed in 1994, a Northstar 951 X DGPS and Raytheon 900 series GPS (not functioning due to lack of Y2K upgrade), two marine radios (Motorola Triton 2 salvaged off the CISCO and a ICOM IC-M127 installed in 1997),

and a Motorola cell phone acquired in 1995, a M500 Wood Freeman Auto Pilot, a Raytheon Loudhailer 430 salvaged from the CISCO, and an Alert AR100 man-over-board alarm system.

VESSEL STAFFING: The SISCOWET, while assigned for use in Lake Superior, was crewed by a boat captain whose official Wage-Board Series classification was a Ship Operator, an engineer whose official classification was a Marine Machinery Repairer, and a Cook/Seaman. Since the re-assignment on Lake Michigan, the vessel has been crewed only by a captain and an engineer. The boat captain is required to have a Coast Guard Masters License for tonnage equal to or exceeding that of the vessel, which for the SISCOWET would be a 50-ton license, and acceptable knowledge, skills, and abilities relating to the position. The boat captain is responsible for operational readiness of the vessel, navigation, routine maintenance, and safety. The captain assists the chief biologist on board in planning daily work schedules. The engineer is not required to be licensed, but must be skilled in the operation, maintenance, and repair of the vessel's engines, machinery, fishing equipment, and all systems such as electrical, heating, plumbing, and hydraulic. As of 2000, pay ranges were $23.90-$27.93 for Ship Operator, $18.73-$21.87 for Marine Machinery Repairer. At least one biologist and one or more technicians provide scientific staffing for all SISCOWET operations. Scientific staff is responsible for developing daily work schedules and coordination of the collection of data necessary to meet research objectives. The SISCOWET crew operates fishing and other data collection gear and rarely assists the scientists in sampling fish catches. The scientific staff assists the vessel crew with some deckhand duties and other aspects of vessel operation. The SISCOWET crew spends about 5% of its time on non-vessel work. This work generally consists of maintenance, housekeeping, and security of the Great Lakes Science Center's vessel base facilities at Cheboygan, MI.

VESSEL OPERATION AND MAINTENANCE COSTS: The SISCOWET operated 25 days in Lake Michigan and 60 days in Lake Erie in 2000. The vessel is projected to operate 75 days in Lake Michigan in 2001. Fuel use is 12.5 gal/hour**.** The SISCOWET is hauled out, inspected every 3-5 years and, if necessary, sandblasted and painted. The last haul-out was in 1997, sandblasting and painting was done in 1993, and the vessel was painted above the water line in 2001. The last engine overhaul was in 1994 and there are 1,750 hours on the engine since that overhaul. The boat captain and engineer work with the Chief of Vessel Management to schedule and complete maintenance projects. The operation and maintenance budget for the SISCOWET has not changed in recent years, but has been adequate to maintain required vessel operation. The frequency of unforeseen repairs has not increased in recent years and they have not resulted in cancellation of an assessment cruise. The crew of the SISCOWET does most of the maintenance, the exceptions being haul out and sandblasting. There is good access to parts suppliers and repair facilities at the Cheboygan vessel base and at certain ports on Lake Michigan. Great Lakes Science Center support for maintenance of the SISCOWET has been just adequate to address repairs and safety concerns necessary to keep the boat operational – this strategy was prudent given the age of the vessel and its impending replacement. However, many of the systems are in need of replacement if longer service is desired. Problems with watertight integrity still plague the vessel and the hull, machinery and electrical systems need to be reevaluated since they have been maintained marginally. The aging electrical system represents a high potential for continuous failure and electric shock.

VESSEL INSPECTIONS, AND SAFETY: The SISCOWET was given a condition assessment inspection by the Great Lakes Science Center Chief of Vessel Management. The last formal inspection by a marine surveyor was in 1998 [Jamestown Marine Services, Inc.]. The SISCOWET received a hull ultrasound (audio gauging) in 1997. A stability test was done in 1958 but those stability calculations do not reflect current weights and loading. The crew receives annual CPR training and first aid training every 3 years. The crew received fire-fighting training in 1995. Safety equipment on the SISCOWET includes a 12-foot aluminum boat with a 6-hp outboard engine, one 10-man life rafts, 8 exposure (survival) suits, 4 life jackets, 2 life rings, and 8 water lights. Fire fighting equipment includes a fixed CO2 system in the engine room, 6 hand-held fire extinguishers, and one fire pump/deck wash system. A dedicated sea chest was fabricated and installed in 2001 for service to the main engine to remedy the water competition problem to allow sufficient flow to fire pump while under way. The pilothouse console was reconfigured for better visual access to instrumentation in 2000.

FUTURE VESSEL PROGRAM: Support for the program has been marginally sufficient to maintain the SISCOWET in a safe operational mode and to complete the minimum required science program objectives. The

Great Lakes Science Center is developing new safety and budget strategies that will help better meet the needs of the Great Lakes vessel program. These strategies include classifying vessels as "facilities" and preparing comprehensive vessel management plans that incorporate up to 5-year preventive maintenance schedules based on regular condition assessments by the Vessel Manager and marine surveyors. Great Lakes Science Center personnel believe that their current core programs of prey fish, lake trout, and fish habitat assessment will be ongoing during the next 20 years but that the sampling technology will likely change. They expect more assessment to be done by remote sensing as current technology is refined and new technology is developed. The Great Lakes Science Center has acquired and is retrofitting a much larger vessel, the STURGEON, to replace the SISCOWET on Lake Michigan. The STURGEON will be much more capable of carrying out the Center's Lake Michigan program than either the SISCOWET or former CISCO. However, this new vessel will be more expensive to operate both in terms of daily operations and number of crew needed for operations and will require appropriate increased agency support.

VESSEL FITNESS AND FUTURE: The SISCOWET was a good low-maintenance work platform that worked well in Lake Superior, especially early on when gill nets were used more for assessments. However, it is an old vessel, has needed hull work in recent years, and its gill-netter design is not the best for the current and future USGS core program in Lake Michigan, which emphasizes trawling and remote sensing to accomplish assessment of fish populations and fish habitat. As indicated above, the SISCOWET will be replaced by a larger vessel by 2002. The STURGEON is over 100 feet long and will facilitate trawling and remote sensing better than the SISCOWET. The SISCOWET may be used to replace the MUSKY II in Lake Erie.

VESSEL PROGRAM SUMMARY

VESSEL NAME: **STEELHEAD**
OPERATOR: Michigan Department of Natural Resources, Charlevoix Fisheries Research Station, Charlevoix, Michigan
LAKE: Michigan
HOME PORT: Charlevoix, MI
CAPTAIN: Jerry Meggison
STATION ADMINISTRATOR: Dave Clapp

STATION PROGRAM DESCRIPTION: The Steelhead is used primarily to assess populations of yellow perch, lake trout, and non-native trout and salmon (chinook and coho salmon, rainbow trout, brown trout) in Michigan waters of Lake Michigan. The vessel typically makes two cruises of the shoreline each year. Sampling begins in April with the start-up date dependent on ice conditions. During the first trip south, bottom-set gill-net assessments of yellow perch and lake trout are conducted at various sites. In mid-May, a lake-wide assessment of chinook salmon and other trout and salmon begins in the south end of the lake and finishes in the north by the end of June. These fish are sampled with large suspended gill nets fished near the surface and at the thermocline. The crew takes some time off in early July then goes back to the south end of the lake and repeats the lake-wide assessment during July to early September. The Steelhead is used from September into early December for forage-fish assessment using hydro-acoustics in cooperation with the U.S. Geological Survey, Great Lakes Science Center (2 weeks), lake trout spawning habitat studies involving egg incubation in containers and Astroturf (2 weeks), for lake trout recruitment evaluations using trawls, and for fall lake trout assessment on spawning reefs using gill nets. The Steelhead has operated an average of 140 days during the past three seasons with 85% being gill-net assessments and the remainder being hydro-acoustic and spawning habitat studies. Ten years ago the assessments were 50% with gill nets and 50% with trawls. Work not involving the Steelhead conducted from the Charlevoix Fisheries Research Station includes operation of the statewide Great Lakes creel survey and charter boat monitoring program, collection of biological data from state-licensed commercial fish catches, assessment of fish populations in near-shore waters by trawling with a small boat, and recovery and reading of coded-wire tags from trout and salmon heads collected from Lake Michigan and Lake Huron. The Steelhead has not done contract work and any contract money earned would not go back to the station's programs. The Charlevoix Fisheries Research Station currently does not contract out any vessel program work.

VESSEL DESCRIPTION: The Steelhead was designed by Korkut Engineer, Inc. of Metairie, LA and built in 1967 by T. D. Vinette of Escanaba, Michigan for the Charlevoix Fisheries Research Station. The Steelhead has a $3/16^{th}$-inch steel hull and aluminum pilothouse, is 62.5 feet long, and has a beam of 16 feet 4 inches, a 70-ton displacement, and a draft of 6.5 feet. Workspace ($feet^2$) on the Steelhead includes a forward deck (140), aft deck (340), and wet lab (90). The Steelhead also has a galley area (130) with 4 bunks and one commode. The vessel is powered by two 380 hp Cummings diesel engines (NT380) and cruises at 2,000 rpms and 11.3 knots. A governor on the engines is set at a maximum of 2,350 rpms. The Steelhead has an Onan 15kw generator (3A1.7-G), and several pieces of hydraulic powered deck equipment including two Bevco Model 1320 trawl winches (Apex Equipment, Inc., Seattle, WA) with a capacity of 2,000 feet of $3/8^{th}$-inch cable, a Crossley 30-inch gill net lifter, a crane with a 1-ton lifting capacity, a Gearmatic Model 7-M trawl drum (Apex Equipment, Inc., Seattle, WA), a capstan of unknown make, and a Marco Power Block. Pilothouse electronics include a Neco 8401 autopilot installed in 1985, two Raytheon 20XX radar units installed in 1992 and 1997, two GPS units (Northstar 9400 in 1997, Furuno GP-31 in 2000), a Furuno LC-90 loran installed in 1992, two depth sounders (Datamarine Dital 2700, Raytheon V-800) installed in 1985 or 1986, an EYM Simrad sounder, two marine radios (Polaris RDF 2-watt, Icom hand-held 1C-M15), Danforth White Compass, Datamarine Chartlink II, and a Simrad CM35 trawl monitor.

VESSEL STAFFING: The current crew of the Steelhead consists of a boat captain, an assistant boat captain, a fisheries technician, and a fisheries assistant. All are full-time positions except the fisheries assistant, which is a 10-month position. The boat captain has worked for the state for 32 years, started out as a boat aide, has boat experience since 1969, and has been the boat captain since 1992. The assistant boat captain and technician are former commercial fishermen and both have been in their positions on the Steelhead since 1992. The fisheries assistant has worked on the boat since 1986. The crew of the Steelhead 20 years ago was also four people but they were all full-time. The boat captain and assistant boat captain are required to have a Coast Guard 100-ton Masters License to operate the Steelhead. The technician and fisheries assistant also have 100-ton licenses but these licenses are not required for their positions. A biologist is present on the Steelhead only about 15% of the time, usually for special projects such as yellow perch or hydro-acoustics. The crew receives annual safety training and is eligible to receive other training available to all state employees such as computer training. Work related training is on-the-job but little is necessary due the tremendous experience of the current crew. The crew spends about 5% of their time on non-vessel related projects such as station maintenance, coded-wire tag removal, and tetracycline studies.

VESSEL OPERATION AND MAINTENANCE COSTS: The Steelhead operated an average of 140 days annually during 1998-2000. Steelhead main engine hours averaged 419 for 1998-2000. Fuel use during 1998-2000 averaged 7,100 gallons and ranged from 6,000 in 2000 to 8,000 in 1999. Average annual fuel cost was about $8,000 during 1998-2000. Fuel use and cost per engine hour for the Steelhead averaged 17 gallons and $19, respectively, and per vessel day was 51 gallons and $57 per day. Operation and maintenance costs other than fuel (dockage, insurance, maintenance-repairs-equipment, utilities, haul-out) averaged $16,390 per year or $117 per vessel day. Crew costs (wages, overtime, travel expenses) were $169,070 or $1,208 per vessel day. Total cost for operating the Steelhead from the above figures would be about $193,460 or $1,382 per vessel operating day. Other expenses that were not but possibly could be added to the above include net material and net construction supplies ($5,000 annually) and fish disposal ($1,400 annually). The above maintenance costs are “normal” and do not reflect special maintenance years such as 2000 when about $30,000 was required to replace engine drive shafts, replace sections of hull, and sandblast and paint the hull. The Steelhead is hauled out, sandblasted, and painted every 4-5 years. Engine tune-ups and overhauls are done as needed. The Steelhead is wet-docked during the non-operational season, heated with an oil furnace, and bubblers are used to prevent ice damage. The boat captain works with the station supervisor in planning maintenance projects, and they have recently developed a maintenance schedule spreadsheet. The boat captain is responsible for completing maintenance projects and the station administrator is responsible for providing budget support and project oversight. The frequency of unforeseen repairs has not increased in recent years and has caused at most 1-2 days lost per operation season. The Steelhead carries a supply of spare parts and the crew handles most scheduled and unforeseen minor repairs and maintenance. For major engine repairs, a mechanic can usually be obtained in a day. Brecheisen Diesel of Gaylord, Michigan services the Steelhead engines. The Steelhead operation and maintenance budget over the past 10 years went down, then leveled off, and then has increased in recent years. The Charlevoix station usually gets all of the operation money they request but not all the requested equipment and maintenance funds. This hasn’t constrained their program yet but they have postponed scheduled maintenance in some years.

VESSEL INSPECTIONS and SAFETY: A marine surveyor completed Condition and Value surveys in 1995 and 2001. The 1995 survey found seven problems and recommended corrective maintenance. A hull ultrasound was done in 2000 resulting in replacement of several deteriorating hull plates. The previous hull ultrasound was in 1990. Although a stability test may have been done when the boat was launched in 1967, knowledge of this test was not available and no test has been done since MIDNR took ownership. Modifications done since 1967 that would influence stability include addition of deck gear (crane, net drum) and replacement of built-in fuel tanks with independent tanks positioned lower below decks. The crew receives CPR training annually and First-Aid training every three years. Man-overboard training is done annually off the boat. A safety-training program is being developed. Safety equipment onboard the Steelhead includes a 13-foot Boston Whaler boat, a Solas 6-man inflatable life raft, one Alden Satfind 406 S-1010 EPIRB, two Type IV life rings, twelve Type I life jackets (10 adult, 2 child), and five Sterns survival suits. Fire suppression and warning equipment includes a Ansul Halon 1301 system in the engine room, seven hand-held CO2 extinguishers stationed in various parts of the vessel,

numerous smoke alarms, and alarm bells for pressure and heat in the engine room. The crew knows how to use the extinguishers and the boat captain has been with the Charlevoix fire department for 31 years. The Steelhead has two bilge pumps, one electric for wash down and bilge and one powered off the starboard engine.

FUTURE VESSEL PROGRAM: The Charlevoix Fisheries Research Station administrator and boat captain believes that the station will have a vessel program 20 years from now, and that support for the Charlevoix station's vessel program is good to excellent within the Research Section and Fisheries Division. The vessel program will be necessary to collect data mandated in the recently negotiated 2000 Consent Decree pertaining to that part of Lake Michigan covered by the 1836 treaty with Native American tribes. The Charlevoix station staff feels that the recent reorganization of Fisheries Division into lake basin teams will increase understanding of the role of MIDNR Great Lakes vessels and increase support for vessel programs among Fisheries Division personnel. Staff believes that certain components of the station's vessel program such as lake trout and chinook salmon assessment and the current months of operation are unlikely to change, but some current work may be scaled back in order to do more work on habitat and other species. The Steelhead operates at or near the maximum number of days available, given weather conditions. Although the vessel and vessel staff may be capable of collecting somewhat more data, the total amount of work done is not likely to increase in the foreseeable future because the station would need more scientific/technical staff to process the data. The current vessel staff is judged to be adequate and almost ideal but the Charlevoix Fisheries Research Station would like to have the 10-month fisheries assistant position changed to a full-time position. This would make the position more desirable and decrease the threat of turnover in this position where experience is important and based on on-the-job training.

VESSEL FITNESS AND FUTURE: The Charlevoix Fisheries Research Station staff believes that the Steelhead is meeting their current program needs and will meet their future program needs, that it will last at least 20 years, and consequently it is not being considered for replacement. The Steelhead is a multipurpose vessel that can do gill netting, trawling, serve as a dive platform, and work with high-tech gear such as ROV's and hydro-acoustics. The Steelhead is a dependable work platform, operating 140 days per season with a minimum of time lost due to repairs. The gill-net lifter is located in a space that is below the main deck but in an optimal forward position for lifting conventional gill nets. Nets and fish are raised by a hydraulic platform or manually to the main deck above for stowage and data collection. The Steelhead's draft prohibits working in some shallow bays but shallow-water work has not been an essential part of the Steelhead's program and this work has been accomplished in recent years using a 20-foot boat. The captain feels the Steelhead could be five feet longer for better handling and more work-deck space.

VESSEL PROGRAM SUMMARY

VESSEL NAME: **O. MYKISS**
OPERATOR: Indiana Department of Natural Resources
LAKE: Michigan
HOME PORT: Michigan City, Indiana
CAPTAIN: Vacant
STATION ADMINISTRATOR: Brian Breidert

PROGRAM DESCRIPTION: The Indiana Department of Natural Resources (INDNR) O. MYKISS vessel program on Lake Michigan runs from late April to early November with gill nets, a small bottom trawl, and a neuston push net used to assess fish populations twice weekly during April-July and four times during late October-early November. Approximately 70 % of the vessel time is spent setting and pulling gill nets for the Lake wide predator assessment project during the spring and fall. Lake trout, burbot, and chinook salmon are the target species. The remaining 30% is spent on trawling and neuston netting for young of the year and larval yellow perch, respectively. Ninety percent of the work done by the O. MYKISS is fisheries assessment for INDNR and 10% is supportive work for other Great Lakes agency projects. The Michigan City station also uses smaller boats to do electro-fishing and collection of fish for contaminant analysis. The O. MYKISS has not been contracted out for work by other agencies, nor has INDNR seriously consider contracting out the work currently being done by the O. MYKISS.

VESSEL DESCRIPTION: The O. MYKISS is a 36-foot aluminum boat designed and built in 1988 by Sea Ark Marine in Monticello, Arkansas. It was acquired by the INDNR in 1988. The O. MYKISS has a beam of 11.5 feet, a draft of 3 feet, and total weight of 20,000 pounds . Workspace is about 80 ft^2 forward and 200 ft^2 aft. The vessel has 2 bunks but does have a commode and potable water supply. The O. MYKISS is powered by two 375 hp Caterpillar diesel engines (Model 3208TA) that were installed in 1988. The top cruising speed for the vessel is approximately 35 knots on flat days. Each engine has a little over 1,400 total hours with less than 200 hours since the last overhaul. Auxiliary electrical power is provided by a Westerbeke 6 kw generator. Deck machinery of a Kolstrand winch and a Crossley 20-inch gill net lifter (being added 2001). The O. MYKISS has a Furuno Model 1800, type RPD-043 class B radar, a SiTex Nav ADD 8000 MKII GPS, a Lowrance X-16 sonar (paper graph) and a Signet MK272 depth sounder, an ICOM IC-M100 marine radio, a Danforth Constellation express compass, a Loran Receiver type 787 SiTex Koden, and Motorola radio with INDNR frequencies.

VESSEL STAFFING: The biologist in charge of the Michigan City station is responsible for the O. MYKISS operation and staffing budgets. The budgets are submitted to the INDNR office in Indianapolis for approval. The biologist also supervises the dedicated crew. The dedicated crew of the O. MYKISS consists of a boat operator, a deckhand, and a seasonal worker. The boat operator supervises the deckhand and the seasonal worker. This has been the crew composition and line of supervision since the O. MYKISS was acquired. Scientific staffing on the vessel is two biologists who must function as part of the crew during fisheries assessments. A boat operator is in the process of being hired this year. The person being hired to fill the position has limited years of experience on the O. MYKISS as well as on the Great Lakes and will require training. The deckhand has 2 years experience on the O. MYKISS, which is that person's experience on the Great Lakes. The Michigan City station has undergone some reclassification changes of the boat operator position in recent years. The boat operator position was once classified as a boat captain position but in 1999 was reclassified as an Operator/Property Manager, which is a professional position that requires a college degree, and pays $22,000-$30,000 annually. A Coast Guard Masters license was required for the boat operator when the position was classified as a boat captain but this requirement was dropped when the position was reclassified to Operator/Property Manager. This position recently became vacant when the incumbent was promoted to a biologist position at the Michigan City station. The position will be filled following normal INDNR hiring practices and will take at least three months to fill. Refilling of the position

will be completed by May 1st of 2001. The deckhand is classified as a Labor and Maintenance Technician, a non-professional position that requires a does not require a degree, and pays $17,000-$22,000 annually. It is currently under review for reclassification. The crew can earn compensatory time off but no paid overtime. Prior approval for compensatory time off must be obtained from the INDNR human resources director. The current classifications of O. MYKISS crew positions provide a career ladder where the boat operator can be promoted to biologist and the deckhand can with additional training move up into the boat operator position. The INDNR provides boater safety training for the crew. Training on vessel operations and safety are conducted at the beginning of each field season. Some members of the crew have attended first aid and CPR training as well. The crew of the O. MYKISS spends 75% of its time on non-vessel related projects such as construction, vehicle maintenance, lab work, and sport fish monitoring.

VESSEL OPERATION AND MAINTENANCE COSTS: The O. MYKISS operated an average of 28 days and engine hours averaged 78 during 1999-2000. Averages for fuel use and fuel costs were 550 gallons and $825. Maintenance costs the last three years were $15,000 in 1998 when the engines were overhauled and the hull was sandblasted, $800 in 1999, and $500 in 2000. The O. MYKISS is hauled out and painted annually at a cost of $1,100 and dry docked during the non-operational season. The biologist in charge of the station and the boat operator prepare the vessel maintenance budget. The boat operator and deckhand work together to schedule maintenance as indicated in the vessel maintenance log. The maintenance log is based on manufacturer's recommendations. Maintenance is also done based on the recommendation of the boat operator when the need arises. The boat operator is responsible for purchasing vessel equipment and overseeing maintenance projects from scheduling to completion. The crew does routine maintenance including electrical work and painting. Maintenance such as winterization, engine inspections and overhauls, and sandblasting are contracted out. The frequency of unforeseen repairs has not increased in recent years. When unforeseen repairs occur, the repairs are handled as quickly as possible. Some assessment effort was cancelled in 1998 when the O. MYKISS engines had to be overhauled. The crew of the O. MYKISS has ready access to parts suppliers and repair facilities at or near Michigan City. Budgetary support for O. MYKISS operation and maintenance costs come from general tax revenue, money from the sale of fishing licenses, and Federal Aid for Sport Fish Restoration reimbursement. This support has been steady and adequate for the past 10 years.

VESSEL INSPECTIONS, AND SAFETY: To the knowledge of the Michigan City station staff, the O. MYKISS has not been inspected by a marine architect nor has there been a stability test done. Safety training for the O. MYKISS crew includes monthly OSHA safety meetings and use of safety equipment. Safety equipment on the O. MYKISS includes an EPIRB, three Mustang survival suits, and various types of PFDs. Fire suppression equipment includes an extinguisher in the engine compartment and several portable extinguishers above deck.

FUTURE VESSEL PROGRAM: The Michigan City station staff believes that they have good support for their vessel program. The operation and maintenance budget has been adequate and they have approval to fill the Operator/Property Manager vacancy. They think they will have a vessel program 20 years from now as long as they do not have major problems with the O. MYKISS. The staff believes the program will likely be unchanged in terms of type of assessments, but would likely expand these assessments and spend more time on the water once the vacant operator position is filled and especially if a desired additional professional position is approved and filled for the vessel.

VESSEL FITNESS AND FUTURE: The O. MYKISS is a little small for work in rough seas so weather conditions must be considered before setting assessment nets. Also the amount of deck workspace is less than desired. The noise within the pilothouse at times makes it difficult to communicate with others. Strengths of the vessel are its size. It is a small vessel, which requires less maintenance. It is fast, has good maneuverability, and is structurally sound since it is primarily constructed of aluminum. Generally, the O. MYKISS accommodates the Michigan City station's vessel program, provides the basic needs of the crew for comfort and safety, and should last at least 15 years with regular maintenance. Replacement or major retrofit of the O. MYKISS is not being considered at this time. However, if it were to be replaced that decision would be made by the biologist in charge of the station and the boat operator, with input from a marine engineer or architect. Criteria for replacement would include vessel condition especially as it effects safety and repair frequency. Specification for a replacement

vessel would be one larger than the O. MYKISS with more deck workspace and a smaller pilothouse. The station staff would likely try to get the new larger vessel from Sea Ark Marine because Sea Ark makes a larger vessel that would meet their specifications and they have been otherwise satisfied with the O. MYKISS.

VESSEL PROGRAM SUMMARY

VESSEL NAME: **BARNEY DEVINE**
OPERATOR: Wisconsin Department of Natural Resources, Sturgeon Bay Fisheries Station, Sturgeon Bay, Wisconsin
LAKE: Michigan
HOME PORT: Sturgeon Bay, Wisconsin
CAPTAIN: Don Bielfuss
STATION ADMINISTRATOR: Mike Toneys

PROGRAM DESCRIPTION: The annual operating season for the BARNEY DEVINE begins with an early-April to early-May lake-wide assessment of lake trout and burbot followed by a two-week assessment of juvenile lake whitefish in northern Wisconsin waters. Chinook salmon populations in the Sturgeon Bay area are sampled during July. In September, chubs (deep-water ciscoes) and lake trout are assessed in the northern part of Wisconsin waters at Baileys Harbor and Jacksonport Deep Reef, respectively. During October, inshore and offshore lake trout spawning populations are assessed from Sturgeon Bay to Sheboygan, and lake whitefish spawning populations are sampled north of Sturgeon Bay at Cardy's Reef. Spawning lake trout are sampled on Jacksonport Deep Reef from the last week of October to mid November, and then the boat is moved to Milwaukee to sample yellow perch during the last week of November into the second week of December. The BARNEY DEVINE operates about 75% of the available time from April to mid December. All assessments are done with gill nets, mainly graded-mesh (mesh sizes dependent on species) that are fished on the bottom, except that nets used for chinook salmon are many meshes deeper and fished suspended. These assessment-netting surveys have made up nearly 99% of the operational year for the BARNEY DEVINE in recent years, with 1% covering occasional assistance to Wisconsin Department of Natural Resources (WIDNR) Law Division in pulling illegal gill nets. The work on lake trout and yellow perch done with the BARNEY DEVINE in Wisconsin waters is part of lake-wide efforts involving many other agencies. The WIDNR currently does not do contact work with the BARNEY DEVINE, nor does it currently contract out any vessel work to other entities. They have previously contracted some gill netting and trawling with commercial fishers but found it to be very expensive. The WIDNR has recently purchased a 45-foot New England lobster boat, the Perca, which is being retrofitted for trawling and fishing salmon gill nets. It will likely be used for chinook salmon and yellow perch assessment and stationed in Milwaukee.

VESSEL DESCRIPTION: The BARNEY DEVINE is a Great Lakes gill-net boat designed and built in 1937 by Burger Boat of Manitowoc, Wisconsin. It is steel-hulled, 50 feet long, a beam of 14.5 feet, a draft of 5.5 feet, and a displacement of 37 tons. The work deck is most the enclosed internal area of the boat, which is approximately 700 ft^2. It does have a commode in a small space forward. The BARNEY DEVINE is powered by a 235 hp Cummins diesel engine that was installed in 1972. Total engine hours are approximately 10,000 with 755 hours since the last overhaul. Onboard electrical power is provided by a diesel-powered 8.5 kW Onan generator installed in 1995. Deck machinery consists of a Crossley gill-net lifter that is believed to have been installed in 1937. Pilothouse electronics includes a Simrad Robertson autopilot installed in 1999, a Simrad radar installed in 1998, a Northstar X41 GPS installed in 1991, a Garmin 210 GPS installed in 1997, a Furuno depth sounder installed in 1983, a Datamarine depth sounder installed in 1999, two Icom marine radios (I10 and I06) installed in 1993 and 1999 and a cellular phone.

VESSEL STAFFING: The Sturgeon Bay station administrator position is classified as Lake Michigan Fisheries Biologist and is responsible for the BARNEY DEVINE operation and staffing budgets, supervises the crew and shares responsibility with his supervisor for filling crew vacancies. The current crew of the BARNEY DEVINE is

made up of a boat captain, classified as a Research Technician IV, and an engineer/deck hand, classified as a Research Technician III. Biologists and technicians represent at-large crewmembers that serve on the boat when assessment netting is done. This crew and scientific staffing is similar to staffing 20 years ago. The vessel crew and scientific staff share many jobs during the assessment netting and work together well. The current captain has served on the BARNEY DEVINE for 14 years, 12 years as the engineer and 2 years as captain. He also served on a university vessel (Neeskay) for 9 years. The current engineer has been on the BARNEY DEVINE for a year and prior to that he was a Washington Island ferry captain. Boat captains and engineers are hired following Wisconsin Civil Service rules. Applicants for these positions are screened and selected based on Civil Service test scores or evaluation of an experience history questionnaire and an interview. The boat captain of the BARNEY DEVINE must have a Coast Guard 100-ton Masters License, whereas the engineer must be able to qualify for a 100-ton Masters License within three years. Starting and top annual salaries for the boat captain and engineer are $28,804-$41,367 and $26,622-$38,006, respectively. The crew of the BARNEY DEVINE earns about 100-125 hours of time-and-a-half overtime per year. This is paid full-time compensatory time and half-time pay for each hour worked over 40 hours per week. The crew spends about 35-40% of its time on non-vessel related projects such as station maintenance, fyke netting, diving, electro-fishing, fish aging, and data entry. The crew receives annual safety training and has attended fish-aging workshops.

VESSEL OPERATION AND MAINTENANCE COSTS: The BARNEY DEVINE operated an average of 107 days annually during 1998-2000. Main engine hours averaged about 350 annually during this period. Fuel and maintenance expenses averaged $11,750 annually for 1998-99. The BARNEY DEVINE is hauled out every three years and painted. The last haul-out was in 1999 and cost $7,000. The hull was sandblasted four years ago, which was for the first time. The boat captain schedules maintenance projects, based on manufacturer's recommendations or as needed, and the station administrator approves them and is responsible for providing budget support. Maintenance projects are planned at least two years in advance because the budgets are planned every two years. The projects are done by the boat captain and engineer except engine overhaul and sandblasting. The frequency of unforeseen repairs has not increased in recent years and unforeseen repairs have not resulted in cancellation of all or part of a survey. Access to parts and repair facilities is good. There are two shipyards in Sturgeon Bay and a Cummins diesel repair facility in Green Bay where service can be obtained within a day.

VESSEL INSPECTIONS, AND SAFETY: The BARNEY DEVINE was inspected in 1999 by a marine architect and received a pretty good bill of health. A hull ultrasound was done in 1999 by a company hired by the boatyard. No stability test (inclining experiment) has ever been done. When the old heavy engine was replaced a lighter diesel in 1972, 7-8 thousand pounds of lead was added to compensate for the difference in weight of the engines. Fire fighting equipment on the BARNEY DEVINE consists of hand-held fire extinguishers, a big one by the engine room and several smaller ones distributed around the boat, and an emergency pump for the bilge and for fire fighting. The crew receives fire-fighting training from the Sturgeon Bay Fire Department, CPR and First-Aid training, and has participated in abandon-ship training at the annual Great Lakes Vessel Coordination Workshop.

FUTURE VESSEL PROGRAM: The Sturgeon Bay Fisheries Station staff hopes that their station will have a vessel program 20 years from now, but they are not sure. Vessel staffing and vessel budget has been adequate in recent years, and staff believes that they have good support within WIDNR for their vessel program. They have always gotten what they needed to maintain the BARNEY DEVINE even though maintenance costs have increased in recent years. The Sturgeon Bay vessel program for the next 20 years is likely to continue to be mainly gill-net assessments of major species. This will certainly be the case for as long as the station is using the BARNEY DEVINE because that's what it is set up to do. Some trawling will be done when the Perca becomes operational. The station staff would like to do a more varied vessel program by using the Perca and perhaps replacing the BARNEY DEVINE with a vessel that is more versatile. However, vessel staffing is inadequate to operate both vessels at the same time and scientific staffing is inadequate to handle much more data so broadening the vessel program will be difficult. Currently, there are no boat captain or engineer for the Perca, so until these positions are filled, it will be operated by the BARNEY DEVINE crew. The Sturgeon Bay staff believes that filling positions on the Perca may be difficult because the pay is less than for comparable positions in other agencies. The research technician classification and pay rate assigned to boat captains and boat engineers does provide adequate recognition for the difficult and responsible nature of these jobs.

VESSEL FITNESS AND FUTURE: In the opinion of the Sturgeon Bay staff, the BARNEY DEVINE has been well built, well maintained, economical to operate, and has been a dependable boat. On the other hand, it is 64 years old, the hull is getting weak in the stern area, and the station staff believes that it will last maybe 10 years but not 20. Station staff will likely recommend that the BARNEY DEVINE be replaced once the Perca has become fully operational. Specifications for a replacement boat would be a design that allows sampling with different types of gear, more crew accommodations for long runs, and a dry or wet lab. The Sturgeon Bay staff believes the process for vessel replacement would be for the station staff to determine specifications of the replacement vessel, get a cost estimate, prepare a justification package describing why the new vessel is needed and why the BARNEY DEVINE can't be used. This package would then be sent to the WIDNR in Madison for approval and forwarding to the Department of Administration. Ultimately the governor and legislature would have to be involved. Station staff believes there are shipyards at Sturgeon Bay that could build a vessel to replace the BARNEY DEVINE (Palmer-Johnson, Bay Ship).

VESSEL PROGRAM SUMMARY

VESSEL NAME: **JUDY**
OPERATOR: Michigan Department of Natural Resources, Marquette Fisheries Research Station, 484 Cherry Creek Road, Marquette, MI 49855
LAKE: Superior
HOME PORT: Marquette, MI
CAPTAIN: James E. Knape
STATION ADMINISTRATOR: Phil Schneeberger, Shawn Sitar (biologist) interviewed

PROGRAM DESCRIPTION: The current Marquette Fisheries Research Station program on Lake Superior focuses on gathering biological data on lake trout from assessment gill nets, lake whitefish from monitored commercial catches, and sport-fish species including lake trout and lake whitefish from a creel survey. Assessment gill netting is done with the JUDY, contracted commercial fishermen, and in cooperation with biological staffs from several Native American tribes. The JUDY is used to assess adult lean variety lake trout populations during May and June, and pre-recruit lean and siscowet lake trout in late July through August. The adult lean assessment has been done annually since the early 1960s. The pre-recruit assessment was started in the 1970s by what is now the U.S. Geological Survey (USGS) Biological Station in Ashland, Wisconsin, and it has been done annually by the Marquette Fisheries Research Station since 1985. Although not conducted annually, the JUDY has been used to do periodic assessments of spawning lean lake trout in late October to early November, and all-age assessments of siscowet lake trout in June or September. These assessments are done lake-wide in cooperation and coordination with other members of the Great Lakes Fishery Commission Lake Superior Technical Committee. The spring adult lean lake trout assessment is done with 4.5-in mesh nets fished on the bottom three nights, whereas the pre-recruit, siscowet, and spawning lean lake trout assessments are done with graded-mesh gill nets fished on the bottom one night. The number of JUDY operating days has ranged from 35-36 in 1998-99, when only the adult lean and pre-recruit assessment was done, to 50 days in 2000 when additional all-age siscowet and spawning lean lake trout assessments were done. The JUDY is occasionally used to assist Michigan Department of Natural Resources (MIDNR) Law Division locate and lift illegally set commercial gill nets. It was used as a dive platform for lake trout egg incubation studies in the late 1980s and early 1990s. However, assessment gill netting has always made up 95-99% of the JUDY operating days. Marquette Fisheries Research Station personnel also do studies on yellow perch and walleye populations in Green Bay, Lake Michigan, sample lake whitefish commercial fisheries in Lake Michigan and Lake Superior, and do lake sturgeon reproduction and stream-fish community studies in Michigan streams. The JUDY has not been contracted to do work for other entities. Any contract money earned by the JUDY would not go back to the Marquette Fisheries Research Station program. Assessment of adult lean lake trout has been contracted out to commercial fishers via issuance of research permits with payment to fishers being retention of a quota of saleable lake trout and some cash payment for fuel used in recent years. Currently there is only one such contracted commercial fisher.

VESSEL PHYSICAL DESCRIPTION: The design of the JUDY is that of a Great Lakes trap net boat but it has been modified for lifting gill nets by the addition of a gill-net lifter forward of amidships on the starboard side. The JUDY was built in 1952 by Marinette Marine of Marinette, WI. The Marquette Fisheries Research Station acquired the JUDY in 1979 via the MIDNR Charlevoix Fisheries Station and USGS. The JUDY's hull is $3/16^{th}$ inch steel, length at the centerline is 40 ft., beam is 12 ft., displacement is 20,000 lbs, and draft is 3 ft. Deck workspace is limited to the aft deck (275 ft^2), although there is a little space in the pilothouse for doing paperwork.

The forward 30% of the aft deck is covered with a canvas canopy to provide the crew protection from sun and rain while lifting the gill nets. There are no bunks, commode, or dry lab. The JUDY is propelled by a single General Motors diesel engine (GM 6-53-V) that generates about 180-200 hp, which cruises the JUDY at 8.9 knots with a maximum speed of 10 knots. It has a PTO-mounted hydraulic gear pump which powers a capstan of unknown make for lifting trap nets and a Crossley 24-inch gill-net lifter. Pilothouse electronics include a Cetrek Pro Pilot 725 autopilot installed in 1996, Furuno 821 radar installed in 1997, North Star 951XD GPS installed in 2000, a Micro Logic ML-8000 loran installed in 1988, Raytheon V-900 and a Data Marine Sand Piper II depth sounders installation not known, Sitex Ultima marine radio installed in 1999, and a MIDNR radio installed in the 1980s.

VESSEL STAFFING: The current crew of the JUDY consists of a full-time boat captain and two 10-month fisheries assistants. The boat captain holds a Coast Guard 50-ton Masters License and has captained the JUDY for about 3 years, with some year's prior experience captaining private recreational boats. The fisheries assistants have been in their position about 9 years with no prior comparable experience. Although knowledge of fishing and fishing gear is desirable for conduct of the vessel program, it is not a job requirement for any crew position. The previous JUDY boat captain had commercial fishing experience and he taught the current fisheries assistant's aspects of boat operation and how to set, lift, and repair nets. In the 1980's, the boat crew consisted of a full-time captain and a full-time fisheries boat aide, with biologists or technicians filling out the crew necessary to fish the nets and collect data. A full-time assistant boat captain was hired in the 1980s but the person left the job, the position was not refilled, and eventually the position was lost. Currently, one fisheries assistant functions as an assistant captain while the other handles the data collection. A biologist was generally on board for 45% of the operating days and a technician was on board 9% of the time during 1998-2000. The vessel crew and scientific staff share jobs and generally work well together. Since only a little more than a third of the Marquette Fisheries Research Station program involves large-vessel Great Lakes work, the crew spends about 50% of its time on non-vessel related projects such as sampling commercial fish catches, walleye tagging, stream-fish population estimates, lake sturgeon reproduction, maintenance related to these other studies, and determining the age and food habits of fish collected with the JUDY and on these other studies. The crew receives annual and periodic safety training, and periodically the GLFC, Lake Superior Technical Committee has sponsored workshops on fish aging and sea lamprey attack-mark identification. The crew is also eligible for training available to all state employees, such as computer training. Most work-related training is on-the-job.

VESSEL OPERATION AND MAINTENANCE COSTS: The JUDY operated an average of 40 days during 1998-2000. Main engine hours averaged 280 for 1998-2000 and ranged from 257 in 1998 and 323 in 2000. Fuel use averaged 1,111 gallons annually and was 1,014, 900, and 1,420 gallons in 1998, 1999, and 2000, respectively. The JUDY used an average of 4.0 gallons of fuel per engine hour during these past three seasons. Annual fuel expense averaged $1,167 during 1998-2000 and averaged $29 per operation day and just over $4 per engine hour. Average annual maintenance cost was $5,800 during 1998-2000. Normal annual maintenance costs have averaged about $1,100 in recent years but was $2,300 in 1999 due to replacement of the propeller and propeller shaft, and $14,000 in 2000 when hull sandblasting and painting was done. New equipment installed in the last three years included a $3,000 GPS/Chart Plotter and a $250 Sitex Marine Radio. The JUDY is hauled out annually for maintenance and dry-docking at an annual cost of around $900, which includes rental of outside storage and contracted hauling services out and back in the water. Since fuel plus normal maintenance plus haul-out averaged about $3,167 annually during 1998-2000, vessel operation expense per operation day and engine hour were $79 and $11, respectively. The JUDY is hauled out, stored, and returned to the water on its own trailer. The Marquette Fisheries Research Station gets $5,000-$6,000 annually for overtime but the amount spent on vessel-related overtime is not known. The boat captain schedules maintenance projects, using manufacturer's recommendations when available, and the station administrator secures budget support and provides project oversight. The captain and crew do most installation of electronic equipment and maintenance other than major engine and hull work. Money is usually available for maintenance necessary to keep the JUDY operating, but less available for maintenance that is of a preventative nature but not yet critical for operation. Unforeseen repairs have been minor, have been handled within a day or two by the crew, and have not resulted in cancellation of all or part of an assessment. The JUDY's homeport of Marquette does not provide ready access to parts suppliers and repair facilities. The nearest shipyards on Lake Superior are 150-300 miles away at Sault Ste. Marie, Michigan and

Duluth, Minnesota. Engine repair for the JUDY can be obtained 5 miles away at a MIDNR facility that maintains fire fighting heavy equipment.

VESSEL INSPECTIONS and SAFETY: A Condition and Valuation Survey was done on the JUDY by a marine surveyor and a hull ultrasound was performed in 2000. The only other known survey was done in 1996 by a heavy equipment surveyor. No stability test has been done on the JUDY since acquired by the MIDNR and station staff has no knowledge of a previous test. The crew receives safety training annually including First-Aid/CPR, life raft and survival suit use, and abandon-ship. The JUDY carries a 6-person life raft (Switlick MD-6 Offshore Solas A), two EPIRBs, six survival suits, and (?) life jackets. Fire suppression equipment includes a Halon system in the engine compartment and two hand-held extinguishers. The JUDY has two electric bilge pumps (Rule, Lovett).

FUTURE VESSEL PROGRAM: The Marquette Fisheries Research Station staff believes that the station will have a vessel program 20 years from now and that the program will be similar to what it is now. They feel that general support for their station's program is good at the Research Section level but less at division and department levels. The Marquette Fisheries Research Station staff believes that lake trout assessment will likely be the priority work in Michigan waters of Lake Superior for the next 20 years and possibly longer. Lake trout are the dominant predator in the lake and sought after by sport anglers and by Native American commercial fishers who have treaty fishing rights. A consent decree negotiated in 2000 for an 1836 treaty, mandates that state, federal, and tribal agencies work together to determine safe harvest limits and specifies allocation of the harvest between sport and commercial fishers in Michigan's eastern Lake Superior waters. The ongoing gill-net assessments are the main source of relative abundance, age, and mortality rate data necessary for determining the safe harvest limits. The Marquette Fisheries Research Station vessel program may need to carry a larger assessment load in the future because it is believed that the commercial fishery at Marquette, currently contracted to do lake trout assessment, will sell their gill-net boat in the near future. Tribal biological agencies, which currently are doing lake trout assessment in four Michigan management areas, have only small boats and may lack the time and capacity to do assessment in other Michigan waters. Marquette Fisheries Research Station staff would like to maintain its current responsibilities for lake trout assessment and expand assessments to some other species or do habitat mapping and acoustic surveys. However, this may be largely out of the question unless the current inadequate vessel and scientific/technical staff is increased to levels necessary to process in a timely manner the current influx of data, conduct an expanded vessel operation, and process the additional data. Station staff recommends that the JUDY crew should consist of a full-time boat captain, full-time assistant boat captain, full-time technician, and a 10-month fisheries assistant. The Marquette Fisheries Research Station currently lacks an assistant boat captain and has only one fisheries technician, who because of the station's program diversity and workload, cannot be assigned to the JUDY except on an occasional basis. Lack of technical staffing also requires that the JUDY crew must function as technicians on non-vessel projects for a considerable portion of the year. Use of fisheries assistants as a major component of the JUDY crew is problematical because the position requires an annual layoff period and personnel are subject to statewide hiring freezes when they occur during layoff. If a hiring freeze persisted into the vessel operation period, the vessel would have to operate without these personnel or cancel the assessments.

VESSEL FITNESS and FUTURE: Although the JUDY is small and not designed optimally for the work it is doing, it has proved able to meet the needs of the current station program. Rarely have sea conditions prohibited use of the JUDY for setting or lifting gill nets during the current lake trout assessments. This success is in part due to the short operating season and relatively good weather during May-August when most of the netting is done. The JUDY has not been used extensively in the fall in recent years when weather on Lake Superior is notoriously bad (witch of November, etc.), and since her hull was not designed for ice breaking and has deteriorated somewhat over the years, ice conditions would prohibit use during at least January-April. The strengths of the JUDY are that she has been a reliable, low-cost work platform that is easy to haul out and maintain. Her size and draft permits access to shallow small harbors and docking facilities, which is critical because good docking facilities are few and far between along Michigan's Lake Superior shore. The weaknesses of the JUDY are that her trap-net design make operation in rough sea conditions difficult, the only possible position of the gill-net lifter is not far enough forward for optimal boat control during gill net lifting, there is no dry lab space or enclosed wet lab space, and a recent hull sandblasting and ultrasound indicated that some areas of the hull are 65% of original thickness. Money to rewire the JUDY to code specifications has been requested annually for nearly 10 years but has not been

forthcoming. The engine is old and will need an overhaul in the near future. In addition, the JUDY lacks dry-lab facilities that would be necessary to house technological equipment if the station wanted to undertake habitat mapping and acoustic surveys. Consequently, the Marquette Fisheries Research Station is considering replacement of the JUDY. Specifications being considered for a replacement vessel include a slightly larger and faster vessel with more displacement, a draft not exceeding 4 feet, and dry lab space. The Marquette staff is working with the ad hoc committee of MIDNR boat captains and management to develop design specifications, cost estimates, and a process for obtaining approval and funding for the JUDY and one or two other agency vessels. Station staff believes that the current and foreseeable fiscal environment within MIDNR is not suitable for obtaining desirable staffing levels or replacing the JUDY.

VESSEL PROGRAM SUMMARY

VESSEL NAME: **HACK NOYES**

OPERATOR: Wisconsin Department of Natural Resources, Bayfield, Wisconsin
LAKE: Superior
HOME PORT: Bayfield, Wisconsin
CAPTAIN: Vacant (Scott Hulse, First Mate)
STATION ADMINISTRATOR: Stephen Schram

PROGRAM DESCRIPTION: PROGRAM DESCRIPTION: The annual vessel program of the Wisconsin Department of Natural Resources (WIDNR) Bayfield station begins with the spring assessment of adult lean lake trout, using 4.5-inch mesh gill nets, starting in early April or as soon as the ice is out. This goes into May, usually 5-6 weeks. Late May and June is used for vessel maintenance or to do siscowet lake trout assessment with large graded-mesh gill nets if scheduled by the Lake Superior Technical Committee. The next regular assessment is the summer graded-mesh assessment targeted at juvenile lake trout, which starts in July and goes into August. Plankton samples are also collected during this assessment for Michigan Technological University in Houghton, Michigan. In September, the HACK NOYES is used as an educational platform for high school and university students and also to move Gull Island Shoal Refuge buoys. The HACK NOYES is then used to do gill-net assessments of spawning lake trout populations in October and spawning lake herring during the last week of November and first week of December. Law Division may use the vessel for a few days after that to check that commercial fishing nets are set in the proper locations. Fish population assessment with gill nets makes up 95% of the HACK NOYES operation days with the remaining 5% being for educational purposes or assistance to Law Division. Most assessments of lake trout and lake herring and inclusive months of operation have been unchanged over the past 20 years. Prioritization resulted in some spring and fall assessments using small-mesh gill nets being dropped because more data was being collected than could be processed. The HACK NOYES was used in 1996-97 to assist University of Wisconsin personnel in a hydro-acoustics study of Wisconsin waters of Lake Superior. Additional work in recent years has been the educational work and occasional siscowet assessments. Although there is not a sharing of vessels and personnel, much of the work done with the HACK NOYES is cooperative with other agencies of the Lake Superior Technical Committee in that the assessments are done in a standardized protocol agreed to by the committee and results are shared with committee members. The Bayfield station also does some other work on Lake Superior with small boats. It has a 24-foot welded aluminum boat made by Thomas Marine of Long Island, New York, which is used for gill netting in Chequamegon Bay, surveying underwater logging sites with an ROV, and as a dive platform. The station also has some smaller aluminum boats, which are used for fyke netting. The Bayfield station does not do contract work with the HACK NOYES, nor does it contract out any of its vessel work. The station administrator doubts that money earned by use of the HACK NOYES would come back to the station program. The station has considered contracting with the USGS Ashland Biological Station or University of Minnesota for trawling at Gull Island Shoal but decided that the cost was too high.

VESSEL DESCRIPTION: The HACK NOYES is a Great Lakes gill-net design boat made by Burger Boat of Manitowoc, Wisconsin in 1946. It was purchased by the WIDNR in 1952. The HACK NOYES is steel-hulled, 56 feet long, beam is 14.5 feet, draft is 5.5 feet, and displacement is 50 tons. Workspace is 224 ft^2 forward, 96 ft^2 amidships, and 280 ft^2 aft. Most of the area is enclosed and might be considered a wet lab. There is no dry lab

space. Crew accommodations include three makeshift bunks in the pilothouse and one commode. The HACK NOYES is powered by a Cummins NT-335M diesel that generates 335 hp and cruises the vessel at 10 knots. The engine was installed in 1970, has 16,614 engine hours, with 6,378 hours since the last overhaul. The HACK NOYES has a Wesmar T25 hydraulic-powered bow thruster with a 12-inch nozzle. It has a Lugger/Northern Lights (NL 844) 16KW generator that was installed in 1994. Deck equipment includes a Crossley 30-inch hydraulic-powered gill-net lifter, a small detachable crane and electric winch with a 500 lb capacity. Other equipment includes an electric live-well pump, an electric shallow-water jet pump with hot-water heater, and two hydraulic pumps for the gill-net lifter and bow thruster. Pilothouse electronics include a Wood Freeman Model 420 autopilot installed in 1974, an Anritsu RA771UA radar installed in 2000, a Garmin 6PS 75 GPS installed in 1997, a Cetrek P1LD 200T CK1 GPS installed in 1998, a Morrow LLC-4000 loran installed in 1983, Datamarine D3001 and Furuno FCV 600L depth sounders installed in 2000, a Polaris Regency ECN 1880 marine radio installed in 1980, a Bendix King LMH 3142 WIDNR radio installed in 1980, a Koden D6BS Diff.Rec KBR-91 installed in 1997, and an E. S. Richie & Sons compass.

VESSEL STAFFING: The Bayfield station administrator position is classified as Lake Superior Fisheries Biologist and is responsible for the HACK NOYES operation and staffing budgets. The administrator schedules vessel work but shares supervision of the crew and responsibility for filling crew vacancies with a lake-basin sub-team leader. The current crew of the HACK NOYES consists of a boat captain, classified as a Research Technician IV, who operates the boat, a first mate, classified as a Research Technician III, who assists the boat captain and helps supervise deck operations and data collection, a technician assigned halftime to the boat who does data collection, and a 6-month limited-term employee hired as a deck hand for the operational season. The above four members of the crew handle much of the vessel work, except that a biologist and sometimes an additional technician are on board for spring lake trout, spawning lake trout, and herring assessments. This crew composition is similar to what it was 20 years ago. The previous boat captain was on the HACK NOYES for 3 years, the first mate has 21 years of experience, and the technician has been on the boat for 8 years. The boat captain is required to have a Coast Guard 100-ton Masters License to operate the HACK NOYES. The first mate does not need the 100-ton license coming into the position but must be qualified to obtain it within three years. The current first mate is qualified but does not yet have this license. The technician and limited-term employee does not need any special licenses pertaining to the boat. Crew annual salary ranges are $28,804-$41,367 for the boat captain and $26,622-$38,006 for the mate and technician. The crew earns full-time compensatory time off and half-time pay for hours exceeding 40 hours per week. All but the limited-term person gets sick and annual leave. Each member of the crew received an average of $60-$100 per month for travel expenses during 1998-2000. The crew receives annual safety training and work related training on-the-job. The crew of the HACK NOYES spends about 25% of its time on non-vessel related projects such as station maintenance, fish aging, and stream sampling.

VESSEL OPERATION AND MAINTENANCE COSTS: The HACK NOYES operated an average of 78 days per year during 1998-2000. Main engine hours averaged 499. Averages for fuel use and fuel cost were 2,391 gallons and $2,550 during 1998-2000. The normal average annual maintenance expense is around $2,000. Maintenance cost was $14,500 in 2000 when the boat was hauled out, sandblasted, painted, and some new electronic equipment (radar, two depth sounders) were purchased and installed. The HACK NOYES is hauled out every three years at a cost of $2,000 just for the haul-out. The boat captain and first mate are responsible for scheduling maintenance projects. The station administrator is responsible for the maintenance budget and project oversight. Maintenance is scheduled based on the judgment of the boat captain and first mate and recommendations in maintenance manuals. Hull sandblasting and painting is done every three years, engine tune-ups and overhauls are done as needed. The crew does routine maintenance and repair of small mechanical equipment such as pumps, whereas major maintenance is contracted out. Unforeseen repairs are handled as quickly as possible and have not caused cancellation of all or part of an assessment. The frequency of unforeseen repairs has not increased in recent years on the HACK NOYES. Although not at Bayfield, parts and repair service can be obtained quickly at Duluth, Minnesota, which is less than 100 miles away. Currently, WIDNR support for the HACK NOYES vessel program is high. Budgetary support, although flat in recent years, has been good to outstanding. The Bayfield station has been able to get the funding it has requested and the vessel program has not been compromised by inadequate budget.

VESSEL INSPECTIONS, and SAFETY: The Coast Guard gave the HACK NOYES a courtesy inspection in 1994. The boat captain did a hull ultrasound in 1996. It is not known if the HACK NOYES has ever been given a stability test (inclining experiment). Modifications to the boat done by WIDNR that might affect stability include replacement of the engine in 1970, the pilothouse was replaced with a larger one in 1973, and a bow thruster was installed in 1985. The safety equipment on the HACK NOYES includes a BF Goodrich Solas B MK3 life raft that is inspected annually, a Kannad 406 EPIRB, 8 survival suits, and 8-12 life jackets. Fire suppression equipment includes 9 hand-held fire extinguishers (7 dry chemical, 2 CO_2) and 2 water hoses (fore and aft). The crew receives medic first-aid training with CPR, fire-fighting techniques from the Ashland, Wisconsin Fire Department, and training on use of the life raft from the manufacturer. A vessel safety manual that provides information on such things as fire fighting, survival suits, and abandon ship is reviewed annually.

FUTURE VESSEL PROGRAM: The Bayfield station staff believes that the station will have a vessel program 20 years from now, citing the need for maintaining the long-term data sets on lake trout as rational. They foresee little change in the basic surveys they are doing now. Since the major funding source for the WIDNR is fishing license and fishing stamp revenue, there is concern that if sport fishing continues to decline they will receive decreased funding for their vessel program. Staffing is perhaps the biggest concern of the Bayfield station for its future vessel program. The Bayfield staff does not know if the person who has captained the boat the past four years will be in that position for the 2001 operating season. If the position must be filled with another person, finding a qualified candidate will be difficult. The boat captain and first mate are classified as research technicians rather than boat-identified classifications and the salaries for these classifications are lower than comparable boat positions in neighboring agencies. This makes recruiting competent people for these positions difficult, especially given the rather small pool of qualified applicants in the area. They feel that the research technician classification and pay rate does not provide adequate recognition for the difficult and responsible nature of the boat captain and engineer jobs.

VESSEL FITNESS AND FUTURE: In the opinion of the Bayfield station staff, the HACK NOYES is a sturdy seaworthy vessel that will last at least another 20-25 years, it is a safe work place, its operating expenses are reasonable, and it meets current and projected program needs. The HACK NOYES is not being considered for replacement by the Bayfield staff. However, it is an old vessel, is slow, and should have the current pilothouse replaced with a smaller one for better handling in wind. In addition, some sections of the hull may have to be replaced in the next 20 years due to pitting. A retrofit to replace the pilothouse or hull plates would probably be done at the Fraiser Shipyard in Duluth, Minnesota.

VESSEL PROGRAM SUMMARY

VESSEL NAME: **KIYI**
OPERATOR: U.S. Geological Survey, Great Lakes Science Center
Ashland Biological Station, Ashland, Wisconsin
LAKE: Superior
HOME PORT: Ashland, Wisconsin
CAPTAIN: Joseph Walters
STATION ADMINISTRATOR: Owen Gorman

PROGRAM DESCRIPTION: The USGS Lake Superior Biological Station (LSBS) vessel program for the KIYI in 2001 will be approximately 100 operating days that will start the end of April and run to about mid November. Prey-fish assessment will be done with trawls from the end of April to the end of June at stations lake-wide in U.S. and Canadian waters. Primary species in this assessment are lake herring, deepwater ciscoes, rainbow smelt, sculpins, and whitefish. Plankton samples will also collected during this assessment. Work on developing an acoustic sampling program will be included during the last week of May and first week of June. Trawling with a 39-foot bottom trawl will be done to assess Chequamegon Bay fish populations during the last week of July. Species in this assessment include those in the lake-wide prey-fish assessment plus freshwater drum, walleye, and yellow perch. Gill nets will be fished from the KIYI for about two weeks in mid August to determine the status of shortjaw cisco populations in waters off Ontonagan, Michigan. During October and early November, the KIYI will serve as a mother ship for small boats and crews assessing coaster brook trout populations with fyke nets and electro-fishing at Isle Royale National Park. A breakdown of the KIYI's operation time in 2001 would be 50% trawling, 10% gill net work, 20% acoustic work, and 20% as a support vessel. The KIYI vessel program will involve more trawling and less gill netting than the program with the previous vessel Siscowet. The previous vessel program 10-20 years ago included the lake-wide prey-fish assessment and the Chequamegon Bay assessment that will be continued by the KIYI. Trawling for young-of-the-year lake trout has been discontinued and graded-mesh gill netting for pre-recruit lake trout has been turned over to the states. In addition to work done with the KIYI, the LSBS also does assessment of ruffe populations in western Lake Superior using trawls and fyke nets fished from 20- and 25-foot boats. Some of the trawl stations in Chequamegon Bay are too shallow to be fished safely by the KIYI and the LSBS is considering acquiring a small, shallow-draft, day boat that will be capable of fishing a 39-foot trawl. All of the work done by the LSBS is in response to needs or in cooperation with partner state, federal, provincial, and tribal agencies. The station also cooperates with the Great Lakes Aquarium in Duluth, Minnesota by collecting live fish for restocking the aquarium. The station currently does not do contract work with the KIYI except that the Ontario Ministry of Natural Resources (OMNR) does pay fuel, per diem, and overtime costs for doing prey-fish assessment in Ontario waters of Lake Superior and the LSBS now has a Partnership Agreement with OMNR that operates in the spirit of the Joint Strategic Plan. Contract work may be done in the future and the estimated cost would be $2,000-$3,000 per day. Years ago, the Lake Superior Biological Station had contracted some of its work to commercial fishermen, but is currently not contracting any of its work and has no plans to do so in the future.

VESSEL DESCRIPTION: The KIYI was designed by the USACE Marine Design Center in Philadelphia, PA and built by Patti Shipyard, Inc. of Pensacola, FL in 1999. It was delivered to the USGS Lake Superior Biological Station at Ashland, WI in 2000. The contract cost of the KIYI was just over $3,299,000. The KIYI is a steel boat 107 feet long, has a beam of 27 feet, a navigational draft of 10.5 feet, and a displacement of 232 tons (290 regulatory tons gross). It has a fuel capacity of 9,600 gallons, which allows it to cruise for approximately 2,300

miles and 8 days (~200 hrs of continuous operation) between refueling. The KIYI has five staterooms with accommodations for 9 people, 3.5 heads, a galley with a sink and two refrigerators, a TV, and a VCR. The KIYI is powered by two 640 hp Cummins KTA-19M3 diesel engines that propel it at a cruising speed of 11 knots and a maximum speed of 11.5 knots. The KIYI has two Cummins GBT5.9GM 99 kW generators, a Wesmar DPC50 75 hp electric bow thruster, and three sets of two ballast tanks each that are operated off a manifold in the engine room. Deck machinery includes a Wintech B-03-0019 anchor windlass, a 7-foot B. T. winch with 900 feet of 3/16th-inch cable, a 18,000-lb static/2,000-lb deployable A-Frame, an Alaska Marine deck crane with a 30-foot reach, a Kolstrand Variable Speed trawl winch, a Kolstrand Dual Drum Vertical Stack net reel, and a 30-inch Crossley Deep Water gill net lifter. Pilothouse electronics include: Furuno differential GPS, JRC 3811 and JMA 2254 radar units, 2 Furuno FM 2710 VHF radios, Raytheon 430 hailer, Furuno FC 600 sounder, KVH Gyro trac, and Robinson AP35 autopilot.

VESSEL STAFFING: Proposed vessel staffing for the Kiyi is a captain, mate, engineer, and seaman. Joseph Walters entered on duty as the captain on April 29, 2001; he has 21 years experience with large ships in the U.S. Coast Guard. Mike McCann is the captain of record on the Musky II in Lake Erie, but also serves as the Mate on the Kiyi when he is not working on Lake Erie. The crew of the previous LSBS vessel Siscowet, consisted of a captain, engineer, and cook/seaman and a similar three-person crew would be adequate for the Kiyi on day trips in the Ashland area. The captain of the Kiyi is required to have a 500-ton Coast Guard Masters License with a radar endorsement and the Mate is required to have a 500-ton Coast Guard Mates License. Mike McCann has several years of experience as a captain of the Musky II and commercial fishing experience. The engineer and seaman are not required by USGS to have any special licenses or certifications. The current engineer and seaman for the Kiyi have 10 and 8 years experience on USGS vessels, respectively, the engineer worked 4 years operating boats for the Park Service, and both have previous commercial fishing experience. The engineer and seaman have been being trained by Cummins as certified engine technicians for the Kiyi. The engineer is a certified Detroit Diesel engine technician. Vessel crew vacancies are filled following federal hiring practices. The positions are advertised or applications solicited and USGS personnel office screens applications to select those with appropriate knowledge, skills, and abilities. Those that qualify are placed on a certification list that is reviewed by a committee made up of the station head and others. The top three candidates are selected from this list and are interviewed by the committee. The station administrator estimates that this process could take from two to six months. Salaries for the current vessel crew are Wage-board Series based and are about $28/hour for the captain and mate, $22/hour for the engineer, and $20/hour for the seaman. The new captain was hired under the General Service (GS) Series as a GS-12 with an annual salary range of $51,000-$67,500. The GS Series provides a better career track and allows for training for advancement. That position is a management supervisor position at the station in charge of the crew and an expensive vessel budget. There is no career ladder for Wage-board Series personnel and rules prohibit agency-supported training for advancement to a higher position. Scientific staffing consists of either a biologist or a technician who are on board for each cruise. The vessel crew and scientific staff work together and share some jobs in completing the required assessments. The vessel crew receives vessel related safety training each year. The vessel crew spends all of their time on vessel operations and maintenance, about 90% on the Kiyi and up to 10% on the LSBS small boat fleet.

VESSEL OPERATION AND MAINTENANCE COSTS: The KIYI was newly acquired and saw only limited operation in 2000. There are only a little over 700 hours on each of the main engines and a little over 1,000 hours on each of the generators. The KIYI consumes approximately 50-60 gallons of fuel per hour. At $1.50 per gallon, fuel expense would be $75-$90 per hour. A 22-day cruise in 2000 cost about $50,000 for fuel, per diem, overtime, etc., which was about $2,300 per day. There have been no major maintenance problems and maintenance expense has been minimal as equipment and engines are new and still under warranty. The KIYI is currently wet-docked at Ashland, WI during the non-operational season. The dockage is free but costs about $1,500 per month in winter to keep the KIYI heated and there are no facilities at the dock for vessel repair and maintenance. Maintenance on the KIYI will follow American Bureau of Shipping (ABS) standards and recommendations above all else to maintain ABS certification, but will also include recommendations provided by Cummins and other manufacturers. The Lake Superior station administrator is responsible for securing operation and maintenance funds for the KIYI. The engineer has been working with the station administrator to schedule and complete maintenance projects, but now that the captain's position is filled, the captain will take over most of these duties. The Lake Superior station

has acquired a computer software package (Vessel Maintenance System by Chartview) that tracks the vessel maintenance schedule. The engineer and other crew members take care of most maintenance except engine overhauls, haul-out, and sandblasting. The KIYI will be hauled out every 5 years for inspection and painting as required for ABS certification. The haul-out will likely be done at Fraiser Shipyard in Duluth, MN. Minimum cost of the haul-out alone is $10,000 with an hourly charge on top of that for sandblasting, painting, etc. Unforeseen repairs should not be a problem or significantly impact a cruise because the KIYI will be maintained following ABS recommendations, and carries manuals, listings of parts suppliers and repair facilities, and an extensive supply of spare parts for most of the onboard equipment. There are a number of ports on Lake Superior that have repair facilities including Duluth, MN and Sault Ste. Marie, MI. The LSBS operating and maintenance budget has increased substantially with acquisition of the KIYI. However, vessel budgets in recent years have been bare bones. Maintenance requirements for ABS certification should help educate USGS regarding vessel costs and provide for adequate funding if money is available in the overall USGS budget.

VESSEL INSPECTIONS, AND SAFETY: An American Board of Shipping (ABS) condition assessment is conducted annually and a full ABS survey and recertification of machinery and hull is done every 5 years, requiring a haul-out. The last full ABS survey was completed in 1999 before it left the shipyard in Pensacola, FL and the next one will be done in 2004. A stability test was done right after launched at the Pensacola shipyard in 1999. No modifications that would affect stability have been done to the KIYI since this last stability test. Safety equipment carried by the KIYI includes one 16-foot Zodiak, two 10-man life rafts, 10 exposure suits, 10 PFDs, two life rings, and an EPIRB. The crew receives annual offshore safety training, which includes use of the PFDs, survival suits, ring buoys, life rafts that are carried on the KIYI. They also get annual CPR training and First Aid training every 3 years. Fire suppression equipment on the KIYI includes a fixed CO2 system in the engine room that can be activated from the pilothouse, 13 hand-held ABC fire extinguishers located strategically throughout the vessel, and a main system that pumps water to a hose on each deck. The crew has received basic fire fighting training from the Ashland Fire Department.

FUTURE VESSEL PROGRAM: The LSBS staff feels that USGS support for the vessel program was not high initially and that USGS did not fully appreciate the relatively high cost of obtaining fisheries data from the Great Lakes. However, the LSBS staff hopes that support for vessel programs will increase in the next few years, especially as the Great Lakes Science Center and its stations develop comprehensive vessel management plans and new budgeting strategies such as classifying vessels as facilities. The LSBS staff believes that their station will have a large-vessel program on Lake Superior as long as there is a need for assessment and they have the support of their partner agencies. The basic mission of the LSBS and the KIYI of providing deepwater fish population assessments mainly via trawling and acoustics is unlikely to change in the next 20 years. The KIYI is new, designed for that mission, and other agencies on Lake Superior do not yet have this capability and therefore support this USGS effort. The LSBS staff believes that acoustics and other remote sensing will be used more in the future for assessment of fish and fish habitat, and that the KIYI will do more contract work for other agencies on the lake. The station administrator would like to increase staffing by one biologist so that more than one biologist will be onboard the KIYI for every cruise and so that the data that are collected data can be processed more rapidly and made available in a timely manner to our partners who use the data to manage the fish resources of the lake.

VESSEL FITNESS AND FUTURE: The KIYI is a new American Board of Shipping (ABS) certified vessel that, according to a recent ABS survey, should last 50 years based on duty cycle. In the opinion of the vessel engineer, the KIYI could last at least 100 years if properly maintained. The KIYI provides a safer and more stable platform from which to sample in deep water and in severe sea conditions than did its predecessor, the Siscowet. The KIYI's large size denies it access to some of the small, shallow harbors previously used by the Siscowet, and makes it unsuitable for trawling in shallow water. However, the KIYI's 2,000-mile, 8-day cruising endurance allows it to reach all suitable harbors and anchorages around the lake needed to support the major LSBS deepwater sampling programs and to initiate other large-scale open-water work, including lake-wide, around-the-clock acoustic assessment of fish stocks. LSBS staff believe that the operating expense of the KIYI is reasonable considering what it can do and compared to vessels of similar size. One of the biggest concerns of the Lake Superior Biological Station staff is to obtain a suitable permanent dockage near the station somewhere along the Bayfield Peninsula in Chequamegon Bay. The current dockage is a defunct ore dock in Ashland, which is close to the station but

problematical with regard to ice-in in the fall and ice-out in the spring, and lacks dockside shop facilities for repair and maintenance. Currently, USGS does not have a vessel replacement plan but one is being developed as part of a management plan for Great Lakes Science Center vessels. A replacement of the KIYI is not being considered at this time.

12. Appendix B – Small Vessel Programs

SGLFMP AGENCIES LACKING A LARGE-VESSEL GREAT LAKES PROGRAM

A number of SGLFMP-signatory agencies do not have large-vessel programs, at least not on all of their Great Lakes waters, but do conduct partial to full assessment programs using smaller boats. These agencies include the Minnesota Department of Natural Resources (MNDNR) on Lake Superior, the Illinois Department of Natural Resources (ILDNR) on Lake Michigan, the Native American tribes that make up the Chippewa/Ottawa Resource Authority (CORA) on Lake Michigan, Lake Huron, and Lake Superior, the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) and affiliated Native American tribes on Lake Superior, the U.S. Fish and Wildlife Service-Fishery Resource Offices (USFWS-FRO) on all the Great Lakes, and the Ontario Ministry of Natural Resources (OMNR) on Lake Superior.

Minnesota Department of Natural Resources (MNDNR)
The MNDNR Lake Superior Area Fisheries Program (LSAFP) at Duluth, MN uses a 25-foot fiberglass Boston Whaler with twin 115 hp outboards and a hydraulic gill-net lifter to fish gill nets to assess adult lean lake trout in May and September, siscowet lake trout in June, juvenile lean and siscowet lake trout in July-August, spawning lean lake trout in October-November, and lake herring in September-October. The assessments take about 92 operation days and are done in near-shore to 1-2 miles offshore except for the siscowet assessment, which is up to 10 miles offshore. The boat is operated and assessment sampling done by a crew of two biologists and 1-2 summer interns. LSAFP staff believes that they will continue to have a vessel program during the next 20 years similar to what they have now. They have no plans to move up to a large-vessel program but are looking into contracting a large vessel to do special projects that involve acoustics, trawling, and substrate mapping. Possible vessels to contract include the University of Minnesota BLUE HERON and the U.S. Environmental Protection Agency LAKE EXPLORER, both located in Duluth, and the USGS KIYI in Ashland, WI.

Illinois Department of Natural Resources (ILDNR)
The ILDNR Lake Michigan station contracts a 50-foot commercial gill-net tug to assess fish populations in Illinois waters of Lake Michigan with variable-mesh gill nets. The ILDNR establishes the sampling protocol and the contractor operates the boat, sets and retrieves the nets, and maintains the nets. ILDNR personnel assist the contractor collected assessment data. Forage and predator fish populations are assessed in April, yellow perch are assessed in June, and a lake trout spawning assessment is done on Julian's Reef in October-November. Assessments are done from near-shore to 25 miles offshore and involve about 31 operation days annually. The ILDNR would like to continue this contracted program for the next 20 years. They would like to expand their program to include alternative sampling gear such as trawls, trap nets, and vertical gill nets, but are restricted to gill netting with the currently contracted vessel. Although the ILDNR does not have any current plans to embark on a large-vessel program of their own, it may become a necessity if the current contracted commercial fisher goes out of business. The commercial fishery in Illinois waters is currently not economically viable and won't be until there is a significant revival of yellow perch populations.

Chippewa/Ottawa Resource Authority (CORA)
The CORA out of Sault Ste. Marie, MI operates the Intertribal Fisheries and Assessment Program (ITFAP) for five Native American tribes with fishing rights in eastern Lake Superior and northern Lake Huron and Lake Michigan. ITFAP has a fisheries staff of biologists and technicians that use a 26-foot fiberglass Privateer with twin outboards, a forward cab, a gill-net lifter, and rigged for small trawling jobs to assess populations of spring and fall lean lake trout, siscowet lake trout, lake whitefish, shallow-water fish communities in the upper three Great Lakes, and lake

herring and associated fish community in the St. Marys River. Commercial fishers are often contracted to do some of this work. These assessments are done during May-November and involve about 50 operational days. The Sault Ste. Marie CORA occasionally uses 16- to 18-foot boats for small near-shore projects. A person classified as a Fishery Technician/Vessel Captain operates the 26-foot boat with the remainder of the crew made up of fishery technicians, fishery aides, or biologists. The Sault Ste. Marie CORA staff believes they will have some kind of a Great Lakes program 20 years from now but doubts that it will be a large-vessel program. Since CORA has responsibilities on all three upper lakes and limited budget and staffing, they believe that having small boats that can be trailered from one lake to the next and occasionally contracting commercial fishing boats is the best strategy. They would like to have a somewhat longer and wider boat with a better cab arrangement than the current 26-footer.

In addition to ITFAP, most tribes represented by CORA have or are developing their own fisheries management programs. Examples of established and developing Great Lakes program among CORA tribes are the Bay Mills Indian Community (BMIC) at Bay Mills, MI and the Little Traverse Bay Band of Odawa Indians (LTBB) at Petoskey, MI. The BMIC has two Boston Whalers, 22- and 17-foot respectively, that are used to assess lake trout and lake whitefish in Lake Superior and lake whitefish in Lake Huron. These assessments are done with gill nets fished out to 4 miles from shore for approximately 40 operation days during April-September. These boats do not have a designated crew. Biologists and technicians operate the boats and conduct the assessments with assistance from seasonal employees. Commercial fishers are sometimes contracted to do some of the assessments. The BMIC fisheries staff believes they will have a Great Lakes program during the next 20 years. They have recently contracted with the Schaefer Boat Company of L'anse, MI for a 27-foot aluminum boat with dual 150 hp Mercury outboard engines. This larger boat will improve safety and their ability to assess offshore fish stocks. However, they have no plans at this time to expand to a large-vessel program. The LTBB are in the process of developing a Great Lakes fisheries program in Lake Michigan waters and has acquired a 27-foot aluminum trap-net boat. Their plans for 2001 include monitoring tribal commercial fishers to obtain biological data from the catches, fish gill nets to assess stocks of lake whitefish, lake trout, yellow perch, burbot, and spawning stocks of chinook salmon and lake trout. They will also use the boat to study effects of egg and fry predators on lake trout recruitment. Most of the work will be done during April-November. Biologists and technicians will operate the boat and conduct the assessments and other studies. The LTBB has not contracted any work but does work cooperatively on several projects with the Michigan Department of Natural Resources and U.S. Geological Survey. The LTBB fisheries staff expects to have a Great Lakes program 20 years from now but it will likely not be expanded to a large-vessel program.

Great Lakes Indian Fish and Wildlife Commission (GLIFWC)

The GLIFWC provides fisheries and other biological services to Native American tribes with fishing rights on western Lake Superior waters. The GLIFWC uses a 25-foot fiberglass Boston Whaler with twin 150 hp outboards and a gill-net lifter to assess spawning lean lake trout populations within 2 miles of shore during October-November and siscowet lake trout populations within 5 miles during June-August. They also use an 18-foot aluminum Lund with a 40 hp outboard to assess lake sturgeon populations within 0.5 miles of shore during May-September. These assessments take 40-60 operational days. A GLIFWC Great Lakes Technician serves as captain of the 25-foot boat with a biologist and two seasonal employees making up the rest of the crew. The GLIFWC also contracts with commercial fishers to do fall lake whitefish assessment in Lake Superior and expects to continue to do this for an unknown number of years. The GLIFWC fisheries staff believes that they will have a Great Lakes vessel program 20 years from now but it will be similar to the current program. They would like a larger vessel because the current vessel is open with a small amount of deck space and is limited by weather. However, GLIFWC fisheries staff does not expect to expand to a large-vessel program in the foreseeable future due to a limited budget and agency priorities.

The tribes affiliated with the GLIFWC have fisheries programs of their own, which involves monitoring and collecting biological data from tribal commercial fish catches and assisting with GLIFWC projects. None of these tribes currently have a large vessel program and do their work either by contracting with a commercial fisher or using their own small boats. Typical of these programs is that of the Red Cliff Band of Lake Superior Chippewas located at Bayfield, WI. The Red Cliff Fisheries Department had a large-vessel program a few years ago using a 37-foot gill-net tug, the Queen of Bayfield. This vessel was determined to need extensive restoration and was taken

out of service. The Red Cliff Fisheries Department not contracts commercial fishers or uses small boats to conduct spring, summer, and fall lake trout assessments, and fall lake whitefish assessments. These assessments require 19-29 days during April-November. Red Cliff biologists and technicians work with the contracted commercial fisher to collect data and crew the small boats. The Red Cliff Fisheries Department staff believes they will have a Great Lakes program as long as there is a viable tribal commercial fishery. They are looking to restore the Queen of Bayfield and resume a large-vessel program.

U.S. Fish and Wildlife Service-Fishery Resource Offices (USFWS-FRO)

The USFWS has Fishery Resource Offices (FRO) on each of the Great Lakes. They use small boats for various assessments and projects in Great Lakes waters. The following describes the program at the Lake Huron FRO at Alpena, MI. The Alpena FRO has four boats, the largest being a 22-foot fiberglass Boston Whaler with twin 100 hp outboards. The other three are all 18-foot long with 25-50 hp outboards and one is specifically designed for electro-fishing. The 22-foot boat is rigged for fishing small trawls for aquatic nuisance species (ruffe, goby, etc) assessment in near-shore waters in Lake Huron and a few stations in Lake Michigan and Lake Superior. Short-gang gill nets are also fished from this boat. The other boats are used in bays and near-shore waters of Lake Huron and Lake Erie, coastal marsh studies, and lake sturgeon assessment in Great Lakes connecting waters. The combined days of operation for the four boats is approximately 90 days during April-October. There is not a designated crew for these boats but all FRO personnel who operate a boat must become certified Boat Operators. This training is provided by the USFWS through a program involving both classroom and on-the-water training. The Alpena FRO expects to have a Great Lakes program 20 years from now and would like a somewhat larger boat (25- to 27-foot) to assess lake trout and lake whitefish populations in near-shore Lake Huron, but have no plans for a large-vessel program. The Alpena FRO currently uses the USFWS Jordan River National Fish Hatchery vessel Togue for lake trout assessment in offshore waters of Lake Huron and also contracts commercial fishing boats to do lake trout early life history studies. They expect to continue using the Togue or its replacement and to continue contracting with commercial fishers for large-vessel work during the next 20 years.

Ontario Ministry of Natural Resources (OMNR)

The OMNR has large-vessel stations on all of its Great Lakes waters except Lake Superior. The OMNR Lake Superior stations at Thunder Bay and Sault Ste. Marie currently monitors commercial fishing catches or contracts commercial fishers to assess lake trout and lake whitefish populations, have an arrangement with the USGS Lake Superior Biological Station out of Ashland, WI to obtain forage-fish assessment data, and receives vessel support from the OMNR research vessel out of Owen Sound, Lake Huron for special projects. The OMNR expects to continue to obtain assessment data for fish populations in Lake Superior during the next 20 years by monitoring commercial fishers and contracts or arrangements. However, they are attempting to obtain a large vessel for their program on Lake Superior. They would like to initiate and conduct a number of their own index and research programs, which would be more intermittent and less amenable to contracting or other arrangements.

13. Appendix C – Interview Questionnaires

QUESTIONNAIRE –Captain and Crew

VESSEL DESCRIPTION:

Review Vessel Description Form.

VESSEL OPERATION:

1. How many hours were accumulated on your vessel's main and auxiliary engines for each of the last three seasons?
2. How much fuel was used in each of the last three seasons? What did it cost?

VESSEL MAINTENANCE:

1. How much was spent on maintenance and repairs in each of the last three years?
2. When was the last haul-out and how much was spent on haul-out maintenance and repairs?
3. What is your normal haul-out cycle?
4. What new equipment was installed within the last three years and what did the equipment cost?
5. Do you get adequate support for maintenance and repairs?
6. What kind of work is done by crew and by contract mechanics?
7. How often are the following maintenance projects done: hull sandblasting, hull inspection, hull and deck painting, engine maintenance, engine overhaul, and electrical inspection?
8. Who schedules the above projects (vessel captain, station head, or other agency personnel)?
9. What criteria are used for establishing the schedule (manufacturer's specifications, etc.)?
10. How are unforeseen (emergency) repairs handled during the operational season?
11. Do you have ready access to parts suppliers or repair facilities for the equipment on your vessel?
12. Have unforeseen repairs caused significant down time in the past (e.g. cancellation of a survey)?
13. Has the frequency of unforeseen repairs increased in recent years?
14. How are unforeseen (emergency) repairs handled during the operational season?

15. Do you have ready access to parts suppliers or repair facilities for the equipment on your vessel?
16. Have unforeseen repairs caused significant down time in the past (e.g. cancellation of a survey)?
17. Has the frequency of unforeseen repairs increased in recent years?
18. How is the vessel buttoned up and stored for the non-operational season (dry dock or wet dock)?

VESSEL STAFFING:

1. How many permanent vessel staff are currently employed to run your research vessel?
2. How long have they been in these positions?
3. How has this staffing changed compared to 20-25 years ago?
4. For each of the crew positions, what are the job qualifications?
5. For each of the positions, what is the starting, 10-year and top pay?
6. Does the crew qualify for overtime compensation?
7. If so, what is the compensation?
8. How much overtime was worked (include time and pay) by each crewmember in each of the last three years?
9. What was the travel costs for the crew in each of the last three years?
10. How are crewmembers recruited and hired for your vessel?
11. What is your crew composition in terms of job classification and number, and are they full or part time?
12. How experienced is your vessel crew (years doing their job)?
13. What licenses, certifications, or special training are required for these classification levels?
14. What is the line of supervision within the crew?
15. Does the agency provide/facilitate training or access to training that is required for the above licenses or certifications?
16. Is there a career ladder to allow for advancement of crewmembers?
17. What is the makeup of the onboard scientific staff (number and job classification)?
18. Does the scientific staff work well with the crew?
19. Do they assist or share jobs with crewmembers or do they just do jobs not involving crewmembers?
20. Does the vessel crew work on non-vessel related projects?
21. If so, when, why, and what percentage of their time is on non-vessel projects?

22. What kinds of work are involved in these non-vessel projects?
23. Do you and/or your crew appreciate this job diversity or would you/they prefer only vessel-related jobs?
24. Are there any crew staffing issues that you think are important?
25. If there are, what remedies would you suggest?

SAFETY:

1. What types of training does the crew receive for safety, maintaining skills, or advancement?
2. Describe your vessels fire-fighting equipment and fire-fighting training experience?
3. When was the last inclining experiment (stability test) done on your vessel?
4. Have their been any modifications to the hull since this last stability test?

SURVEYS, INSPECTIONS and FITNESS:

1. What inspections were conducted during the last ten years?
2. When was the last inclining experiment (stability test) done on your vessel?
3. Have their been any modifications to the hull since this last stability test?
4. When were the main(s) and auxiliary last overhauled?
5. Has your vessel been surveyed? If so, what were the findings? Have their recommendations been implemented?
6. In your opinion, what is the current state of fitness of your vessel – hull and mechanical systems?
7. Are there any current problems with your vessel that need attention?

PROGRAM DESCRIPTION:

FUTURE PROGRAM:

VESSEL SUITABILITY:

1. Is your vessel meeting the needs of the scientific staff (any complaints)?
2. What are the strengths and weaknesses of your vessel?

3. How could specific complaints be rectified (new or retrofitted vessel, newer or different equipment, more operational funds, improved or more technical staffing, etc.)?
4. Do you think inadequate budget, staffing, or design (sea-state, weather, docking, winter storage, or other limitations) limits your vessel's operation?
5. How would you characterize your agency's support of your vessel?
6. How flexible is your boat and crew to new ideas?
7. Do you think your station will have a vessel program 20-25 years from now?
8. In your opinion, what is the current state of fitness of your vessel – hull and mechanical systems?
9. Do you think your vessel has a remaining serviceable life of 20-25 years?
10. If not, have you had a comprehensive survey done by a qualified marine surveyor?
11. If not, what is your best estimate of its life?
12. If not, could a major rehab extend the vessels operating life?
13. Who determines if and when your vessel should be refitted or retired?
14. If your vessel is retired, do you think it will be replaced?
15. What are the criteria for vessel replacement (vessel age, vessel condition, repair frequency, program needs)?
16. What is your specific input to this action?
17. Would you be involved in the design and specifications of a new or replacement vessel?
18. Who else would be involved?
19. Is your vessel currently a safe work place for the crew?
20. Does your vessel meet current and projected program needs?
21. Compared to other boats of similar size, are your vessels' operating expenses reasonable?
22. Has there been any serious talk of a vessel replacement in the foreseeable future?
23. If so, for what reason?
24. What specifications of a new or replacement vessel do you think are most important to handle needs of the current and foreseen vessel tasks?
25. What shipyard or ship builder would you use to refit your existing vessel or build a new one?
26. Do you know of any others that are capable of doing these jobs?

QUESTIONNAIRE –Administrators/Scientists

VESSEL DESCRIPTION:

VESSEL OPERATION:

VESSEL MAINTENANCE:

1. How much oversight do scientists/administrators have over the maintenance of your vessel?
2. What specifically is scientist's role, if any, in scheduling and completing maintenance tasks?
3. What is the scientist's role regarding dealing with unforeseen repairs during the vessel operating season?
4. Does your station have ready access to repair facilities that can handle hull, engine, or electrical problems with a minimum of down time?
5. Has unforeseen repairs ever caused cancellation of all or a part of a survey?
6. Has need for repairs increased in frequency in recent years?
7. Do you have any concerns that vessel maintenance has constrained your ability to implement program?

VESSEL STAFFING:

1. Who is responsible for your vessel's operational budget?
2. Who is responsible for your vessel's staffing and who supervises the crew?
3. How are crewmembers recruited and hired?
4. Do you have any problems recruiting qualified people to run your vessel?
5. Is there a career ladder so that crewmembers can advance within the ranks of the crew?
6. For the scientists, do you have a permanent biologist that does all the vessel work or are there several biologists that assist the crew?
7. Are the on-board biologists responsible for all aspects of the survey, i.e., data collection, tabulation, analysis and report writing?
8. How do the vessel crew and the biologists work together, is there a sharing of jobs among the scientific staff and the vessel crew, or does each have specific jobs?
9. Do the scientific staff and vessel crew work well together?

SAFETY:

SURVEYS, INSPECTIONS and FITNESS:

PROGRAM DESCRIPTION:

1. Describe your current vessel program (provide copy of vessel field schedule)?
2. How does your 2000 vessel program compare with your program in 1980?
3. How many months/days did your vessel operate in each of the last 3 field seasons?
4. What is the earliest and latest date your vessel can operate (maximum length of field season)?
5. What percent of the time is the vessel operating during that period?
6. What percent of vessel operation is allocated to fisheries survey (assessment), habitat survey, specific research projects, law enforcement, cooperative work with other agencies, or contract work for other agencies?
7. What gear do you use on each survey?
8. Are any surveys done in cooperation with other agencies or groups?
9. Is your scientific staffing adequate to enable full utilization of your research vessel?
10. If you do contract work, is the contract work necessary to fund vessel operations or just to maximize utilization of the vessel?
11. What are the strengths and weaknesses of your vessel?
12. Does your vessel accommodate the basic needs of the crew for comfort and safety?
13. Does your vessel and/or staff meet your current program needs?
14. If not, what aspects of vessel operations do not meet your needs?
15. What is required of your vessel or program to better meet your needs?
16. Have you considered other vessel-support options such as contracting other agency or private vessels to meet the unmet needs?
17. What is your attitude and that of your agency regarding outside contracting?
18. Do contract dollars flow back to your program?
19. If not, is this an issue?
20. Who is responsible for the vessel's operational budget (captain, lab director, other)?

21. What is the source of funding for your vessel program (general tax revenue, fishing license dollars, Federal Aid etc.)?
22. Is the vessel's operating budget and level of staffing adequate for your current vessel program?
23. Has your vessel's operating budget constrained, in any way, your program within the last 10 years?
24. What has been the trend in your vessel-operating budget in the last 10 years?
25. Do you normally get all the operating dollars you request or do you normally get a portion of your request?
26. If you have not received what you requested, what has been the impact on your program?
27. How would you rate your agency's support of your vessel program (scale 1-5; 5= Outstanding)?
28. Do you foresee the current support changing in the next 20-25 years?

FUTURE PROGRAM:

1. What changes in your vessel program do you foresee in the next 20-25 years (programs discontinued, new programs)?
2. What kind of staffing changes might you see in 20-25 years?
3. What, if any, vessel changes would be required to meet these new program needs?
4. Have you considered vessel replacement or a mid-life refit of your existing vessel?
5. Is there a process in place for securing agency and budgetary support for upgrading or replacing your vessel to meet these new program needs?
6. Are there alternatives being explored through cooperation or contracting with other agencies to meet these needs?
7. How would your vessel program change if your operational budget were doubled (expand existing operations, undertake new operations)?
8. How would your vessel program change if your operational budget were halved (scale back or eliminate existing operations)?
9. Do you think your station will still have a vessel program in 20-25 years?

VESSEL SUITABILITY:

1. Have you considered vessel replacement or a mid-life refit of your existing vessel?

2. Is there a process in place for securing agency and budgetary support for upgrading or replacing your vessel to meet these new program needs?
3. Are there alternatives being explored through cooperation or contracting with other agencies to meet these needs?
4. Have you had a recent comprehensive survey of your vessel by a surveyor, marine engineer or architect?
5. If so, did they indicate the serviceable life of your vessel?
6. Do you think that your vessel has a remaining serviceable life of 20-25 years?
7. If not, what is your estimate of your vessel's serviceable life?
8. What guidance have you received, if any, regarding moving ahead with a planned replacement or midlife refit?
9. Have you developed a strategy for addressing this issue?
10. Is the fiscal environment within your agency suitable for funding a vessel replacement?
11. How would purchase of new or replacement vessels be financed?
12. Who in your agency determines if a vessel should be retrofitted or when a vessel is no longer seaworthy, not repairable and must be retired from operation?
13. What criteria are used in determining that a vessel should be retired (age, seaworthiness, repair frequency, program changes)?
14. Who or what process determines if a new or replacement vessel will be acquired for your vessel program?
15. Can you estimate the minimum time it would take to purchase a replacement vessel, or to build a new vessel?
16. What would be your role in determining the specifications and acquiring a new vessel for your station?
17. Who else would be involved?
18. What specifications of a new or replacement vessel do you think are most important for your program?
19. Once the need is established and approved, how long do you estimate it would take to replace your existing vessel via purchase of an existing vessel or build a new vessel?
20. What shipyard or ship builder would you use to retrofit or replace your existing vessel?
21. Do you know of any others that are capable of doing these jobs?